

# **Potential Effectiveness of Quality Tools and Techniques to Introduce Total Quality Management (TQM) in Ready Made Garment (RMG) Manufacturing Industries in Bangladesh.**

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## **Abstract**

This study is a research program on the implementation of the Total Quality Management (TQM) framework in the readymade garments (RMG) manufacturing industries detailing the order in which quality tools and techniques should be implemented. This study aims to implement TQM and determine whether and how the application of Total Quality Management (TQM) practices can improve organizational and quality performance in the readymade (RMG) garments manufacturing industries. The study suggests implementing the TQM framework to develop quality performances within the ready-made garments (RMG) industries in Bangladesh by applying and analysing, various quality tools, techniques, and TQM approaches. The research methodology adopted a comprehensive literature review on TQM, followed by a questionnaire survey.

A self-completion questionnaire was designed and perception-based data were collected from a sample of three hundred and twenty-two (322) readymade garment (RMG) firms, from greater Dhaka city Bangladesh (BGMEA, 2018-19). Quantitative data analysis is being adopted, following a questionnaire survey within RMG industries to collect primary data, from 06 (six) different places of greater city Dhaka, in Bangladesh by self-designed questionnaires, and analysed through statistical software i.e. SPSS and AMOS (SEM). Secondary data is to be collected from articles, journals, various ministry websites of Bangladesh, and related online resources. The research study covers a wide range of various concepts of quality. TQM is defined and illustrated by various authors and scholars. The literature part also includes detailed discussion, benefits, justification, and hindrances of TQM implementation. Researcher practices SPSS-25 & AMOS (for SEM) software to carry out various tests for data analysis, such as reliability and validity, descriptive statistics, frequency distribution, p-test, chi-square, ordinal logistic method (OLM), confirmatory factor analysis (CFA), factor loading, average variance extracted (AVE), discriminant validity tests to find out proper findings for justifying the research study.

## **1. Introduction**

Quality holds significant importance in the world trade of garments. After phasing out of MFA (Multi-Fiber Agreement), Bangladesh Garment manufacturing trade is competing with other countries for the market share in the world without quotas. Quality as the number one source of competitive advantage for garments export (Rashid et al. 2016). The product line of RMG is a complex array of styles, seasons, varying life cycles, and multidimensional sizing. Many garments firms are upgrading their quality control procedure to be more competitive in the world market (Nuruzzaman 2015). Total Quality Management (TQM) refers to organization wide effort to achieve quality. It can accurately be described as a philosophy about quality that suggest for involving everyone in the organization in a quest for quality. It extends to suppliers as well as to customers. In fact, in TQM, the customer is the focal point, as the business is driven by customers. As such, customer's satisfaction is the main driving force. Everyone in the organization, from the top most chief executive to the bottom most workers, has to take part in this endeavour. TQM requires all employees of the organization for improving the products, processes and services (Islam & Haque 2012). All employees, no matter what role, are responsible for quality and quality assurance. The research attempts to fill the gap in literature of TQM, essential aspects of TQM elements in the readymade garments (RMG) trade in Bangladesh and it is expected to be the beginning of further investigation and related studies.

## 2. Literature Review

### 2.1 Quality

Quality is referred to the concept of excellence, completeness, and fineness. It is often used for words to depict fineness. Existing literature has defined quality in various ways. Garvin (1987) defined quality as strategic tool to attain operational efficiency and organizational performance. In other words, quality refers to meeting customers need and requirement. The study highlights various perspective of quality such as reliability, performance, durability, conformation, serviceability, and aesthetics. Juran (1988) defined quality as meeting the customer's satisfaction and requirement. According to Oaklands (2004), quality is conformation to need and requirement. It may refer to a degree to which inherent set of characteristics justifies requirements. The evolution in the definition and concept of quality has been recorded during last twenty years. The concept of quality has extended from product quality to leadership quality, project management, customer satisfaction. Kerzner (2009) highlighted the evolution in the concept of quality.

Table 1. Changing views of quality (Kerzner, 2009, p. 874)

Past	Present
Quality is the responsibility of blue-collar workers and direct labour employees working on the floor	Quality is everyone's responsibility, including white-collar workers, the indirect labour force, the floor and the overhead staff
Quality defects should be hidden from the customers (and possibly management)	Defects should be high-lighted and brought to the surface for corrective action
Quality problems lead to blame, faulty justification, and excuses	Quality problems lead to cooperative solutions
Corrections-to-quality problems should be accomplished with minimum documentation	Documentation is essential for "lessons learned" so that mistakes are not repeated
Increased quality will increase project costs	Improved quality saves money and increases business
Quality is internally focused	Quality is customer focused
Quality will not occur without close supervision of people	People want to produce quality products
Quality occurs during project execution	Quality occurs at project initiation and must be planned for within the project

Moreover, in past the quality problems usually lead to excuses, faulty justification and blame, whereas, now organizations are adopting the concept of cooperative solutions. Goetsch and Davis (2010) in their study define quality in terms of customer's satisfaction. The study defines quality as broad based quality in people and every operational aspect of organizations. In the light of above discussion and extant literature, it may deduce that quality is a tool to improve competitiveness and performance of an organization. To facilitate readers few more definition of quality have been presented in chronological order in Table 2.

Table-2. Quality definition by various Quality Gurus

Quality is fulfilling the requirement and need of customers	Deming, 1986
Quality is based on eight dimensions such as performance, reliability, durability, conformance, services, features, aesthetics and perceived quality.	Garvin, 1987
Quality is composition of products' characteristics such as engineering, maintenance, marketing through which product will meet the requirement and expectation of customers	Feigenbaum, 1991
A total corporate focus on meeting and exceeding customers' expectations and significantly reducing costs resulting from poor quality by adopting a new management system and corporate culture	Berry (1991)
A new way of managing to improve effectiveness, flexibility and competitiveness of a business to meet customers' requirements	Oakland (1993)
Quality is meant to satisfy the expectation and need of customers	Bregman and Klesfsjo, 1994
A positive attempt by the organizations concerned to improve structural, infrastructural, attitudinal, behavioral and methodological ways of delivering to the end customer, with emphasis on consistency, improvements in quality, competitive enhancements, all with the aim of satisfying or delighting the end customer	Zairi et al. (1994)
A strategic architecture requiring evaluation and refinement of continuous improvement practices in all areas of business	Roosevelt (1995)
Management process which any organization can implement through long term planning, by using continuous quality management plans which lead the organization towards the fulfilment of its vision.	Dahlgaard et al. (1998)
An approach for continuously improving the quality of goods and services delivered through the participation of 'all' levels and functions of the organizations	Mohanty and Lakhe (2002)
An integrated approach to bring continuous improvement in products and services using proper tools, technology and training to meet customer's expectations on a continuous basis	Palo and Padhi (2005)
Quality is strategic tool to enhance the performance of firm	Prajogo, 2007
A business management strategy seeking to improve the quality of organizational management, competitiveness and providing value to customers	Lee et al. (2010)
Quality refers to providing quality experience to customers to enhance competitiveness.	Halvorsrud, Kvale, and Følstad, 2016

## **2.2 TQM**

A significant number of enterprises are applying TQM and the methodology is being analytically exposed in literature. Total Quality Management (TQM) was first presented at 1985 by the Naval Air Systems Command in order to describe the Japanese way of quality management. This methodology includes a series of elements from behavioural sciences, analysis of quantitative and non-quantitative data, economics theories, and process analysis. (Westcott, 2006, pp. 303-307). Increasing globalization and integration among economies has enhanced the importance of TQM in various industries. Flynn, Schroeder and Sakakibara (1994) denote TQM as industry wide strategy in which employees are equipped and encouraged to perform tasks right the very first time and subsequent time, and to analyse what they have done and how to advance in the work they have done. Hafeez (2006) proposed the concept of quality trio to explain TQM. The quality trio is based on three pillars i.e. quality assurance, quality control, and quality improvement. The concept is parallel to achieving excellence in all domains and functions of organizations. According to Flynn (2012), TQM is an effective strategy for maintaining high quality result and concentrating on incessant improvement in processes and error avoidance to meet the customers need or to even go beyond.

During the 1990s, TQM was considered as one of the most important alternatives which was been adopted worldwide. TQM has been denoted and expressed in many ways such as zero defects, pursuit for excellence, first time right approach, exiting clients etc. (Wang 2013). Besides, Sharma, Gupta and Singh (2014) take the definition of TQM one step forward by referring it to enhancing the competitiveness, effectiveness, and flexibility of organization as a whole. It is also considered as comprehensive and organized approach to entity management that looks forward to enhance the quality of products & services through consistent modification in response to feedbacks. Concept of TQM encompasses customers' requirement, management responsibility for quality refinement, and systematic analysis for improving work process. It is considered as most important concept of management of product & services, which ensures quality standards and conforms to society needs and benefits. TQM is not confined to products & services management but extends to all stages of production such as visioning, planning, storing, producing, packaging, and administration etc. In other words, it is an approach to management and includes a set of principles, practices, and techniques related to products processing and designs, waste management, human resources management, and relationship with customers and stakeholders (Prajogo *et al.* 2016).

According to Sao *et al.* (2017), TQM is a management system which aims to enhance the rate of customer satisfaction at a continued rate. Moreover, it works horizontally across all departments and functions, involving human resource from top to bottom. TQM emphasizes on learning and encompasses continual changes that area key to organizational advancement. In context of resource based view theory, TQM enables firms to enhance their compatibility by using its tangible and intangible resources, which enable them to capture opportunities and compete in global market (Bello-Pintado *et al.* 2018). Drawing upon above studies and literature, it may deduced that TQM is management of quality in overall organization through customers focus, continual improvement, and total participation.

## **3. Research Methodology**

### **3.1 Survey Questionnaire**

A set of questionnaire are placed to the quality managers of some selected RMG firms in Bangladesh through e-mail and fax. During the formulation of questionnaire, researcher have gone through the papers of several authors (Jayaram *et. al.*, 2010; Mosadeghrad, 2013; Tari *et. al.*, 2007; Valmohammadi, 2011; Zhang *et. al.*, 2000). The questionnaire consist of four (4) sections. First section: consists of 08 (eight) questions regarding the elementary of generic and demographic of respondents and RMG industry. Five point Likert scale is used to measure the opinion of respondents (where, strongly disagree = 1 and strongly agree = 5). Second section: into 2 part, first part consists of 10 (ten) questions regarding the basic know how of total quality management (TQM) system and later part consist of 80 (eighty) questions on the various TQM factors (i.e. key elements), Section 3 consists of 06 (six) questions on quality management system i.e. on quality measuring process and different quality frameworks and lastly section 4 consists of 16 (sixteen) questions which deals with quality tools and techniques if the RMG industries are trying to pursue or not.

### **3.2 Sampling**

The sample frame is the representations of the elements of the target population (Malhotra & Birks 2003). For the purpose of this study target population is 3500 RMG industries in greater Dhaka, 322 readymade garment (RMG) manufacturing firms has been selected (shown table-4.5 below) using' stratified random sampling (Saunders, Lewis & Thornhill 2009, p-219).

Table 3. RMG Industries in greater Dhaka, Bangladesh (Source: BGMEA 2018-19)

Location of RMG (small, medium, large) industries (Sample units)	Total no. of RMG with respect to location	Proportion (%)	Selected no. from each location
Dhaka	3058	87.37	282.0
Gazipur city	163	4.67	15.0
Narayanganj	132	3.76	12.0
Savar-Ashulia	78	2.22	7.0
Dhaka-Mymensingh Rd.	37	1.06	3.0
Gazipur downtown	32	0.92	3.0
<b>Total:</b>	<b>3500</b>	<b>100.00</b>	<b>322.0</b>

This stratified random sampling process is been utilized to make sure that a proper proportional representation of population subgroups is been studied. Stratified random sampling intends to guarantee that the sample represents specific sub-groups or strata. In order to avoid criticism of single response data from each firm, this study will use multiple respondents from each readymade garment industry (i.e. 2-5 respondents who have enough knowledge about firm's total quality management (TQM) practice. Assuming a response rate of 50% (i.e.  $322/2= 161$  firms,), the expected range of sample size would be 322 (i.e.  $161*2$ - minimum) to 805 (i.e.  $161*5$ - maximum), whether the researcher intended to collect 300 sample size. Thus a total of 252, usable responses were received from the two waves (i.e. e-mail and postal/telephonic reminder) of data collection.

## 4. Data Analysis

### 4.1 Descriptive statistics:

In order to get a descriptive overview of the data, descriptive statistics is used, and this statistical analysis summarizes the large set of data through a limited number of meaningful statistical indicators. Each variable is studied separately to compare average scores of variables among the different groups of respondents (Janssens et al., 2008). The descriptive statistics of the TQM implementation also indicate the respondents' perceived level of TQM Implementation in Bangladesh readymade garment industry. The TQM extent of implementation are indicated by following measures: Managerial Leadership (ML), Resource management (RM), Measurement and Feedback (MF), Supplier Quality Management (SQM), System and Process (SP), Education and Training (ET), Working Environment and Culture (WEC), Customer's Focus and Satisfaction (CFS), Quality Policy (QP), Employee Empowerment (EE), Rewards and Recognition (RR), Communication and Information System (CIS), Benchmarking, and Continuous Improvement (CI). In Table 4 below, the mean values of these TQM implementation measures except RR are higher than 4.0 on Likert scale and hovering around 4.0 on Likert scale, which indicates that most of the respondents were agree or strongly agree with statements of measures. Hence it has been confirmed that perceived level of TQM implementation in readymade garment industry of Bangladesh is satisfactory. The purpose to analyse the frequency of all measures is to get the idea about degree of consent with the survey items that pertain to different factors of TQM implementation Higher frequency of strongly agree on 5 point Likert scale indicates that respondents are strongly agree that factors explain TQM implementation in Bangladesh readymade garment (RMG) industry.

Table 4. Descriptive statistics

	N	Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic
<b>TQM</b>	<b>252</b>		<b>2</b>	<b>5</b>	<b>4.29</b>
ML	252		2	5	4.35
RM	252		2	5	4.32
MF	252		2	5	4.19
SQM	252		3	5	4.37
SP	252		1	5	4.28
ET	252		1	5	4.35
WEC	252		2	5	4.34
CFS	252		3	5	4.36
QP	252		2	5	4.32
EE	252		2	5	4.35
EI	252		2	5	4.35
<b>RR</b>	<b>252</b>		<b>1</b>	<b>5</b>	<b>2.20</b>
CIS	252		1	5	4.28
BM	252		2	5	4.28
<b>CI</b>	<b>252</b>		<b>1</b>	<b>5</b>	<b>4.38</b>
impofQm1	252		1	5	1.80
QTT	252		1	5	3.14

#### 4.2 Ordinal Logistic Method (OLM) Analytical Approach

In order to check the robustness of empirical findings, ordinal logistic regression analysis is also conducted. The Ordinal Logistic Model (OLM) are also called Proportional Odds Model. It is employed to estimate the model in which the dependent variable is an ordinal or a categorical variable. The OLM is first used by the Peter McCullagh to analyse the ordinal variables of surveys (Glonck & McCullagh, 1995; McCullagh, 1980). OLM is the extension of the logit model which is used to explain the binary or dummy variables. The OLM provides efficient results of the model meets the assumption of proportions odd assumption, which denote effects of any categorical explanatory variables are consistent or proportional across the different thresholds or level of responses.

#### 4.3 Model Fitting Information

Model fitting information in Table 5, below examined the quality and fitness of model. The test illustrates that either the proposed model is best fit to explain TQM than the intercept model. Intercept model is the model which is not explained by any variable but fixed intercept and random error. Model fitness test estimate intercept model without incorporating any dependent variable. The null hypothesis of model fitness test is that intercept model is better fit than proposed model. The small value of P (0.004) rejects the null hypothesis and makes the model significant. This indicates that TQM is not intercept model but it is explained by different variables or measures. Based on Chi-square and P values it may infer that proposed model is relatively better fit than intercept model. In other words, there is significantly improvement in the fitness of model by incorporating the independent variables than the fitness of intercept model.

Table 5. Model fitting test

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	179.939			
Final	152.384	27.555	11	.004

Link function: Logit.

#### 4.4 Goodness-of-Fit

Another pre-estimation test conducted is the Goodness of Fit model. It is a statistical model that measures that how well the proposed model fits set of observation. In other words, it typically summarize the divergence between observed values and expected/explained value under the model in question. The Table 6, below shows the two tests i.e. Pearson and Deviance. The insignificance of the p-values of both tests denote that model is good fit to the data (Qiu, Liu, Lai, & Qiu, 2019). The Chi-square values of Pearson and Deviance tests are 295.2 and 152.38, respectively. The insignificant of p-values of both test suggest that model is good fit to data.

Table 6. Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	295.202	473	1.000
Deviance	152.384	473	1.000

Link function: Logit.

#### 4.5 Pseudo R-Square

The Pseudo R<sup>2</sup> values in Table 7 below are the analogous to the coefficient of determination (R<sup>2</sup>) in Ordinal Logistic Model (OLM). However, the clear cut interpretation of Pseudo R<sup>2</sup> is not found in the literature (Lumley, 2017). The values of Pseudo R<sup>2</sup> cannot approach zero and one. Unlike normal R<sub>2</sub>, it does not explain variation in dependent variable cause by independent variable, but its compares the log likelihood of proposed model with log likelihood of baseline model (intercept model).The following methods are used to estimate the coefficient of determination.

Table 7. Pseudo R<sup>2</sup> Square test

Cox and Snell	.104
<u>Nagelkerke</u>	.203
McFadden	.153

Link function: Logit.

#### 4.6 Ordinal Logistic Model Parameter Estimates

Table-8 below indicates the parameters of the independent variables estimated by Ordinal Logistic Model (OLM). The model shows two threshold values i.e. 2 denotes disagree, and 3 denotes neutral. Where 4 is the reference category of the dependent variable that is TQM implementation. The purpose of this study is to investigate TQM implementation in readymade (RMG) garment industry of Bangladesh. Therefore, TQM implementation factors is used as independent variable that is explained by multiple independent factors such as managerial leadership (ML), quality policy (QP), supplier quality management (SQM), measurement and feedback (MF), resource management (RM), continuous improvement (CI), reward and recognition (RR), etc.

Table 8. Ordinal Logistic Parameters

	Estimate	Exp. Estimate	Std. Error	Wald	df	p-value	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold [TQM= 2.00]	16.951		6.883	6.065	1	.014	3.460	30.442
[TQM= 3.00]	20.717		6.874	9.082	1	.003	7.243	34.190
Location <b>QP</b>	2.189	8.93	.923	5.624	1	<b>.018</b>	-.380	3.998
<b>EE</b>	1.037	2.82	.877	1.398	1	<b>.037</b>	-.682	2.755
<b>RR</b>	1.404	4.07	.598	5.507	1	<b>.019</b>	-.231	2.577
<b>ML</b>	-.638	0.47	1.239	.265	1	<b>.007</b>	-3.067	1.790
<b>RM</b>	0.271	1.31	1.194	.052	1	<b>.020</b>	-2.069	2.612
<b>MF</b>	0.385	1.47	1.064	.131	1	<b>.017</b>	-1.701	2.471
<b>WEC</b>	0.277	1.32	.830	.111	1	<b>.038</b>	-1.349	1.903
<b>CFS</b>	1.1	3.00	1.136	.939	1	<b>.033</b>	-1.125	3.326
<b>CI</b>	-.721	0.51	1.194	.364	1	<b>.046</b>	-3.060	1.619
<b>IoQimi</b>	0.342	1.41	.528	.420	1	<b>.052</b>	-.692	1.377
<b>QTT</b>	0.859	2.36	1.056	.662	1	<b>.042</b>	-1.210	2.929

Link function: **Logit**.

The estimated parameters indicates the measures of change in the log odds of the dependent variable (TQM) fall in higher category or higher level for every unit of increase in the independent variable. The coefficient Quality Policy (QP) is 2.189 shows that for every one unit increase in QP (Quality Policy), the odd ratio of moving towards higher category of TQM goes up by  $\exp(2.189) = 8.93\%$  on average. The coefficient of QP (Quality Policy) is significant as p-value is less than 0.05. The coefficient of EE (Employee Empowerment) is significant at 5% significance level and indicates that one unit increase in EE will cause 2.82 % increase in the log ratio of being in higher level of TQM. Likewise the coefficients of RR (rewards and recognition), ML (Management and leadership), RM (Resource management), MF (Measurement and Feedback), WEC (Working Environment and Culture), CFS (Customer Focus and Satisfaction), and QTT (Quality Tools and Techniques) are significant, which denotes that one unit increase in these independent variable will bring significant improvement in the log ratios of being in higher level of TQM i.e. dependent variable. The coefficient or estimate of CI (Continuous Improvement) shows that one unit increase in continuous improvement will decrease the log ratios of being in higher category of TQM by  $\exp(0.721) = 0.51$  percent. Likewise, the coefficient reward and recognition is 4.07, which shows that for every one unit increase in RR, the odd ratio of moving towards higher category of TQM goes up by  $\exp(1.404) = 4.07\%$  on average. The results of the model indicate that significant variables has contribution in promoting the extent level TQM implementation in Bangladesh readymade garment (RMG) sector.

#### 4.7 Test of Parallel Lines

The test of parallel lines are conducted in Table-9 below, to test that relationship between all the independent variables in all possible comparison of TQM (dependent variable) is same. The test check the assumption of proportional odds. The significance of p-value of test indicates that assumption of proportion odds has been satisfied.

Table 9 Test of Parallel lines.

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	152.384			
General	145.869	6.516	11	.837

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.

a. Link function: **Logit**.

#### 4.8 Framework summary

The empirical framework developed in the light of literature to explain TQM implementation in Bangladesh's readymade garment sector is estimated by multivariate regression. The values of R<sup>2</sup>, adjusted R<sup>2</sup>, and standard errors of the model estimates are shown in Table-10. The R<sup>2</sup> is the coefficient of correlation which indicates that how much variation in the empirical model is explained by the independent variables. It denotes that how well the model's estimated measures fit with actual data. For this particular study, the value of R<sup>2</sup> stands on 0.79, which illustrates that 79.7 percent variation in the model or dependent variable TQM implementation is explained by the independent and control variables. The adjusted R<sup>2</sup> in Table-10, below indicates the extent of variation in the dependent variables explained by the model after adjusting the irrelevant independent variables.

Table-10: Framework Summary.

Model	R	R Square	Adjusted Square R	Std. Error of the Estimate
1	.804 <sup>a</sup>	.797	.739	.25805

The value of adjusted R<sup>2</sup> for this model is also high and stands at 0.73, which shows that after accounting for the irrelevant independent variable, the 73 percent variation in TQM is explained by the model. However, the adjusted R<sup>2</sup> is slightly less than R<sup>2</sup>, but it is a more authentic indicator which depicts the variation in the dependent variable explained by the model after dealing with errors and irrelevant variables.

The framework summary also indicates the standard errors of the model. The S.E (standard error) is the measure of variability or dispersion of estimates in the regression. The standard error depicts that variation in the estimated values of TQM by the model from the actual values. The high value S.E denotes high dispersion of the explained value from the actual value, where a low value of S.E denotes low dispersion and variance of the explained value from the actual value. The smaller value of S.E denotes the high probability of model fitness. In this case, the standard error of the model is 0.258, which means the variation of the estimated value from the actual value is 0.258 percent.

#### 4.9 Structural Equation Model (SEM)

The structural equation model is an efficient statistical tool to estimate the causal relationship between each measure and survey items. The SEM model is run on AMOS-18 to estimate the causal relationship between each survey item and measure. The diagram below indicates the causal relationship of all independent variables with TQM implementation and their survey items. In order to avoid complexity, we are presenting the regression coefficient. The regression coefficient of each latent construct with survey items and other measures.

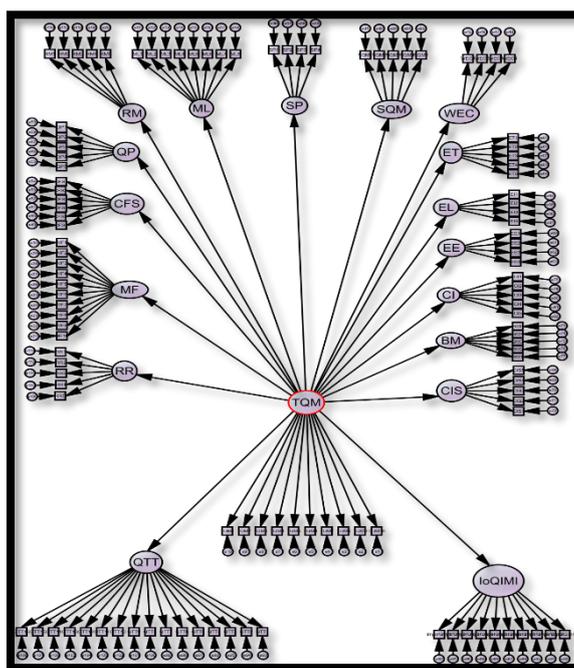


Fig 1 SEM diagram (Effect of all independent variables with TQM).

## **5. Factor loading and convergent validity test**

Table 11, below illustrates the results of Composite Factor Analysis (CFA). CFA actually explains measurement model that is analysed on the basis of survey by using questionnaire. The construct of each measure which is derived by survey items/questions is validated or confirmed by CFA. The table-11 below, also indicates convergent validity, composite reliability (CR) and average variance extracted (AVE) of CFA. The convergent reliability statistics indicates that correlation of items (questions) with each construct. The column 2 indicates the loading of measures that is also referred to principal component analysis. It denotes the correlation of all survey items with construct of TQM, or correlation of all survey items of TQM implementation with consolidated/derived measure of TQM implementation. The values indicates that items number 1 and 2 have 0.56 and 0.61 correlation with construct of TQM.

The values of correlation of first and second items of Managerial leadership (ML) are 0.69 and 0.57 indicates that first and second survey item of ML has 69 and 57 percent correlation with overall construct or derived variable of ML. Likewise, the factor loading factors of other derived variables (derived from survey items) may be interpreted. The analysis shows that most of the items loaded significantly to their corresponding scale with factor loading more than the threshold value of 0.50 (Fornell and Larcker, 1981; Gefen and Straub, 2005; Hulland 1999). The factor loading of all the measures of TQM (total quality management) is higher than the threshold level of 0.5, which indicate the presence of scale validity or convergent reliability, this clearly shows that the measurement model passes the convergent validity test. The loading factor of first question of TQM ('TQM is a management philosophy and practice to ensure effective and efficient use of all available resources') is 0.558, which is higher than the threshold value of 0.5 that indicates that scale/construct of the measure derived from survey questions is valid to measures TQM. Likewise, the loading factors of the second measure Management Leadership (ML) is also higher than 0.5. The loading factor of most of the items of Management Leadership is higher than 0.5. Likewise, the loading factors of items of other constructs are also higher than 0.5, which are acceptable to ensure reliability of construct.

## **6. Composite Reliabilities (CR):**

In Table 11 below, the second last column indicates the values of composite reliability of measures. The composite reliability (CR) is a measure that indicates the reliability of construct of derived variable. Reality is measured to check that depict the internal consistency in each scale items (questions), which is analogous to Cronbach's alpha. The statistics of composite reliability (CR) in second last column indicates that most of the measures have valid construct of measures/variable derived from survey questions, as the values of CR for each measures is higher than 0.7. The CR value for TQM and ML is stand on 0.813 and 0.821, respectively. Likewise, the composite reliabilities of RM (Resource management), MF (Measure and Feedback), and SQM (Supplier Quality Management) are 0.911, 0.902, 0.882 respectively. The composite reliability (CR) values of all the construct are higher than the threshold value, which according to few study is 0.7 (Slyke et.al, 2010).

## **7. Average Variance Extracted (AVE):**

The last column of the Table 11, below indicates the Average Variance Extracted (AVE) of each variable which is a measure of discriminant validity. Discriminant validity referred to the degree to which measures of different dimensions are distinct from each other. It is a measure of amount of variance in constructed in relationship with variance in measurement error. In other word, the discriminant validity in each measure is evaluates by comparing the Average Variance Extracted (AVE) derived from any single construct with variance share by any other construct (Fornell & Larcker, 1981).

The acceptable value of Average Variance Extracted (AVE) of each latent construct for discriminant reliability must be greater than the highest squared correlation with any other latent variable. In our case the values of Average Variance Extracted (AVE) indicates the presence of discriminant validity in the construct level because the AVE by any construct is much higher that the AVE of shared variable between any two construct. The discriminant validity checks whether survey item of variable that are not supposed to be related are actually unrelated. The Average Variance Extracted (AVE), for TQM is 0.793 which is suffice to confirm discriminant validity in measure and endorse that survey item of variable that are not supposed to be related are actually unrelated. The purpose of discriminant validity is to identify the uniqueness of each items or in other words each items only estimate one construct. Similarly, AVE for Managerial Leadership (ML) and Resource Management (RM) measures are 0.801 and 0.882, respectively. That also confirm discriminant validity in both measures. The AVE values of most of the measures are suffice to confirm that all unrelated concept or survey questions which are not supposed to be related are actually unrelated, hence discriminant validity is presence.

## 8. Discriminant validity:

Discriminant validity is identified by the AVE (average variance extracted) by estimating Composite Factor Analysis (CFA). In order to check the robustness of discriminant validity of measures, researcher have conducted Chi-square difference test of discriminant validity (ZAIT, A. 2011). The Chi-square difference test of discriminant validity is the difference of unconstrained and constrained Chi-square test values. The unconstrained ( $\chi^2$  a) Chi-square value indicates that covariance between all construct when they are allow to co-vary freely. The constrained ( $\chi^2$  b) Chi-square value indicates the covariance between each construct is fixed. Anderson and Gerbing, (1988) also indicates that significance of Chi-square difference between correlation of construct when variables freely estimated or fixed at 1.0. The test indicates the chi-square difference ( $\chi^2$  b-a) of 116 items, and difference between constrained and unconstrained Chi-square is significant. Thus, it confirms the presence of discriminant validity of construct.

Table 11. Scale Validity and Reliability (Factor loading, Composite Reliabilities, and Average Variance Extracted)

Scale	Factor loading	CR	AVE
(TQM) Total Quality Management	( $\alpha = 0.704$ )	0.813	0.793
(ML) Management Leadership	( $\alpha = 0.754$ )	0.821	0.801
(RM) Resource Management	( $\alpha = 0.710$ )	0.911	0.882
(MF) Measurement and feedback	( $\alpha = 0.821$ )	0.902	0.854
(SQM) Supplier Quality Management	( $\alpha = 0.778$ )	0.882	0.793
(SP) Systems and Processes	( $\alpha = 0.791$ )	0.798	0.722
(ET) Education and Training	( $\alpha = 0.767$ )	0.818	0.785
(WEC) Working Environment and Culture	( $\alpha = 0.788$ )	0.904	0.814
(CFS) Customer Focus and Satisfaction	( $\alpha = 0.738$ )	0.914	0.815
(QP) Quality Policy	( $\alpha = 0.798$ )	0.875	0.812
(EE) Employee Empowerment	( $\alpha = 0.819$ )	0.804	0.799
(EI) Employee Involvement	( $\alpha = 0.795$ )	0.897	0.821
(RR) Reward and Recognition	( $\alpha = 0.789$ )	0.811	0.783
(CIS) Communication and Information System	( $\alpha = 0.739$ )	0.759	0.728
(BM) Benchmarking	( $\alpha = 0.718$ )	0.723	0.691
(CI) Continuous Improvement	( $\alpha = 0.842$ )	0.922	0.841
(IoQImI) Implementations of Quality Improvement Initiative	( $\alpha = 0.883$ )	0.823	0.877
(QTT) Quality Tools Techniques	( $\alpha = 0.713$ )	0.745	0.721

## 9. Development of hypotheses

To develop hypotheses, constructs and tests are examined separately to explore various dimensions underlying these constructs. Review of literature in the context of readymade garment manufacturing industries has been done to find support for these constructs. Research hypotheses several studies show a relationship between TQM in each of its forms and organizational performance (Jun et al., 2006; Lin et al., 2005; Prajogo & Sohal, 2004; Sila, 2007). The various hypothesis developed in this research studies to justify the research proposal and thereafter the findings of particular three (3) hypothesis tests are described in Table 11.

### The effect of Managerial Leadership (ML) commitment on TQM implementation

The first hypothesis suggests that, the managers of Bangladeshi RMG firms are spending less time on quality improvement activities. As a result, long term strategy for quality improvement is always neglected in this sector. Further, the quality improvement policy is not well communicated through the organization. As far as managerial leadership's role in reinforcing TQM practices in Bangladesh's readymade garment is concerned; Talapatra (2019) indicated that managerial leadership is a critical factor to reinforce TQM implementation in Bangladesh's readymade garments sector. . The coefficient of managerial leadership indicates (according to above table 8) that one unit improvement in managerial leadership will increase the odd ratio of moving towards higher category of TQM by 0.47% on average. Significance of managerial leadership (ML) *accept hypothesis H1* which states that managerial leadership has significant impact on TQM implementation in Bangladesh's readymade garment sector. Significance and sign of managerial leadership is consistent with exiting research (Ilies Salagean & Beleiu 2017; Sawaeen & Ali 2020). However, the studies on TQM practices model in perspective of Bangladesh's readymade garment sector are limited. Thus, based on above discussion and literature review, following hypothesis is proposed:

- **H1:** Managerial leadership (ML) significantly impacts TQM implementation in Bangladesh's readymade garments sector.

### **The effect of Continuous Improvement (CI) on TQM implementation:**

This hypothesis explains recent studies emphasize on continuous improvement in order to ensure implementation of TQM, by reducing the cost of customers' satisfaction. Continuous improvement is essence of TQM. Continuous improvement of production processes and service quality develops excellent quality level and tends to improve that in future. TQM practices also impact customers' behaviour. Ershadi, Najafi, and Soleimani (2019) empirically explored the impact of TQM practices on customers' behaviours through channel of continuous improvement and innovation. Continuous improvement strategy not only facilitates TQM implementation but also offers competitive advantage. According to table-8, the coefficient of continuous improvement is also significant and indicates that continuous improvement has positive impact of TQM implementation. The literature also endorses the mediating impact of continuous improvement on relationship between TQM and business performance of firms (Jimoh et al. 2019). Drawing upon extant studies, the following hypothesis is being proposed:

- **H2:** Continuous improvement has significant effect on TQM implementation in Bangladesh's readymade garment sector.

### **The effect of Customers Focus Satisfaction (CFS) on TQM implementation:**

In this hypothesis customers' focus refers to stressing on customers' satisfaction and putting customers' requirement first in every decision made by a company. Extant studies on customer's focus unanimously argued that customers' satisfaction is a key to implementation of TQM. Receiving feedback to maintain close relationship with customers is an important factor to reinforce TQM (Sousa 2003). Readymade Garment (RMG) industry has to face cut throat competition in market. Competitiveness of garment producing companies is highly dependent on customers' satisfaction with cuts, design, colours, stitching, and fabrics. Despite considerable importance of customer focus in TQM, no empirical research has been conducted in this perspective. Drawing upon extant research on customers focus and TQM the following hypothesis has been developed. Drawing upon extant research on customers focus and TQM the following hypothesis has been developed:

- **H3:** Customer focus has significant impact on TQM implementation in Bangladesh's readymade garment sector.

## **10. Analysis from findings of Quantitative Data**

The results indicate that respondents of survey have diversified background in terms of demographic characteristics and education. Drawing upon extant studies and theories, the study developed framework to explore the implementation of TQM in readymade garment sector in Bangladesh. According to empirical framework, the elements of TQM implementation are managerial leadership, resource management, measurement and feedback, supplier quality control, system and process, education and training, customers' focus, recognition and reward, quality policy, working environment, employee empowerment, employee involvement, communication, benchmarking and continuous improvement. In order to investigate the perceived TQM implementation in Bangladesh readymade garment sector, the study employed total 18 variables (including elements of TQM) which are measured by different survey items. In order to investigate the reliability of measures adopted in model, the study used Cronch alpha test of reliability. The test confirms that all the measures are reliable and have valid construct because the value of Cronbach alphas and factor loading are more than 0.7, which is minimum benchmark for acceptance of reliability and validity of latent variables. In order to enhance the internal consistency of survey items, survey question having low factor loading have been omitted.

In order to empirically analyse the effect of elements of TQM on total quality management, the study employed OLM (Ordinal Logistic Model). Multiple regressions are run to get model having most significant variables. The analysis of OLM model indicates that quality policy, employee empowerment, reward and recognition, managerial leadership, resource management, measurement and feedback, working environment and culture, customers focus, continuous improvement, implementation of ISO 9000/9001, Quality tools and techniques have positive significant impact of TQM. The coefficient of managerial leadership indicates that one unit improvement in managerial leadership will increase the odd ratio of moving towards higher category of TQM by 0.47% on average. Significance of managerial leadership (ML) **accept hypothesis H1** which states that managerial leadership has significant impact on TQM implementation in Bangladesh's readymade garment sector. Significance and sign of managerial leadership is consistent with exiting research (Ilies Salagean & Beleiu 2017; Sawaeen & Ali 2020).

The coefficient of continuous improvement is also significant and indicates that continuous improvement has positive impact of TQM implementation. The literature also endorses the mediating impact of continuous improvement on relationship between TQM and business performance of firms (Jimoh et al. 2019). Furthermore, the coefficient of customer focus satisfaction (CFS) illustrates that one unit increase in customer focus satisfaction will increase the TQM by 3.0 percent. The result is in line with the past studies, which proposed customers' focus as key element of TQM (Sousa, 2003). These results area also consistent with empirical study of Mirfakhradini,

et al. (2018) which proposed that customers focus has a significant impact on development of new products. Rejikumar and Saha (2019) also endorse that customers' focus moderated the relationship between services quality and customers' satisfaction. Based on findings and extant literature the *hypothesis H3 is accepted*. In the light of significance of continuous improvement and customer focus satisfaction, the study accepts hypothesis *H2 and H3*.

### **11. Contributions of the Study**

The results of this study would contribute greatly to the understanding of total quality management (TQM) in the readymade garments (RMG) manufacturing industry. In particular to those firms anticipating to implement extent of total quality management tools and techniques in their total quality journey. It would also be of great benefit to those people involved in the nurturing of the competitiveness of the company and in the introduction and implementation of total quality management in particular. In general, the results i.e. findings of this study may contribute as the survey questionnaire and data's could be used in future study, ISO 9000/9001 is the launching pad for implementing extent level TQM, performance of local firms may improve considerably with increase in foreign ownership, membership to a quality association/body (local, internationally) contributes to better practice and performance, RMG firms with higher practice and performance in TQM employed an increasing array of methods to communicate quality to its employees, and employ higher number of elements in their reward system.

### **12. Limitations of the study**

There are some limitations of our study. First, the response rate, it is not poor but need to be improved. Actually it is very difficult to overcome such situation. Second, survey result, it is based on the context of Bangladeshi RMG sector (Talapatra, S., & Uddin, 2018). Therefore, these findings cannot be conveyed directly to other sectors, because these obstacles occur to varying degree with frequency in the context of different types of RMG firms. There is another scope of integrating different organizational theories with this model so that the organization can obtain more knowledge from the investigation of new TQM obstacles (Syduzzaman & Yeasmin, 2018). This research has some limitations and these limitations of the research are presented as follows:

- Since the TQM as a topic is almost new in developing countries, and never been fully implemented in the apparel manufacturing industry in Bangladesh, the literature review is based on the existing work done in the developed countries.
- The proposed TQM framework is to be applied in a few RMG manufacturing industry as its very vast concept and needs to change the whole factory set-up gradually.

### **13. Conclusion**

TQM is a catalytic tool for achieving excellence in the practice of management. Its continuous improvement principle gives it a dynamism by which organizations can anticipate, meet and surpass customer expectations. However, its implementation requires the presence of a culture—of ethical conduct, of integrity and of trust—that harmonize with its principles (Alaskari, O, & Pinedo-Cuenca, R., 2012). In the last few decades the concepts and frameworks of total quality management (TQM) are warmly welcomed in developed countries, however, industries in gradually developing nations like Bangladesh remained unacquainted with such initiatives. To implement TQM framework successfully, in the RMG industries as well as to improve their performance this study indicates some necessary steps (Akter, P., 2016). The study still have some analysis and findings to investigate. Though several points can be obtained from the above discussions and study (Syduzzaman, 2014) which are listed as follows-

- Leadership including top management commitment is first and crucial factor for implementing TQM;
- Continuous improvement which is the main goal of TQM can be achieved through training and teamwork;
- To motivate employees, supplier, customers and stakeholders concept of TQM is indispensable;
- If it can be ensured continuous improvement, then a culture will develop that will help to build relationship among management, employee, supplier and customer;
- To assure product quality and maintain other related activities by using total quality management in the organization (Mazumder et al. 2011).

The current pragmatic literature on TQM is subjugated by empirical studies in the framework of developed western countries, but one can just hardly find any wide-ranging research in the context of a developing country, like Bangladesh. Implementing a framework on TQM, the present study can help in:

- Understanding the awareness of TQM or any other quality program in Bangladesh service sector.
- Investigating the TQM implementation experiences in Bangladesh service sector.
- Identification of the key TQM practices for effective TQM implementation in Bangladesh business sector.

## References

- Alaskari, O, Ahmad M.M, N. Dhafr, Pinedo-Cuenca. R (2012), *Critical Successful Factors (CSFs) for Successful Implementation of Lean Tools and ERP Systems*, Proceedings of the World Congress on Engineering 2012 Vol III WCE 2012, July 4 - 6, 2012, London, U.K.
- Anderson, C., Rungtusanatham, M., & Schroeder, G., (1994) 'A theory of quality management underlying the Deming management method', *Academy of Management Review*, vol.9, no.3, pp. 472-509.
- Bello-Pintado, A., Kaufmann, R., de Cerio, D., (2018) 'Firms' entrepreneurial orientation and the adoption of quality management practices', *International Journal of Quality & Reliability Management*, vol. 35 no. 9, pp. 1734-1754.
- Ershadi, J., Najafi, N., & Soleimani, P., (2019) 'Measuring the impact of soft and hard total quality management factors on customer behavior based on the role of innovation and continuous improvement', *The TQM Journal*.
- Goetsch, L., & Davis, B., (2010) 'Quality Management for Organization Excellence Introduction to Total Quality 6th Edition, pp 115-118.
- Hafeez, K., Malak, N., & Abdelmeguid, H., (2006) 'A framework for TQM to achieve business excellence', *Total Quality Management and Business Excellence*, vol.17, no.9, pp.1213-1229.
- Ilies, L., Salagean, C., & Beleiu, I., (2020) 'The impact of quality culture and leadership on customer relationship in organizations from the Romanian metal construction industry', *Amfiteatru Economic*, vol.19, no.11, pp.1050-1063.
- Islam, M., Haque, A., (2012) 'Pillars of TQM implementation-An Empirical Study, Journal of Research in International Business and Management, Vol. 2, no.5, pp-128-14.
- Juran, J., (1988) '*Juran on planning for quality*. Collier Macmillan.
- Juneja, D., Ahmad, S., & Kumar, S., (2011) 'Adaptability of total quality management to service sector. *International Journal of Computer Science & Management Studies*, vol.11, no.2, pp.93-98.
- Jimoh, R., Oyewobi, I., & Waziri, I., (2019) 'Total quality management practices and organizational performance: the mediating roles of strategies for continuous improvement', *International Journal of Construction Management*, vol.19, no.2, pp.162-177.
- Malhotra, N, Birks, D (2003), 'An Applied Approach. *European Edition*.
- Nuruzzaman, M., (2015) 'Improving Competitiveness in Manufacturing' first ed. India: Emerald Group Publishing Ltd.
- Oakland, J, 2003, 'TQM-Text with Cases. 3, painos.
- Prajogo, D., Oke, A., Olhager, J., (2016), *Supply chain processes: linking supply logistics integration, supply performance, lean processes and competitive performance*, International Journal of Operations & Production Management, Vol. 36 No. 2, pp. 220-238.
- Rashid, Farhana, CheAzlanTaib, Rushami Zien Yusoff, Mohd Ahmad, and AkhirHj (2020), 'Human Resources Management Practices and Total Quality Management (TQM) is the Precondition to Gain the Sustainable Competitive Advantage in the Bangladesh Ready-Made Garments Sector', *Journal of Economics and Business*, vol.3, no.1, pp.131-141
- Rejikumar, G, Saha, R., (2019), 'An integrated framework for service quality, choice overload, customer involvement and satisfaction, *Management Decision*.
- Sao, A., Singh, S., Dixit, S., Pandey, A K., and Singh, S., (2017), 'Quality, productivity and customer satisfaction in service operations: A, no empirical study. *International Journal of Mechanical Engineering and Technology*, vo8, no.10, pp.579-596.
- Saunders, M., Lewis, P., and Thornhill, A., (2009), '*Research methods for business students*. Pearson education.
- Sharma, S, K., Gupta, S, V., and Singh, R., (2014), 'Implementation of TQM for improving organizational effectiveness', *International Journal of Application or Innovation in Engineering & Management*, vol.9, pp.105-110.
- Syduzzaman, M., Islam, M, M., Habib, M, A., and Yeasmin, D., (2018), 'Effects of implementing TQM principles in the apparel manufacturing industry: case study on a Bangladeshi clothing factory. *Science and Technology*, vol.6, no.3, pp.68-75.
- Talapatra, S, Uddin, M, K 2018, 'some obstacles that affect the TQM implementation in Bangladeshi RMG Sector: An empirical study. In *Proceedings of the 8th International Conference on Industrial Engineering and Operations Management, Bandung*, pp. 6-8.