Measuring Top Management Commitment in SMEs: A Self-Assessment Scale

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Abstract

This paper describes the development of a scale for measuring top management commitment towards continual quality performance improvement in small and medium-sized enterprises (SMEs). A set of self-assessment questions of the ISO 9004: 2000 Standard was used to assess the adoption status of quality management practices. This paper investigates the inter-item reliability and the content validity of the Quality Management Principles Scale (QMPS) in an integrated improvement process in SMEs. An empirical study was conducted to acquire senior management views on the use of the QMPS in manufacturing sectors in Trinidad and Tobago. Based on 328 responses from 110 SMEs, statistical software packages were used to analyse the empirical data and determine the reliability and validity of the QMPS. The paper contributes to develop a self-assessment scale that can be used to measure top management commitment. It is anticipated that the findings would provide practical insights for evaluating the levels of maturity on performance improvement in SMEs.

Key Words: ISO 9004, QMPS, SMEs, Top Management Commitment

1. Introduction

The International Organisation for Standardisation (ISO) defined top management as "a person or group of people who direct and control an organisation" and continual improvement as "a recurring activity to increase the ability of fulfilling the requirements that are stated, such as the needs and expectations, generally implied or obligatory" [3]. According to ISO Focus [4], more than 90% of global businesses are small and medium-sized enterprises (SMEs) and many of them have used the ISO Standards as one of the most preferred

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means of continual improvement. There has been a pressing need for SMEs to have objective means by which their top management can use for making strategic decisions towards the continual improvement.

The Technical Committee 176 of ISO developed the series of ISO 9001 : 2000 and ISO 9004 : 2000 Standards for promoting ease of transition and efficiency within an organisation. ISO 9004 : 2000 is recommended as a guide for organisations to move beyond the requirements of ISO 9001 in pursuit of continual improvement of performance [5]. It provides an annex of 53 Self-Assessment Questions (SAQs) that would be used to measure the status of organisations with respect to eight quality management principles. The self-assessment approach advocated by the ISO 9004 : 2000 Standard could be applied to the entire quality management system or to a part of it, or to any process in the entire organisation or part of the organisation [5, 7].

The SAQs help users to determine the relative degree of maturity of the quality management system and identify main areas for improvement in organisations. Nevertheless, the Standard does not provide explanatory link between the SAQs and their corresponding principles. This paper discusses the use of a self-assessment scale (i.e. the Quality Management Principles Scale, QMPS) to measure the top management commitment in SMEs. By mapping the quality management principles with respective SAQs, the inter-item reliability and validity of the self-assessment scale are determined.

2. The Quality Management Principles Scale

The ISO 9004 : 2000 Standard advocates eight quality management principles that are aimed at continually improving performance by focusing on customers while addressing the needs of other stakeholders [5]. These principles include 1) customer focus organisation, 2) leadership, 3) involvement of people, 4) process approach, 5) system approach to management, 6) continual improvement, 7) factual approach to decision making, and 8) mutually beneficial supplier relationship. They are comprehensive and fundamental rules or beliefs for leading and operating an organisation, and can be regarded as the main constructs of quality management practice [7].

The self-assessment scale, or the QMPS, is based on these eight principles. The scale maps fifty-three SAQ items to the eight constructs based on the numbering in Annex A of the ISO 9004 : 2000 Standard. Table 1 depicts a summary of the mapping among quality management principles, the SAQs and the corresponding clauses of the Standard. It shows that seven SAQs would be used to measure customer focus, ten SAQs for leadership and six SAQs for people involvement. Both process approach and system approach to management account for eight and seven SAQs, respectively, while factual approach to decision

making could be measured by another six SAQs. Besides, there are seven SAQs addressing the measures of continual improvement and another four for mutually beneficial supplier relationship. Employing the approach helps organisations to identify the prioritisation of opportunities for improvement, and to facilitate the adoption of the quality management system towards world-class performance.

Table 1. Mapping quality management principles with the SAQs

The Principles	The ISO 9004 : 2000 Clauses	SAQ Number as in Annex A of the ISO 9004 : 2000 Standard
1. Customer Focused Organisation (CFO)	5.2 Needs and expectations interested parties 6.3 Infrastructure 7.2 Processes related to interested parties 7.5 Production and service operations	4a) Does the organisation identify customer's needs and expectations on a continual basis? 4d) Does the organisation identify other interested parties' needs and expectations that can result in setting objectives? 4e) Does the organisation ensure that statutory and regulations have been considered? 11b) Does management consider environmental issues associated with the infrastructure? 18b) Does management define other interested party related processes to ensure consideration of interested party needs and expectations? 21a) Does management ensures that the input to the realisation processes takes account of customer and other interested parties? 24b) Does management ensure the collection of data from other interested parties for analyses and possible improvements? Interested parties of organisations include customers and end-users; people in the organisations; owners/investors (such as shareholders; individuals or groups, including the public sector, that have a specific interest in the organisation)
2. Leadership (LDR)	5.1 Financial resources 5.3 Responsibility, authority and communication 5.4 Planning 5.5 Management responsibility 6.1 Resource management	3a) Does TM demonstrate its leadership, commitment and involvement? 5a) Does the quality policy ensure that the needs and expectations of customers and other interested parties are understood? 5b) Does the quality policy lead to visible and expected improvements? 5c) Does the quality policy consider the organisation's vision of the future? 6a) Does the objectives translate the quality policy into measurable goals? 6b) Are the objectives deployed to each management level to assure individual contribution to achievement? 6c) Does management ensure the availability of resources needed to fulfill the objectives?

		7b) Does communicating quality requirements, objectives and accomplishments contribute to improvement of the organisation's performance? 9a) Does management plan for resources to be available in a timely manner? 10a) Does management promote involvement and support of the organisation? 16a) Does management plan, provide, control and monitor the financial resources necessary to maintain an effective and efficient quality management system and ensure the achievement of the objectives of the organisation?
3. Involvement of People (IOP)	5.2 Needs and expectations of interested parties 5.3 Responsibility, authority and communication 6.2 People 6.4 Work environment 6.8 Financial resources	4b) Does the organisation identify people's need for recognition, work satisfaction, competence and personal development? 7a) Does management ensure that responsibilities are established and communicated to people in the people for improvement of the effectiveness and efficiency of the organisation? 10b) Does management ensure that the competence of people in the organisation is adequate for current and future needs? 12a) Does management ensure that the work environment promotes motivation, satisfaction, development and performance of people in the organisation? 16b) Does management ensure awareness of people in the organisation about the link between product quality and costs?
4. Process Approach to Management (PAM)	4.1 Managing systems and processes 7.1 Product realisation-General guidance 7.2 Processes related to interested parties 7.3 Design and development 7.4 Purchasing 7.5 Production and service operations	1a) Does management apply the process approach to achieve the effective and efficient control of processes, resulting in performance improvement? 17a) Does management apply the process approach to ensure the effective and efficient operation of the realisation and support processes and the associated process network? 18a) Has management defined customer-related processes to ensure consideration of customer needs? 19a) Has management defined design and development processes to ensure they respond to the needs and expectations of the organisation's customers and other interested parties? 19c) Are activities such as design, review, verification, validation and configuration management considered in the design and development processes? 20a) Has management defined purchasing processes to ensure purchased products satisfy the organisation's needs? 20c) Does the organisation ensure conformity of purchased products from specification through to acceptance? 21c) Are activities such as verification and validation addressed in realisation processes?

5. System Approach to Management (SAM)	4.2 Documentation 6.3 Infrastructure 7.3 Design and development 7.4 Purchasing 7.5 Production and service operations	2a) Are documents and records used to support effective and efficient operation of the processes of the organisation? 11a) Does management ensure that the infrastructure is appropriate for the achievement of the objectives of the organisation? 19b) Are design and development processes managed in practice, including the definition of design and development requirements and the achievement of planned outputs? 20b) Are purchasing processes managed? 21b) Are realisation processes managed from inputs and outputs?
6. Continual Improvement (COI)	8.2 Measurement and monitoring 8.3 Control of Nonconformity 8.5 Improvement	24a) Does management ensure collection of customer-related data for analysis, in order to obtain information for improvements? 24c) Does the organisation use self-assessment of the quality management system for improving the overall effectiveness and efficiency of the organisation? 25a) Does the organisation control process and product non-conformity? 25b) Does the organisation analyse nonconformity for lessons learned and process and product improvement? 27a) Does management use corrective action for evaluating and eliminating recorded problems affecting its performance? 27b) Does management use preventive action for loss prevention? 27c) Does the management ensure the use of systematic improvement methods and tools to improve the organisation's performance?
7. Factual Approach to Decision Making (FADM)	5.6 Management review 6.5 Information 7.6 Control of monitoring and measuring devices	8a) Does TM ensure valid input information is available for the management review? 8b) Does the management review activity evaluate information to improve the effectiveness and efficiency of the processes of the organisation? 13a) Does management ensure the appropriate information is easily available for fact-based decision making? 22a) Does management control the measuring and monitoring devices to ensure that correct data are being obtained and used? 23a) Does management promote the importance of measurement, analysis and improvement activities to ensure that the organisation's performance results in satisfaction of interested parties? 26a) Does the organisation analyse data to assess its performance and identify areas for improvement?
8. Mutually Beneficial Supplier Relationship (MBSR)	5.2 Needs and expectations of interested parties 6.6 Suppliers and partnerships 6.7 Natural resources	4c) Does the organisation consider the potential benefits of establishing partnerships with its suppliers? 14a) Does management involve suppliers in the identification of purchasing needs and joint strategy development? 14b) Does management promote partnership arrangement with suppliers? 15a) Does the organisation ensure the availability of necessary natural resources for its realisation processes?

3. Conduct of an Empirical Study

3.1 Methodology of the study

An empirical study was conducted to acquire senior management views on the use of the QMPS in an integrated improvement process in SMEs. Using systematic sampling method, a targeted group of 400 organisations were invited from the major manufacturing sectors in Trinidad and Tobago. These SMEs were classified by size in terms of the number of employees hired (i.e. 300 or less) and were at different stages of implementing the ISO 9001: 2000 Standard. A structured questionnaire was designed and sent to at least two practitioners representing senior management of individual SMEs. The item-item reliability and the construct validity of the QMPS were analysed, with the aid of the Statistical Package for the Social Sciences (SPSS) and the Linear Structural RELationships (LISREL) software. Reliability is indicated by the repeatability of the measure, while validity refers to whether the measures centre on the true measure. The Cronbach alpha was used to demonstrate inter-item reliability by internal consistency.

The Confirmatory Factor Analysis (CFA) was then performed on the individual constructs. The factor loadings indicate the strength of their relationship and are referred to as validity coefficients. For determining the construct validity, the eight principles are considered as the latent factors of the QMPS. It is assumed that units of measurements of the latent factors are standardised so that there will have unit variances in the population [6]. This means that the unit of measurement of each latent factor equals to its standard deviation.

The goodness of fit statistics is detailed for each construct or measurement model. A good fit exists if the chi-square to degrees of freedom ratio is less than 3. The factor loadings or validity coefficients give an indication of the extent to which each scale item is able to measure the latent factor and also determines its validity [8]. The R^2 value is a measure of the strength of the linear relationship between the scale item and the latent factor. These values provide information about the extent to which a given scale item is able to measure its construct.

3.2 Response rate and profile of respondents

The QMPS questionnaires were distributed to 400 SMEs in Trinidad and Tobago. A total of 110 SMEs participated the study, yielding a response rate of 28.8%. Bentler and Chou [1] suggested that a ratio of 5 cases per variable would be sufficient for normal and elliptical distributions when the latent variables have multiple indicators and that a ratio of at least 10 cases per variable would be sufficient for other distributions. Since there are eight factors or variables in the analysis of the QMPS, a valid response of 110 satisfies this condition.

The basic information about the sample and the informants is given in Table 2. This includes the SME groupings by industry and the numbers of senior management respondents including senior executives, directors and managers. A total of 328 completed questionnaires were received from 110 participating SMEs. The major six industry groupings constituted 71 SMEs (i.e. 64.5%) and 234 respondents (i.e. 71.3%). In terms of number of participating SMEs, these included 1) the printing, packaging and plastics sector (i.e.; 13.6%), 2) the food, beverage and tobacco sector (i.e. 12.7%), 3) the construction and accessory products sector (i.e. 10.0%), 4) the energy and related sector (i.e. 10.0%), 5) the assembly and related products sector (i.e. 9.1%), and 6) the chemical and processing sector (i.e. 9.1%).

Table 2. The profile of SMEs by industry and respondents

SME Groupings by Industry	Number of Firms Participated	Number of Respondents
1. Printing, packaging and plastics	15(13.6%)	45(13.7%)
2. Food, beverage and tobacco	14(12.7%)	41(12.5%)
3. Construction and accessory products	11(10.0%)	41(12.5%)
4. Energy and energy related	11(10.0%)	35(10.7%)
5. Assembly and related products	10(9.1%)	42(12.8%)
6. Chemical and processing	10(9.1%)	30(9.1%)
7. Transport and distribution	6(5.5%)	16(4.9%)
8. Textiles and garments	6(5.5%)	13(4.0%)
9. Furniture and appliances	5(4.5%)	11(3.4%)
10. Engineering services	5(4.5%)	12(3.7%)
11. Financial services	4(3.6%)	10(3.0%)
12. Personal products	3(2.7%)	8(2.4%)
13. Professional services	3(2.7%)	7(2.1%)
14. Distribution	3(2.7%)	6(1.8%)
15. Others (including business services, IT/electronics and telecommunications)	4(3.6%)	11(3.4%)
Total :	110(100%)	328(100%)

4. Measuring the Inter-item Reliability and Construct Validity

4.1 Inter-item Reliability of the QMPS

The reliability of a scale is the degree to which the observed instrument measures the 'true' value and is free from measurement error [2]. A reliable measure provides consistent results when administered repeatedly to the same group of people. The concepts of reliability and validity are related. Reliability is said to be a condition but is not sufficient to explain validity. The Cronbach alpha is used to demonstrate reliability by internal consistency called

inter-item reliability. It is the average of the correlation coefficient of each item with every other item. Values for the Cronbach alpha range between 0 and 1.0, with higher values indicating higher validity [2].

Based on the empirical data obtained from 110 SMEs in the survey, Table 3 depicts the Cronbach alpha values for the scales being examined. It shows that these measures for the constructs met the minimum acceptable Cronbach Alpha value, with the greatest value of 0.9231 for Continual Improvement, and the smallest one of 0.8516 for Customer-focused Organisation. These inter-item reliability values provide evidence for the reliability of the SAQs in measuring the stipulated principles of quality management.

Table 3. Inter-item reliability of the QMPS

The Eight Quality Management Principles	Cronbach's Alpha
1. Customer-focused organisation (CFO)	0.8516
2. Leadership (LDR)	0.9209
3. Involvement of people (IOP)	0.8546
4. Process approach to management (PAM)	0.8846
5. System approach to management (SAM)	0.8628
6. Continual improvement (COI)	0.9231
7. Factual approach to decision making (FADM)	0.9123
8. Mutually beneficial supplier relationship (MBSR)	0.8456

4.2 Construct Validity of the QMPS

The Confirmatory Factor Analysis was used to analyse the hypothesized measurement models of the eight constructs of the QMPS. Overall, these measurement models represent a good fit to the data collected since the chi-square to degrees of freedom ratio is less than 3 for individual case. Jöreskog and Sörbom [6] suggest that the factor loadings can act as validity coefficients if the model fits the data well. Table 4 summarises the findings of the CFA with respect to the factor loadings, squared multiple correlations R^2 and the t-values of the SAQs of the QMPS.

For the CFO measurement model, six SAQs that are hypothesized to measure CFO have high factor loadings and R^2 values. This indicates that the SAQs 4, 13, 31, 35, 50, and 53 are valid measures of CFO. The factor loadings have an average of 0.859 and range from a low of 0.782 for SAQ 53 and a high of 0.953 for SAQ 50 with corresponding values of R^2 being 0.611 and 0.907. These SAQs have high t-values, which means that they are all highly significant.

For the LDR measurement model, eight SAQs that are hypothesized to measure LDR have high factor loadings and R^2 values. This indicates that the SAQs 10, 17, 21, 24, 26, 30,

Table 4. CFA analyses of the constructs of the QMPS

Latent Factors	SAQ No.	Factor loadings	R^2	t-values	Latent Factors	SAQ No.	Factor loadings	R^2	t-values
CFO	4	0.838	0.702	14.369	SAM	19	0.962	0.926	29.316
	13	0.889	0.790	25.739		22	0.861	0.741	15.839
	31	0.811	0.657	15.113		28	0.681	0.464	9.513
	35	0.881	0.776	16.067		36	0.862	0.742	16.798
	50	0.953	0.907	27.255		37	0.892	0.796	20.467
	53	0.782	0.611	13.496		42	0.929	0.864	28.200
LDR	10	0.919	0.845	32.072		45	0.905	0.819	19.463
	17	0.843	0.711	24.915	COI	16	0.864	0.746	20.401
	21	0.939	0.881	24.269		25	0.905	0.818	27.394
	24	0.837	0.700	27.400		29	0.952	0.907	37.805
	26	0.960	0.921	42.681		41	0.903	0.815	22.865
	30	0.980	0.961	63.383		44	0.969	0.938	57.692
	32	0.847	0.717	18.886		46	0.963	0.928	52.058
	38	0.767	0.588	13.458		47	0.964	0.929	52.900
IOP	3	0.778	0.605	10.986		52	0.978	0.956	50.572
	5	0.692	0.479	7.919	FADM	15	0.848	0.720	24.082
	8	0.573	0.329	8.213		23	0.886	0.785	32.462
	20	0.912	0.832	18.942		39	0.961	0.923	39.353
	33	0.882	0.777	14.386		40	0.921	0.848	31.041
PAM	7	0.860	0.739	18.467		43	0.864	0.747	23.000
	9	0.870	0.756	17.501		48	0.882	0.777	18.970
	11	0.815	0.664	19.571		49	0.936	0.876	29.429
	12	0.945	0.894	25.115		51	0.943	0.888	40.047
	18	0.682	0.465	11.271	MBSR	1	0.923	0.853	20.253
	27	0.867	0.751	21.434		2	0.878	0.771	20.155
	34	0.847	0.717	23.046		6	0.903	0.815	17.669
						14	0.652	0.425	8.388

32, and 38 are valid measures of LDR. The factor loadings have an average of 0.741 and range from a low of 0.767 for SAQ 38 to a high of 0.980 for SAQ 30 with corresponding values of R^2 being 0.588 and 0.961. These SAQs have high t-values, which means that they are all highly significant.

For the IOP measurement model, five SAQs that are hypothesized to measure IOP have fairly high factor loadings and R^2 values. This indicates that the SAQs 3, 5, 8, 20 and 33 are valid measures of IOP. The factor loadings have an average of 0.767 and range from a low of 0.573 for SAQ 8 to a high of 0.912 for SAQ 20 with corresponding values of R^2 being 0.329 and 0.832. These SAQs have high t-values, which means that they are all highly significant.

For the PAM measurement model, seven SAQs that are hypothesized to measure PAM

have high factor loadings and R^2 values. This indicates that the SAQs 7, 9, 11, 12, 18, 27, and 34 are valid measures of PAM. The factor loadings have an average of 0.841 and range from a low of 0.682 for SAQ 18 to a high of 0.945 for SAQ 12 with corresponding values of R^2 being 0.465 and 0.894. These SAQs have high t-values, which means that they are all highly significant.

For the SAM measurement model, seven SAQs that are hypothesized to measure CFO have high factor loadings and R^2 values. This indicates that the SAQs 19, 22, 28, 36, 37, 42, and 45 are valid measures of SAM. The factor loadings have an average of 0.870 and range from a low of 0.681 for SAQ 28 to a high of 0.962 for SAQ 19 with corresponding values of R^2 being 0.464 and 0.926. These SAQs have high t-values, which means that they are all highly significant.

For the COI measurement model, eight SAQs that are hypothesized to measure COI have high factor loadings and R^2 values. This indicates that the SAQs 16, 25, 29, 41, 44, 46, 47 and 52 are valid measures of COI The factor loadings have an average of 0.937 and range from a low of 0.864 for SAQ 16 to a high of 0.969 for SAQ 44 with corresponding values of R^2 being 0.746 and 0.938. These SAQs have high t-values, which means that they are all highly significant.

For the FADM measurement model, eight SAQs that are hypothesized to measure FADM have high factor loadings and R^2 values. This indicates that the SAQs 15, 23, 39, 40, 43, 48, 49, and 51 are valid measures of FADM. The factor loadings have an average of 0.905 and range from a low of 0.848 for SAQ 15 to a high of 0.961 for SAQ 39 with corresponding values of R^2 being 0.720 and 0.923. These SAQs have high t-values, which means that they are all highly significant.

For the MBSR measurement model, four SAQs that are hypothesized to measure MBSR have high factor loadings and R^2 values. This indicates that the SAQs 1, 2, 6, and 14 are valid measures of MBSR. The factor loadings have an average of 0.839 and range from a low of 0.652 for SAQ 14 to a high of 0.923 for SAQ 1 with corresponding values of R^2 being 0.425 and 0.853. These SAQs have high t-values, which means that they are all highly significant.

5. Conclusion

This paper proposes a self-assessment scale, i.e. the QMPS, to measure the top management commitment in facilitating continual quality performance in SMEs. The QMPS uses the fifty-three SAQs of Annex A of the ISO 9004 : 2000 Standard to map the eight principles or constructs of the Standard. Based on the empirical data obtained from SMEs operating in Trinidad and Tobago, the inter-item reliability of the QMPS in measuring their hypothesized

construct was determined by their collective Cronbach Alpha values. The construct validity was empirically determined using the structural equation technique and CFA. The research findings verified the factor loadings, R^2 values and t-values and determined the validity of the hypothesised relationships between the scale items and their constructs.

It is evident that the QMPS is a reliable and valid measure of the maturity of quality management system implementation with regard to top management commitment. The QMPS is of practical use to SME practitioners who would use the ISO 9004 : 2000 Standard for guidance on attaining quality performance improvement. SMEs could use the QMPS to determine the extent to which the eight quality management principles are implemented. Future research would validate the importance of individual QMPS constructs on measuring top management commitment towards quality performance improvement in SMEs. Closer examination of each QMPS item would be made to identify and prioritise areas for continual improvement.

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