Critical Success factors (CSFs) for Total Quality Management (TQM) Success, in SMEs

(Case of Uttarakhand)

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***Abstract*—Quality management approach is an important tool which holds the key to competitiveness in the global market irrespective of the size of the company. It is an integrated management approach that aim to improve continuously the performance of products, processes, and services to achieve and surpass customer's expectations. To accomplish this objective, some key factors i.e. critical success factors (CSFs) that contribute to the success of Quality Management efforts are identified for the growth of Large and Medium Scale Organization. For successful implementation of total quality management (TQM), a number of factors have been developed by various scholars. Usually, the factors are not equally important. In many cases, among various factors, there are a vital few that determine success. The various CSFs identified for SMEs are (1) Strategic, (2) Tactical, and (3) Operational, based on Choong.Y.Lee (2004), study. The aim of this study is to identify the critical success factors for TQM implementation in SMEs of Uttarakhand. The analysis applied in this study embraced descriptive Statistics. The inferential statistical measures were Reliability analysis, KMO and Bartlett's Test, chi-square tests of independence, Exploratory Factor analysis was performed (EFA), one-way analyses of variance (ANOVAs), two-way ANOVAs, and multiple regression analyses.**

***Keywords*— *Total Quality Management, Small and Medium Enterprise (SME), Quality Management System; CSF*.**

I. INTRODUCTION

In the period of liberalization and globalization of world economies, new set of challenges have arisen focused on quality of products, processes along with customer focus. These aspects have become crucial not only for growth but very survival of organizations. This is forcing firms to achieve world-class manufacturing capabilities and can be done through TQM in the market. One of the means to achieve the world-class manufacturing capability is through the practices of Total Quality Management (TQM).Due to this, Total quality management (TQM) has grown to become an established field of research (Aquilani et al., 2017; Hackman & Wageman, 1995; Hietschold et al., 2014; Khanna et al., 2011; Kr Singh, 2011; Talib et al., 2014). Product of management practice, the principles of TQM (total quality management) have had a significant and unparalleled impact on modern business history. Mixing production with statistics and quality control, modern quality management it started in USA in the early 1900s and raised to prominence in Japan in the 1950s after Second World War by Juran and Deming to revitalize their manufacturing industry and then again in 1980 s resurfaced in America. It is an integrative management philosophy of continuous improvement in quality with regards to products as well as processes in order to achieve customer satisfaction (Joseph et al., 1999).It can be thought of as an organizing technology which is based on scientific principles and improves productivity by encourages the use of science in decision-making to improve productivity ((Wruck & Jensen, 1994)

Effective implementation of TQM requires change in critical organization rules related to performance like decision right allocation, performance measurement, reward or punishment systems (Jensen and Meckaling , 1995) One way to analyse what needs to be changed is through analysing the Critical Success Factors for implementation of TQM (Kr Singh, 2011). Critical Success Factors are the critical areas which organization need to address for achieving its mission by examination and categorization of their impact (Ismail Salaheldin, 2009). Every organisation need a framework that is comprehensive, flexible and easy to adopt. Since success clearly depends on a combination of factors that are interrelated, the approach must be holistic, important and at the same time ensure that any change in one of the components will not have a negative effect on the overall system (Kanji, 2001). These factors

can be called critical success factors for that organization. Many Critical Success factors had been prescribed by recognized quality management researchers (Crosby, 1979; Deming, 1986; Garvin, 1983; Juran, 1986). But, these were generally based on judgements and experiences of researchers instead of systematic empirical research and on the basis of a systematic empirical research **(**Saraph et al., 1989**).** Saraph and his colleagues developed the first tool to systematically and empirically measure these Critical Success Factors for TQM and ever since various researchers have developed such tools and success of every quality management concept depends on its successful implementation within the company (Black & Porter, 1996; Joseph et al., 1999; Khanna et al., 2011; Kr Singh, 2011; Saraph et al., 1989; Talib et al., 2014). But practically, the implementation of TQM is a complex and difficult process and the advantages are not easily achieved (Rad, 2006). Investigating critical success factors to ensure positive outcomes of TQM implementations is particularly important. These factors are found to have a positive influence on firm performance (Sadikoglu & Olcay, 2014).Measuring critical success factors (CSF) is an essential to control the implementation process of TQM and to increase the chances of success. Previous research has suggested a variety of possible measurement instruments for CSF (Ismail Salaheldin, 2009; Khanna et al., 2011; Talib et al., 2014), However, finding and selecting adequate measurement instruments is a major challenge to companies because there is no consensus on certain factors or a holistic framework (Ismail Salaheldin, 2009). The research field of CSFs and relating measurement instruments is wide and opaque. Thus, this research tries to find Critical Success Factors for successful implementation of TQM/QM in Uttarakhand in context of SMES and to do so researcher has identified relevant CSFs from past studies and test their relevance in context of SMEs in Uttarakhand by analysing them empirically using primary data collected with the help of survey questionnaire.

II. REVIEW LITERARTURE

Total Quality Management: This is the highest level of quality management. It is concerned with the management of quality principle in all the facets of a business including customers and suppliers (Dale et al, 1994, Lockwood et al, 1996). Total Quality Management (TQM) involves the application of quality management principles to all aspects of the organization, including customers and suppliers, and their integration with the key business processes. It is an approach which involves continuous improvement by everyone in the organisation. TQM is a principle which involves the mutual cooperation of everyone that aids the business process of an organisation and it involves all the stake holders of an organisation. (Dale et al, 1994). ***'TQM is defined as a philosophy embracing all activities through which the needs and expectations of the customer and the community, and the objectives of the organisation are satisfied in most efficient and cost effective way by maximising the potentials of all employees in a continuing drive for improvement'.*** Intensified global competition and increasing demand for higher quality by customers have instigated an increasing number of organizations to invest substantial resources in adapting and implementing Total Quality Management procedures, tools and techniques (Demirbag et al., 2006). Over the past few decades, paramount figures in the field of quality management, like Crosby (1979), Deming (1986) and Juran (1988), have developed and advocated abundant prescriptions in the area of Total Quality Management. Their insight into the field of Total Quality Management has provided a useful understanding of the underlying principles of Total Quality Management and has formed the basis against which subsequent researchers have formulated and verified critical success factors of Total Quality Management (Karuppusami & Gandhinathan, 2006). Critical success factors are the behavioural aspects of management styles or the human factors which emphasized on organization's total quality management. Rahman et al., (2005) & Lewis et al., (2006) pointed out that success factors include Leadership, Customer focus, Quality culture, Teamwork, Training, Communication, Product design and etc. Moreover, the efficient utilize of critical success factors can increase quality improvement in each organization. Several authors have attempted to derive the critical factors using different methods. One of the main difficulties in studying critical factors of TQM, is how to define and measure them before they become critical (Zairi,1996). A Study of CSS was pioneered by (Saraph et al.1989), in which they derived a set of eight critical factors of quality management mainly from literature published by the quality gurus. They defined critical factors as those critical areas of managerial planning and action that must be practised to achieve effective quality management in a business unit (Saraph,1989). The study of CSF was later perceived by other authors who approach to the problem using different methodologies for factor derivation using a different set of factors (Black and Porter,1996), and replacing the instrument in different cultures and countries. However, though such affecting factors are responsible for the successful implementation of TQM, they are not truly the difficulties faced by SMEs in the way of adopting TQM, for which they lose their interest/drive for TQM implementation. One of the most influential factors in ensuring quality management initiative adoption success is the formulation of a sound implementation framework prior to embarking on such a change process (Yusof & Aspinwall, 2000). Similarly Choong Y. Lee (2004) identified 25 Critical Factors for successful implementation of TQM in Chinese SMEs and classified them in three categories as (1) Strategic, (2) Tactical, and (3) Operational. The review of the literature suggested that there are numerous CSFs that can be identified as being crucial to the successful implementation of TQM. The CSFs in this study have been extracted in or identified is through the review of CSF literature developed by many experts and across various industries.

III. OBJECTIVES

1. To know what are the critical success factors for TQM in SMEs in Uttarakhand.
2. To know the impact of critical success factors on Total Quality Management.

IV. HYPOTHESIS

Broad hypothesis of the papers is:

H0: There is no significant impact of Critical Success Factors on Total Quality Management**.**
Ha: There is a significant impact of Critical Success Factors on Total Quality Management.

V. RESEARCH METHODOLOGY

This study is primary in nature and the data was collected using questionnaires method. The analysis applied in this study embraced descriptive Statistics and parametric test. The inferential statistical measures were Reliability analysis, KMO and Barlett"s Test, chi-square tests of independence, Exploratory Factor analysis was performed (EFA), Principal Component Analysis (PCA), one-way analyses of variance (ANOVAs), two-way ANOVAs, correlation and multiple regression analyses was run to check the impact and relationship between critical success factors and Total quality management barriers.

VI. ANALYSIS AND INTERPRETATION

Reliability:

Reliability analysis was performed to test the reliability of scale and inner consistency of items. For this purpose, Cronbach's alpha coefficient was calculated. Below shown Table 1 tells the calculated value of Cronbach's alpha coefficient value for 20 items of "Critical Success factor" is .921, which is considered acceptable and indicates the reliability of scale.

Table 1--Reliability Statistics

Cronbach's Alpha	N of Items
.921	20

Independent Variable Critical Success Factor (CSF):

Descriptive statistics for CSF:

This table includes Descriptive Statistics for each variable and the Analyses N, which in this case is 192. The below table 2 represents the mean value as well as the standard deviation value for each statement of CSF.

This table 2 includes Descriptive Statistics for each variable and the Analyses N, which in this case is 192 because several items have one or more participants missing. The below table represents the mean value as well as the standard deviation value for each statement of critical success factors. The mean of all items of CSFs are more than 4 (5-point scale) which is representing a good average.

Table 2-Descriptive Statistics

	N	Mean	Std. Deviation
Impact of leadership influence success and failure of TQM implementation	192	4.70	.460
Organisational culture plays vital role in TQM implementation	192	4.66	.479
Top management support is crucial for TQM	192	4.67	.473
Conducting continuous improvement is a key factor for making TQM adoption successful	192	4.58	.498
Benchmarking is an essential tool for making TQM successful	192	4.52	.504

Clear quality goals and policies are important for TQM	192	4.52	.504
Team building and problem-solving approach helps in TQM implementation	192	4.36	.515
Employee empowerment is critical for TQM success	192	4.34	.541
Employee involvement at all level is necessary for TQM implementation	192	4.47	.503
Employee training and development plays role in TQM adoption	192	4.47	.503
Use of IT helps in TQM	192	4.45	.589
Supplier quality checks are important for making TQM successful	192	4.45	.532
Good relationship with supplier is a must for TQM	192	4.42	.498
Assessment of performance of suppliers is crucial for TQM implementation	192	4.33	.506
Right product and service design is major factor in TQM implementation	192	4.66	.479
Taking care of customer preference is important for TQM	192	4.53	.534
Tools to manage customer relationship are essential for TQM	192	4.56	.500
Financial resources availability is a factor for successful TQM implementation	192	4.55	.589
Adopting realistic time line for TQM implementation is important	192	4.31	.467
Resource conversation and utilization is a factor for successful TQM implementation	192	4.34	.541
Valid N (listwise)	192		

KMO and Bartlett's Test

The KMO (Kaiser-Meyer-Olkin) and Bartlett's test measure of sampling adequacy was conducted to check the appropriateness of factor analysis. Factor analysis is said to be suitable if the calculated value of KMO is 0.6 or above and Bartlett's test should be significant @ 5% level of significance. The KMO value for CSF was 0.793, which was greater than the recommended value of 0.6 (Kaiser, 1974).

Table 3 --KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.793
Bartlett's Test of Sphericity	Approx. Chi-Square	812.219
	Df	153
	Sig.	.000

Table 3 indicated that the calculated value of KMO measure of sampling adequacy was 0.793 for CSF which is suitable and adequate for factor analysis. Similarly, the value of Bartlett's test of sphericity was also found significant as the Chi-square value = 812.219 with degree of freedom of 153 @ 5% level of significance (p = .000). It also signifying that correlation matrix is not distinctive matrix and hence the data is appropriate and valid for factor analysis.

Total Variance Explained:

The Exploratory Factor analysis was performed to identify the factors behind CSF with the help of respondents of questionnaire. Likert scale of 5 point was used to examine the response of the managers ranging from 'strongly disagree' to 'strongly agree'.

Principal Component Analysis (PCA) with Varimax rotation and eigen value (≥ 1) was used and only those elements were hold with factor loadings ≥ 0.50 (Hair et al., 1998). The Total Variance Explained table 5 shows how the variance is divided among the 18 possible factors. Five factors have eigenvalues (a measure of explained variance) greater than 1.0, which is a common criterion for a factor to be useful. When the eigenvalue is less than 1.0 the factor explains less information. For this analysis in this chapter, we will use an orthogonal rotation (varimax). This means that the final factors will be at right angles with each other. As a result, we can assume that the information explained by one factor is independent of the information in the other factors.
Table 5 of Total Variance Explained depicts that there are total 18 attributes for CSF which converts to 5 factors and explaining 74.967% variance in the total output**.**

Table 4- Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.718	42.875	42.875	7.718	42.875	42.875	3.992	22.175	22.175
2	1.932	10.734	53.609	1.932	10.734	53.609	2.923	16.239	38.415
3	1.594	8.854	62.463	1.594	8.854	62.463	2.587	14.371	52.786
4	1.217	6.759	69.222	1.217	6.759	69.222	2.116	11.754	64.539
5	1.034	5.745	74.967	1.034	5.745	74.967	1.877	10.427	74.967
6	.889	4.940	79.907						
7	.665	3.695	83.602						
8	.647	3.597	87.199						
9	.474	2.631	89.829						
10	.372	2.067	91.896						
11	.346	1.920	93.816						
12	.283	1.572	95.388						
13	.267	1.486	96.874						
14	.190	1.054	97.928						
15	.147	.815	98.743						
16	.102	.567	99.311						
17	.081	.449	99.760						
18	.043	.240	100.000						

Extraction Method: Principal Component Analysis.

Rotated component matrix

Rotated component matrix table 6 represents the strength of relationship between the item and factor is determined by identifying the highest factor loading in one factor. Generally, factor loading higher than 0.5 is acceptable ***(Hair et al., 1998)***.

Rotated Component Matrix[a]

Factor name	Attributes of CSF	Component				
		1	2	3	4	5
CSF1	Impact of leadership influence success and failure of TQM implementation	.892				
	Organisational culture plays vital role in TQM implementation	.880				
	Top management support is crucial for TQM	.846				
	Conducting continuous improvement is a key factor for making TQM adoption successful	.723				
	Benchmarking is an essential tool for making TQM successful	.610				

	Clear quality goals and policies are important for TQM	.571				.535
CSF2	Right product and service design is major factor in TQM implementation		.803			
	Financial resources availability is a factor for successful TQM implementation		.791			
	Tools to manage customer relationship are essential for TQM		.679			
	Taking care of customer preference is important for TQM		.670			
	Use of IT helps in TQM					
CSF3	Team building and problem-solving approach helps in TQM implementation			.913		
	Employee empowerment is critical for TQM success			.895		
CSF4	Adopting realistic time line for TQM implementation is important				.798	
	Employee involvement at all level is necessary for TQM implementation			.503	.611	
	Employee training and development plays role in TQM adoption				.586	
CSF5	Resource conversation and utilization is a factor for successful TQM implementation					.778
	Supplier quality checks are important for making TQM successful					.614

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 8 iterations.

Factor Analysis Results CSF for TQM:

The following table 6 depicts the output of factor analysis by rotated component matrix and only those variables are taken into consideration which has factor loading greater than 0.5. On the basis of factor analysis following factors of CSF for TQM was emerged.

CSF1: This factor is a combination of few items and explained 22.175% of variance in the total output of Critical success factor. The following statements are "Impact of leadership influence success and failure of TQM implementation" with 0.892 factor loading. "Organisational culture plays vital role in TQM implementation" with 0.880 loading, "Top management support is crucial for TQM" with 0.846 factor loading and "Conducting continuous improvement is a key factor for making TQM adoption successful" with 0.723 loading; "Benchmarking is an essential tool for making TQM successful" with 0.610 loading; "Clear quality goals and policies are important for TQM" with 0.571 loading. They are highly correlated with each other. These six statements were named as CSF1 factor.

CSF2: this factor explained 16.239% of variance in the total variance explained by CSF. This factor is a combination of four items, the first item is "Right product and service design is major factor in TQM implementation" with factor loading 0.803; "Financial resources availability is a factor for successful TQM implementation" this item represents .791 factor loading, "Tools to manage customer relationship are essential for TQM" with loading 0.679 and lastly the fourth item "Taking care of customer preference is important for TQM" has .670 factor loading. They show correlation with each other and named as CSF2.

CSF3: This factor explained 14.371% of variance and includes statements, **"**Team building and problem-solving approach helps in TQM implementation" and "Employee empowerment is critical for TQM success" had factor loadings 0.913 and 0.895 respectively. This factor is a combination of two items of CSF for TQM hence named as CSF3.

CSF4: This factor is a linear combination of three items, this factor explained 11.574% of variance. The included statements are "Adopting realistic time line for TQM implementation is important" and represents .798 factor loading; "Employee involvement at all level is necessary for TQM implementation" with 0.611 factor loading and the last one is "Employee training and development plays role in TQM adoption" represents .586 factor loading. This factor is named as CSF4.

CSF5: this factor includes 2 items namely **"**Resource conversation and utilization is a factor for successful TQM implementation" with factor loading 0.778 and the second item is "Supplier quality checks are important for making TQM successful" with .614 loading. This factor is named as CSF5.

Dependent variable: Total Quality Management:

Descriptive statistics for TQM:

This table 5 includes Descriptive Statistics for each variable and the Analyses N, which in this case is 291. The below table 5 represents the mean value as well as the standard deviation value for each statement of Total Quality Management (TQM).

Table 5- **Descriptive Statistics**

	N	Mean	Std. Deviation
Lack of Management Commitment effects success full TQM implementation	291	4.38	.756
Lack of understanding about TQM or inadequate knowledge is a barrier to TQM implementation	291	4.66	.538
Organisational culture plays important role in TQM implementation	291	4.66	.476
Poor Planning is a barrier in TQM implementation	291	4.48	.597
Continuous training, education and development is important for TQM implementation	291	4.47	.522
Failure to create organisation that provide continuous improvement & learning leads to failure in TQM	291	4.00	.777
Conflicting organisational structure & unconnected employees and departments creates barrier in TQM	291	4.30	.648
Inadequate resources are barrier in TQM	291	4.52	.579
An improper reward & recognition practice is a barrier in TQM	291	4.22	.544
Not selecting a proper TQM program	291	4.21	.628
Inefficient measurement techniques are a barrier to TQM	291	4.30	.615
Not having a long term focus or vision is a barrier for TQM	291	4.41	.608
Paying insufficient attention to customers causes TQM failure	291	4.32	.638
Not having suitable conditions for implementing TQM	291	4.26	.582
Improper use of empowerment and teamwork	291	4.19	.618
Valid N (listwise)	291		

KMO and Bartlett's Test

The KMO (Kaiser-Meyer-Olkin) and Bartlett's test measure of sampling adequacy was conducted to check the appropriateness of factor analysis. Factor analysis is said to be suitable if the calculated value of KMO is 0.6 or above and Bartlett's test should be

significant @ 5% level of significance. The KMO value for TQM was 0.683, which was greater than the recommended value of 0.6 (Kaiser, 1974).

Table 6 -KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.697
Bartlett's Test of Sphericity	Approx. Chi-Square	432.242
	df	91
	Sig.	.000

Table 8 indicated that the calculated value of KMO measure of sampling adequacy was 0.697 Total Quality Management which is suitable and adequate for factor analysis. Similarly, the value of Bartlett's test of sphericity was also found significant as the Chi-square value = 432.242 with degree of freedom of 91 @ 5% level of significance (p = .000). It also signifying that correlation matrix is not distinctive matrix and hence the data is appropriate and valid for factor analysis.

Total Variance Explained:

The Exploratory Factor analysis was performed to identify the factors behind TQM with the help of respondents of questionnaire. Likert scale of 5 point was used to examine the response of the managers ranging from 'strongly disagree' to 'strongly agree'. Principal Component Analysis (PCA) with Varimax rotation and eigen value (≥ 1) was used and only those elements were hold with factor loadings ≥ 0.50 (Hair et al., 1998). The Total Variance Explained table 10 shows how the variance is divided among the 14 possible factors. Five factors have eigenvalues (a measure of explained variance) greater than 1.0, which is a common criterion for a factor to be useful. When the eigenvalue is less than 1.0 the factor explains less information than a single item would have explained. For this and other analyses in this chapter, we will use an orthogonal rotation (varimax). This means that the final factors will be at right angles with each other. As a result, we can assume that the information explained by one factor is independent of the information in the other factors. Table 10 of Total Variance Explained depicts that there are total 14 attributes for TQM which converts to 4 factors and explaining 68.242% variance in the total output.

Table 7-Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.101	29.289	29.289	4.101	29.289	29.289	2.423	17.309	17.309
2	1.800	12.855	42.144	1.800	12.855	42.144	2.271	16.218	33.527
3	1.508	10.773	52.917	1.508	10.773	52.917	1.921	13.718	47.245
4	1.123	8.021	60.937	1.123	8.021	60.937	1.743	12.453	59.698
5	1.023	7.305	68.242	1.023	7.305	68.242	1.196	8.544	68.242
6	.951	6.793	75.035						
7	.734	5.246	80.281						
8	.567	4.050	84.331						
9	.533	3.805	88.137						
10	.490	3.498	91.635						
11	.397	2.837	94.472						
12	.335	2.390	96.862						
13	.235	1.676	98.539						
14	.205	1.461	100.000						

Extraction Method: Principal Component Analysis.

Rotated component matrix

Rotated component matrix table 8 represents the strength of relationship between the item and factor is determined by identifying the highest factor loading in one factor. Generally, factor loading higher than 0.5 is acceptable ***(Hair et al., 1998)***.

Table 8-Rotated Component Matrix[a]

Factor Name	Attributes of TQM	Component				
		1	2	3	4	5
TQM 1	Not having a long-term focus or vision is a barrier for TQM	.814				
	Inadequate resources are barrier in TQM	.691				
	Conflicting organisational structure & unconnected employees and departments creates barrier in TQM	.574				
	Inefficient measurement techniques are a barrier to TQM	.557				
	Lack of Management Commitment effects success full TQM implementation					
TQM2	Lack of understanding about TQM or inadequate knowledge is a barrier to TQM implementation		.904			
	Poor Planning is a barrier in TQM implementation		.770			
	Organisational culture plays important role in TQM implementation		.730			
TQM 3	Improper use of empowerment and teamwork			.884		
	Not having suitable conditions for implementing TQM			.868		
	Paying insufficient attention to customers causes TQM failure					
TQM 4	Not selecting a proper TQM program				.789	
	Failure to create organisation that provide continuous improvement & learning leads to failure in TQM				.777	
	An improper reward & recognition practice is a barrier in TQM					.754

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization. a.Rotation converged in 7 iterations

Factor Analysis Results TQM:

The following table 8 depicts the output of factor analysis by rotated component matrix and only those variables are taken into consideration which has factor loading greater than 0.5. On the basis of factor analysis following factors of TQM was emerged.
TQM1: This factor is a combination of few items and explained 17.309% of variance in the total output of TQM. The following statements are "Not having a long-term focus or vision is a barrier for TQM" with 0.814 factor loading. "Inadequate resources are barrier in TQM" with 0.691 loading, "Conflicting organisational structure & unconnected employees and departments creates barrier in TQM" with 0.574 factor loading and "Inefficient measurement techniques are a barrier to TQM" with 0.557 loading. They are highly correlated with each other. These four mediums were named as TQM1 factor.

TQM2: this factor explained 16.218% of variance in the total variance explained by TQM. This factor is a combination of following items, the first item is "Lack of understanding about TQM or inadequate knowledge is a barrier to TQM implementation" with factor loading 0.904, "Poor "Planning is a barrier in TQM implementation" this item represents .770 factor loading, and lastly the third item "Organisational culture plays important role in TQM implementation" has .730 factor loading. They show correlation with each other and named as TQM2.

TQM3: This factor explained 13.718% of variance and includes statements, **"**Improper use of empowerment and teamwork" and "Not having suitable conditions for implementing TQM" had factor loadings 0.884 and 0.868 respectively. This factor is a combination of improper use of teamwork and unsuitable environment for TQM hence named as TQM3.

TQM4: This factor is a linear combination of three items, out of three one is showing as fifth factor but it is not possible to form a factor with single item hence merged with the fourth factor. Hence this factor explained 20.997% of variance as it includes variance of fourth factor and variance explained by fifth factor also. The statements are "Not selecting a proper TQM program" and represents .822 factor loading and the other one is "At on values even if it is at personal cost" represents .648 factor loading. This factor is named as TQM4.

Analysis and Interpretation:
The hypothesis drawn for current objective were:
H0: There is no significant impact of Critical Success Factors on Total Quality Management.
Ha: There is a significant impact of Critical Success Factors on Total Quality Management
The test this hypothesis, the study required analysis tool that can determine the strength and character of relationship between Critical Success Factor (CSF) and Total Quality Management (TQM). To draw the meaningful conclusion from the study, one needed to assess how change in CSF results in change in TQM and Regression analysis a form of predictive modelling technique can investigate the relationship between TQM which is dependent and CSF which is independent.
On performing factor analysis on CSF and TQM we extracted five factors of CSF and four factors of TQM. So simple linear regression would not have been an appropriate tool to analyse the relationship between our dependent and independent constructs, since there are multiple dependent variables and multiple independent variables. So instead of Simple linear regression researcher has used multiple regression which is an extension to simple linear regression. It allowed to determine the overall fit of our model along with the contribution of each of the independent variable to total variance explained, in relative terms.
Multiple Regression Analysis
The objective of study was to identify the linear relationship present between Critical Success Factor (CSF) and Total Quality Management (TQM) and multiple regression analysis was conducted to investigate the relationship by analysing the impact of CSF on factors extracted of TQM. For the purpose of this study, Factors of CSF were taken as independent variable and Factors of TQM as dependent variable. Total five factors were identified through factor analysis for CSF and the study also identified four factors of TQM. In order to perform multiple regression on extracted variables researcher has divided hypothesis into sub hypothesis based on dependent variables TQM1, TQM2, TQM3, TQM4 and investigate the impact of all the factors of CSF onto dependent variables separately.
Impact of Critical Success Factors on TQM1
Sub hypothesis for this can be constructed as below:
$H0_1$: There is no significant impact of factors of Critical Success Factors on TQM1.
Ha_1: There is a significant impact of factors of Critical Success Factors on TQM1.

The results of the test are summarised in Table 9 presented below. The R Square column represents the R_2 of 0.541 representing the proportion of variance in TQM1 (dependent variable) that can be explained by Critical Success Factor (CSF1, CSF2, CSF3, CSF4, CSF5) i.e. our independent variables. Test for Independence performed using Durbin-Watson has value of (DW= 2.265) which shows there is no significant autocorrelation in residuals from regression analysis. A value of (R_2=0.541) indicates that independent Critical Success Factor can explain 54.1% of the variability in TQM1. F value for the model (F= 13.690) with

Table 9

Dependent Variable	**TQM1**
Test of Independence by Durbin-Watson value	2.265
R-Square Value	.541
F value of the Model	13.690
Significance	.000 @ d.f. (regression 5), (residual 58)

Predictor (Critical Success Factor)	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta**			**Tolerance**	**VIF**
(Constant)	1.092	2.131		.513	.610		
CSF1	.363	.081	.505	4.482	.000	.622	1.609
CSF2	.060	.117	.059	.513	.610	.592	1.688
CSF3	-.087	.176	-.051	-.494	.623	.743	1.346
CSF4	.165	.180	.115	.913	.365	.502	1.991
CSF5	.444	.213	.229	2.088	.041	.660	1.515

(significance =0.000) indicates that regression model is good fit for data as ($p < 0.05$).

Based on value of (R_2=0.541) and (F= 13.690 with significance =0.000) the sub hypothesis ***H0$_1$:*** *There is no significant impact of factors of Critical Success Factors on TQM1* is rejected and alternate sub hypothesis ***Ha$_1$:*** *There is a significant impact of factors of Critical Success Factors on TQM1* is accepted.

Impact of Critical Success Factors on TQM2

Sub hypothesis for this can be constructed as below:

H0$_2$: There is no significant impact of factors of Critical Success Factor on TQM2.

Ha$_2$: There is a significant impact of factors of Critical Success Factor on TQM2.

The results of the test are summarised in Table 10 presented below. The R Square column represents the R_2 of 0.439 representing the proportion of variance in TQM2 (dependent variable) that can be explained by Critical Success Factor (CSF1, CSF2, CSF3, CSF4, CSF5) i.e. our independent variables. Test for Independence performed using Durbin-Watson has value of (DW= 1.934) which shows there is no significant autocorrelation in residuals from regression analysis. A value of (R_2=0.439) indicates that independent Critical Success Factor can explain 43.9% of the variability in TQM2. F value for the model (F= 9.071) with (significance =0.000) indicates that regression model is good fit for data as ($p < 0.05$).

Based on value of (R_2=0.439) and (F= 9.071 with significance =0.000) the sub hypothesis ***H0₂:*** *There is no significant impact of factors of Critical Success Factors on TQM2* is rejected and alternate sub hypothesis ***Ha₂:*** *There is a significant impact of factors of Critical Success Factors on TQM2* is accepted.

Table 10

Dependent Variable	**TQM 2**
Test of Independence by Durbin-Watson value	1.934
R-Square Value	.439
F value of the Model	9.071
Significance	.000 @ d.f. (regression 5), (residual 58)

Predictor (Critical Success Factor)	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta**			**Tolerance**	**VIF**
(Constant)	3.289	1.990		1.653	.104		
CSF1	.408	.076	.674	5.401	.000	.622	1.609
CSF2	-.017	.109	-.020	-.156	.877	.592	1.688
CSF3	.264	.164	.184	1.612	.112	.743	1.346
CSF4	-.113	.168	-.093	-.670	.505	.502	1.991
CSF5	-.165	.198	-.101	-.834	.408	.660	1.515

Impact of Critical Success Factors on TQM3

Sub hypothesis for this can be constructed as below:

Table 11

Dependent Variable	**TQM3**
R-Square Value	.156
F value of the Model	2.145
Significance	.073 @ d.f. (regression 5), (residual 58)

Predictor (Critical Success Factor)	**Unstandardized Coefficients**	**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**

	B	Std. Error	Beta			Tolerance	VIF
(Constant)	3.995	1.612		2.479	.016		
CSF1	.041	.061	.102	.665	.509	.622	1.609
CSF2	.181	.088	.322	2.052	.045	.592	1.688
CSF3	.038	.133	.040	.285	.777	.743	1.346
CSF4	.053	.136	.066	.390	.698	.502	1.991
CSF5	-.125	.161	-.115	-.777	.440	.660	1.515

H0$_3$: There is no significant impact of factors of Critical Success Factor on TQM3.
Ha$_3$: There is a significant impact of factors of Critical Success Factor on TQM3.
The results of the test are summarised in Table 11 presented below. The R Square column represents the R_2 of 0.156 representing the proportion of variance in TQM3 (dependent variable) that can be explained by Critical Success Factor (CSF1, CSF2, CSF3, CSF4, CSF5) i.e. our independent variables. A value of (R_2=0.156) indicates that independent Critical Success Factor can explain only 15.6% of the variability in TQM3. F value for the model (F= 2.145) with (significance =0.073) indicates that regression model is not a good fit for data as ($p > 0.05$).
Based on value of (R_2=0.156) and (F= 2.145 with significance =0.073) the sub hypothesis ***H0$_3$**: There is no significant impact of factors of Critical Success Factors on TQM3* is accepted.

Impact of Critical Success Factors on TQM4

Sub hypothesis for this can be constructed as below:
H0$_4$: There is no significant impact of factors of Critical Success Factor on TQM4.
Ha$_4$: There is a significant impact of factors of Critical Success Factor on TQM4.
The results of the test are summarised in Table 12 presented below. The R Square column represents the R_2 of 0.254 representing the proportion of variance in TQM4 (dependent variable) that can be explained by Critical Success Factor (CSF1, CSF2, CSF3, CSF4, CSF5) i.e. our independent variables Test for Independence performed using Durbin-Watson has value of (DW= 1.610) which shows there is no significant autocorrelation in residuals from regression analysis. A value of (R_2=0.254) indicates that independent Critical Success Factor can explain 25.4% of the variability in TQM4. F value for the model (F= 3.951) with (significance =0.004) indicates that regression model is good fit for data as ($p < 0.05$).

Table 12							
Dependent Variable			**TQM4**				
Test of Independence by Durbin-Watson value			1.610				
R-Square Value			.254				
F value of the Model			3.951				
Significance			.004 @ d.f. (regression 5), (residual 58)				
Predictor (Critical Success Factor)	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Collinearity Statistics**	
	B	**Std. Error**	**Beta**			**Tolerance**	**VIF**

(Constant)	2.570	2.346		1.096	.278		
CSF1	.113	.089	.182	1.266	.211	.622	1.609
CSF2	.034	.129	.039	.263	.794	.592	1.688
CSF3	.283	.194	.192	1.463	.149	.743	1.346
CSF4	.280	.198	.226	1.409	.164	.502	1.991
CSF5	-.008	.234	-.005	-.034	.973	.660	1.515

Based on value of (R_2=0.254) and (F= 3.951 with significance =0.004) the sub hypothesis ***H0$_1$:*** *There is no significant impact of factors of Critical Success Factors on TQM4* is rejected and alternate sub hypothesis ***Ha$_1$:*** *There is a significant impact of factors of Critical Success Factors on TQM4* is accepted.

Findings

The objective of study was to identify if there is a linear relationship present between Critical Success Factor (CSF) and Total Quality Management (TQM) and for the purpose hypothesis drawn for current objective were **H0 (**There is no significant impact of Critical Success Factors on Total Quality Management) and **Ha (**There is a significant impact of Critical Success Factors on Total Quality Management). Where CSF was our independent variable and TQM was our dependent variable. We divided hypothesis into sub hypothesis based on dependent variables investigated the impact of all the factors of CSF onto dependent variables and performed multiple regression on each sub hypothesis, results of which is summarised in Table 13 below:

Table 13

Hypothesis	R Squared Value	P value	Result
$H0_1$: There is no significant impact of Critical Success Factors on Total Quality Management. Ha_1: There is a significant impact of Critical Success Factors on Total Quality Management	**0.541**	**0.00**	**Rejected** **Accepted**
$H0_2$: There is no significant impact of factors of Critical Success Factor on TQM2. Ha_2: There is a significant impact of factors of Critical Success Factor on TQM2.	**0.439**	**0.00**	**Rejected** **Accepted**
$H0_3$: There is no significant impact of factors of Critical Success Factor on TQM3. Ha_3: There is a significant impact of factors of Critical Success Factor on TQM3.	**0.156**	**0.073**	**Accepted** **Rejected**
$H0_4$: There is no significant impact of factors of Critical Success Factor on TQM4. Ha_4: There is a significant impact of factors of Critical Success Factor on TQM4.	**0.254**	**0.004**	**Rejected** **Accepted**

Based on value of R_2 and p-value for significance of results, null hypotheses $H0_1$, $H0_2$, $H0_4$ were rejected since p-value in all these cases is ($p<0.05$) and value of R_2 were 0.541, 0.439, 0.254 explaining 54.1%, 43.9%, 25.4% variability in dependent variable by independent variables respectively. $H0_3$ was rejected since the p-value was 0.73 which was greater than accepted value of 0.05 for p at 95% level of significance, though it had a R_2 value of 0.156.

The null hypothesis drawn for current objective was "***H0:*** *There is no significant impact of Critical Success Factors on Total Quality Management".* Which could be partially rejected and alternate hypothesis ***Ha:*** *There is a significant impact of Critical Success Factors on Total Quality Management* is partially accepted, which means that there is a significant impact of Critical Success Factors on Total Quality Management though there is an absence of significant causal relationship between CSF and TQM3.

VII. CONCLUSION

It has been an established fact that TQM helps in firms to achieve world-class manufacturing capabilities and there are certain critical factors that affects the successful implementation of TQM. Which from past research has been known to vary from industry to industry. Thus, the objective of with this study was to know the Critical Success Factors for successful implementation of TQM/QM in Uttarakhand that are relevant for SMEs. To test their relevance in context of SMEs in Uttarakhand by analysing them empirically using primary data collected with the help of survey questionnaire. Reliability analysis was performed to test the reliability of scale and inner consistency of items. For this purpose, Cronbach's alpha coefficient was calculated, value of Cronbach's alpha coefficient turned out to be 0.921, which is considered acceptable and indicates the reliability of scale, after finding that the scale is reliable further tests were performed on data from the survey questionnaire.

The objective of study was to identify if there is a linear relationship present between Critical Success Factor (CSF) and Total Quality Management (TQM) and for the purpose hypothesis drawn for current objective were **H0 (**There is no significant impact of Critical Success Factors on Total Quality Management) and **Ha (**There is a significant impact of Critical Success Factors on Total Quality Management) and Factor analysis was performed for both independent and dependent variables to find the underlying factors of CSF and TQM. KMO value for CSF was 0.793 and the KMO value for TQM was 0.683. The value of Bartlett's test of sphericity was also found significant for both CSF and TQM signifying that correlation matrix is not distinctive matrix and the data is appropriate and valid for factor analysis. On performing factor analysis, we extracted five factors of CSF (CSF1, CSF2, CSF3, CSF4 and CSF5) and four factors of TQM (TQM1, TQM2, TQM3 and TQM4). Due to multiple factors of both CSF and TQM, in order to establish linear relationship between dependent and independent variables simple linear regression would not have suffice, so multiple regression analysis was performed to establish the relationship.

For the purpose of performing multiple regression, four sub hypotheses were drawn to analyse the impact of all the factors of CSF on four factors of TQM. Based on value of R_2 and p-value for significance of results, null hypotheses $H0_1$, $H0_2$, $H0_4$ were rejected since p-value in all these cases is ($p<0.05$) and value of R_2 were 0.541, 0.439, 0.254 explaining 54.1%, 43.9%, 25.4% variability in dependent variable by independent variables respectively. $H0_3$ was rejected since the p-value was 0.73 which was greater than accepted value of 0.05 for p at 95% level of significance, though it had a R_2 value of 0.156. It lead to partial rejection of null hypothesis drawn for current objective was "There is no significant impact of Critical Success Factors on Total Quality Management" and alternate hypothesis "There is a significant impact of Critical Success Factors on Total Quality Management is partially accepted".

This means that there is a significant impact of Critical Success Factors on Total Quality Management though there is an absence of significant causal relationship between CSF and TQM3. We can argue that Critical success factors cannot predict the values of variables in TQM3. Which mean, absence or presence of Critical Success Factors has no significant impact on the two components of TQM that are "proper use of empowerment and teamwork" and "having suitable conditions for implementing TQM". But, these Critical Success Factors are essential for rest of the components of TQM and can significantly impact the success or failure of TQM in our organizations.

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