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Application of Quality Management Excellence Model in ISO Certified Companies of Pakistan

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Abstract: Current research aims to explore the practical application of the Quality Management Excellence Model EFQM in ISO-certified companies. It investigates how the leadership, process, people, and strategy help the organization sustain the performancein ISO certified companies. Deploying the quantitative strategy, researchers collected the data from qualified professionals, supply chain experts, productions icons, and business icons of twenty ISO-certified companies operating in metropolitan cities of Pakistan. Results of the factor analysis confirm that essential elements of the EFQM Modelplay a vital role in ISO-certified companies in their quality journey. Under the umbrella of People Management Training & Participation and voice to ethical issues are considered.Similarly,only manufacturing and quality assurance processes are considered to make the model within the Processes preview.The paper reveals leadership commitment; people roles and processes are the essential EFQM elements that need attention from a corporate viewpoint to manage the quality in companies. Leadership and Top Management commitment are the key drivers that positively impact management. People are educated, trained, groomed, and tamed as per the company's norms, and they are bound to follow the company values giving due weightage to ethical issues. The effect of enablers of the model, their interrelationships, and their combined effecton their results give insight while implementation.

Keywords- Pakistan, Quality,EFQM, ISO-Certified companies

Introduction

Quality is the need of today. Every organization is irrespective of its nature; whether it is a multinational or local company, they want to have Quality Management System. Quality is not a knee-jerk; it is based on continual improvement methods. In the USA, Malcolm Baldrige National Quality Award (MBNQA) is the highest-level quality implementation criteria(Wilson & Collier, 2000), whereas in Europe is EFQM: European Foundation Quality Model(Doeleman, ten Have, & Ahaus, 2014), andin Japan is Deming Quality Award(Baila, 1996). Our neighboring country, India,uses Rajiv Gandhi Quality Award(Tan & Khoo, 2002), whereas the Proposed Pakistan National Quality Award operates in Pakistan(Mahmood, Mahmood Ahmad Qureshi, & Nisar, 2014). Such awards measure the organization's performance based on a rigorous assessment scheme, evaluating the past and current data set and focusingon the strategic plan for the next five years.

The models mentioned above are the highest level of TQM Models that measure the organization's excellent performance and exhibit the best quality management practices per the criteria guide, which vary slightly depending on the model used. ISO 9001:2008, ISO 14001, ISO 18001, ISO 22001, ISO 27001, SA 8000, HACCP (Tan et al. 2006), ISO 17025, BRC are the certifications in place Pakistani industries. The most commonly used and widely accepted certification is ISO 9001:2008. There is a need to establish the linkage with dimensions of the EFQM Model and ISO 9001:2008. The reason to opt for the EFQM Model is that its criteria guide is closerto the criteria guide of the Proposed Pakistan National Quality Award.

Increasing the demand for ISO 9001:2008 certification is crucial for ISO 9001:2008. More than twenty ISO Certification bodies are in operation in Pakistan. They keep on conducting the one-day and five-day training workshops to market the ISO as a process improvement tool and develop the Quality Professionals to be active in the companies while preparing the companies for ISO Certification and developing the companies a quality-focused company. As per the data provided by the ISO certification bodies, more than 9000 companies are certified in Pakistan, covering the manufacturing, agriculture, and service sector, including government bodies like the Lahore Chamber of Commerce of Industries (LCCI). ISO certified bodies have a strong foundation of Total Quality Management covering employee training, process improvement, and customer focus. The companies wish to have ISO certification to gain a competitive advantage over the competition and improve processes(Syed, Ur Rehman, & Kitchlew, 2018).

Literature Review and Theoretical Framework

In 1990, there was a wave to have ISO certification to gain a competitive advantage. Worldwide and in Pakistan, many organizations opted for ISO certification; few are inclined to improve processes. Many are involved either for the export requirement or to gain a competitive advantage. ISO acts as a building block for TQM and contains all the elements which are essential in TQM(Yusuf & Raouf, 2013). Many authors like (Nurcahyo, Zulfadlillah, & Habiburrahman, 2021)believed that ISO associated with TQM could secure organizational success. TQM is the guiding philosophy to bring excellence in operations and lead a high-performing unit. TQM philosophy emphasizes a systematic, well connected, integrated, and enterprisebroad perspective involving everyone and everything.TQM applications help reduce process variance, which significantly affects supply chain performance measures, such as cycle time, defect reduction, and on-time delivery. TQM, a tripod, comprises employee participation, processes, and customer focus. Itis done with the visionary leadership and the commitment of the top management, who usually are the steering committee members(Din & Cheema, 2013).

The essential TQM dimensions are leadership, people management, and processes to generate business results. Performance Excellence Models like Malcolm Baldrige National Quality Award (MBNQA), European Foundation for Quality Management Model (EFQM), Deming Award, Malaysian National Quality Award,

RajivGandhi National Quality Award, and Proposed Pakistan National Quality Award provide sufficient information and highlightsthe importance of Leadership, People Management, and Processes. MBNQA and EFQM are the most widely used models in the world. EFQM has been taken as a benchmarking model to deduce or propose the TQM model based on the three most important TQM Constructs Leadership, People Management, and Processes. Santos-Vijande and Álvarez-González (2007)shared the impact of enablers on people, customers, society, and business results in the EFQM model using the structural equation model (SEM). It has been proven from the interpretation of SEM results that there arepositive causal relationships between enablers and results. This causality can be modeled using a causal loop diagram in system dynamics. The influence of enablers can be evaluated and determined while simulating the integrated system dynamics model. Policies can be designed and framed to improve the system's people, customers, society, and business results.

Research Methodology

This study is based on the EFQM business excellence model developed in 1988 with the support of 14 European companies endorsed by the European Commission. This award is presented to those companies that demonstrate excellence in the management of quality for continual improvement. This model covers nearly 30 percent of ISO 9001:2008 standard and has explicit results orientation, which comprises people satisfaction, customer satisfaction, impact on society, and business results (Figure 1). The research instrumentfor this study was developed based on the studies of (Lakhal, Pasin, & Limam, 2006), Sarapha et al.(1989), and (Burli, Bagodi, & Kottur shettar, 2012)and the experiential information of the researchers for the elements of EFQM**.** A pilot study conducted by the authors indicated the relevance of theconstruct; "voice to values, employee training and participation, manufacturing process, and quality assurance processfor ISO certified companies. Thus,the instrument for the study was based on a modified EFQM model (Figure 1). The"enablers" represent Model elements, and the "results" criteria are the outcomes that need to beassessed to study the impact of enablers. The instrument contained seven sections with 50 indicators to be measured on a Likert five-point scale with the endpoints"strongly disagree =1" and "strongly agree = 5". The first questionnaires werecirculated amongst 15 senior quality professionals serving in two different ISO certified companies to ascertain the content validity. A finalinstrument for the study was prepared after incorporating the suggestionsmade and circulatedto others to get the knowledge.

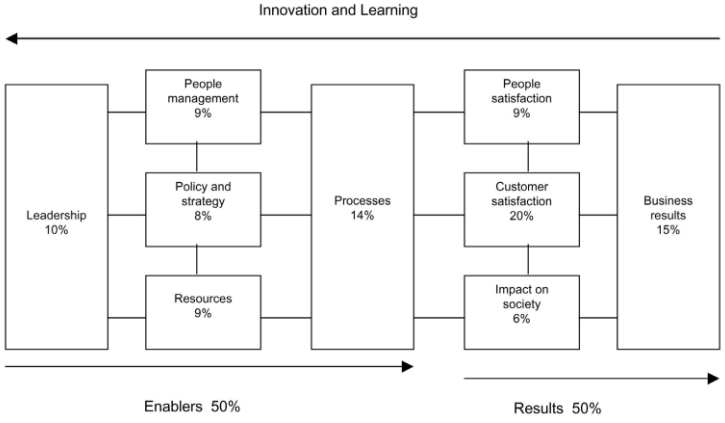

Figure 1. EFQM Excellence Model
Source: (Calvo-mora, Leal, & Roldán, 2005)

Sample

ISO-certified companies from seven sectors have been selected based on convenience and snowball sampling for data collection. Self-administrated questionnaires were distributed to Quality Assurance managers, production managers, supply chain managers, quality executives, supply chain executives, production executives, and

members of the steering committee.The total number of questionnaires distributed was140 in 20 ISO-certified companies. The total numbers of filled-in questionnaires received were 95. The data cleaning resulted in 90 usablequestionnaires for final analysis (response rate of 68 percent). The profile of the sampleof this study is shown in Table 1

Table 1 Demographics

Sr.No	*Unit of Analysis*	*No of Companies*	*Frequency*	*Percentage*
1	Members of Steering Committee (GM/Director/PM/BUH)	**20**	3	15 %
2	Quality Manager	**20**	5	25 %
3	Production Manager	**20**	6	30 %
4	Supply Chain Manager	**20**	3	15 %
5	Quality Executive	**20**	4	20 %
6	Production Executive	**20**	5	25 %
7	Supply Chain Executive	**20**	4	20 %
	Total	**140**	30	21.4%

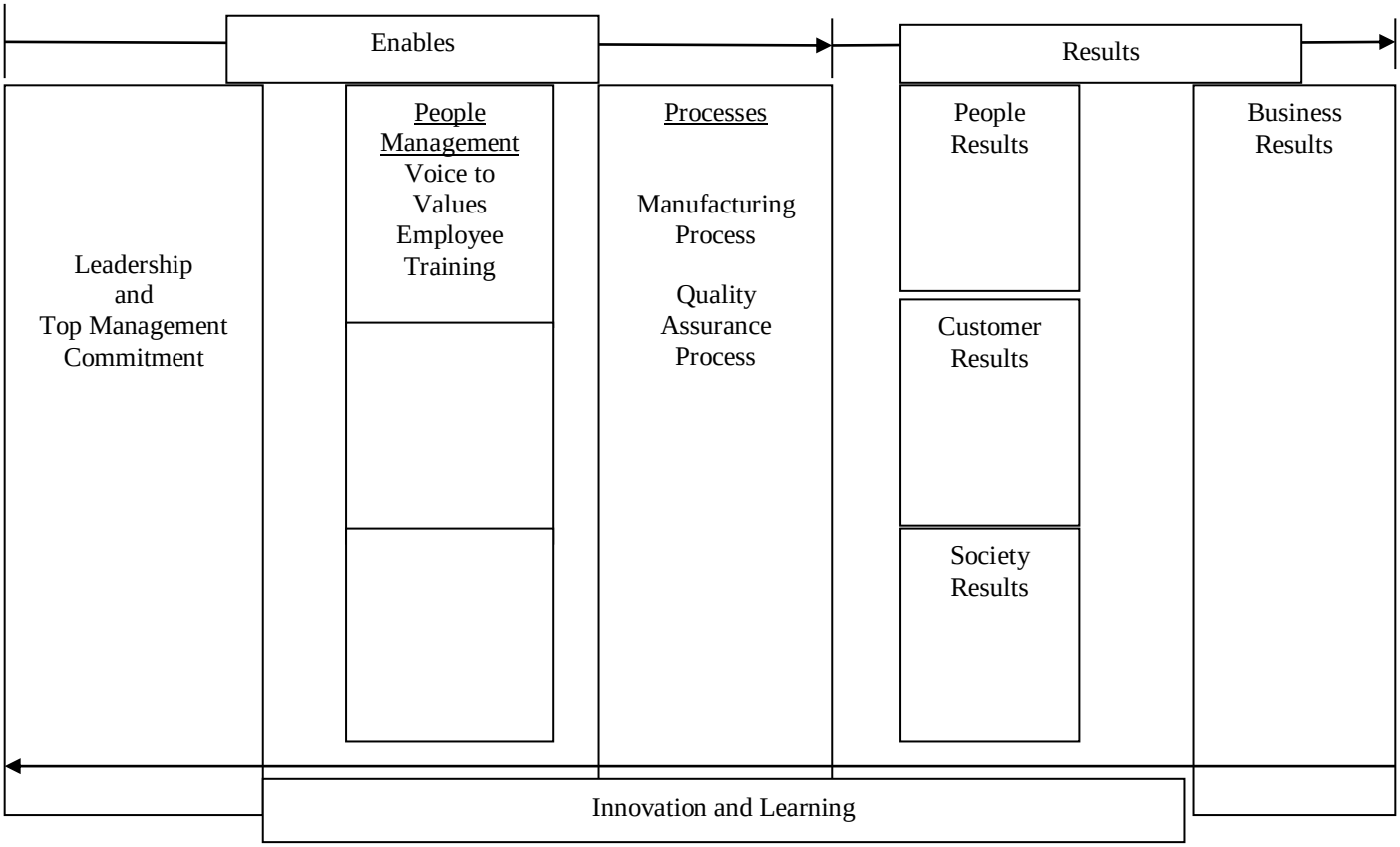

Figure 2. The proposed TQM Model for Manufacturing Industry

Research Model and Hypotheses

Some authors (Calvo-Mora et al., 2005), in their study on the EFQM model, have explored therelationships between enabler factors of the EFQM model. EFQM Model shown in Figure 1.provides the foundation stone to develop the model as shown in Figure 2 to investigate the effectof leadership on processes through people management. A research model shown in Figure 3 was developed to investigate relationships between enablersof the proposed TQM model.

From this research model, the following ten research hypotheses have been formulatedfor testing:

H1: The leadership and commitment of top management have a positive influence
on people, management developing competence, and employee participation through training.

H2: The leadership and commitment of top management have a positive influence
on people management giving voice to values developing employees for ethical issues.

H3: The leadership and commitment of top management positively influence the manufacturing process for productivity enhancement.

H4: The leadership and commitment of top management positively influence the Quality Assurance Process for system improvement.

H5: People management developing competence and employee participation through training has a positive influence on people management, giving voice to values developing employees for ethical issues.

H6: People management developing competence and employee participation through training positively influencesthe manufacturing process.

H7: People management developing competence and employee participation through training positively influencesthe quality assurance process.

H8: People management giving voice to values developing employees for ethical issues positively influencesthe manufacturing process.

H9: People management giving voice to values developing employees for ethical issues positively influencesthe quality assurance process.

H10: Quality Assurance Process has a positive influence on the manufacturing process.

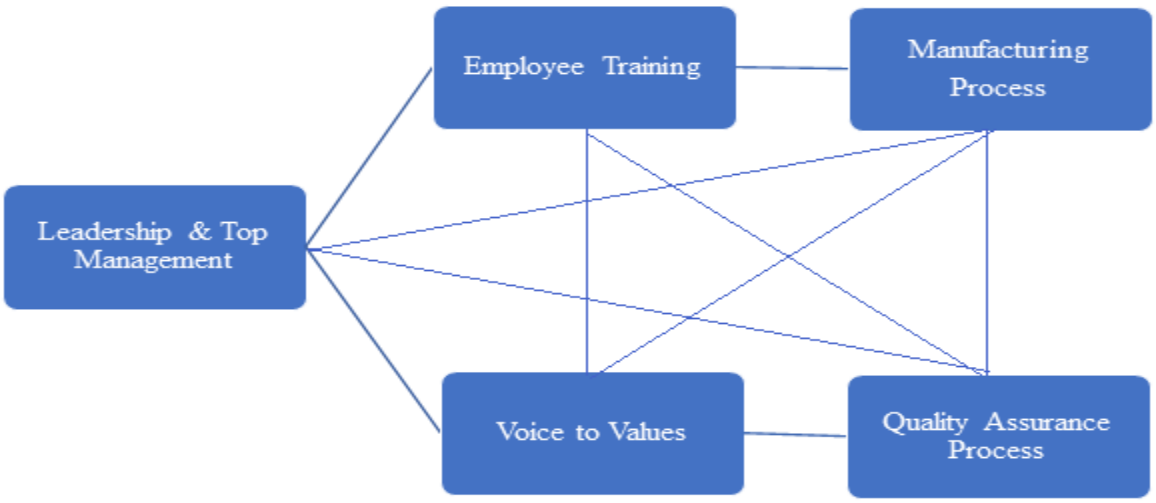

Figure 3. Research Model

Data Analysis and Results

Exploratory Factor Analysis

To find underlying latent construct and to determine the association between multiple factors, exploratory factor analysis is done.

Sr. No	*Description of Items*	*Variable Range*	*No. of Variables*
1	Leadership &Top Management Commitment	LM1------ LM-7	7
2 (a)	People Management: Employee Training and Participation	PT1 ------ PT7	7
2 (b)	People Management: Voice to Values	PV1 ------ PT5	5
3 (a)	Manufacturing Process	MP1------ MP6	6
3 (b)	Quality Assurance Process	QP1--------QP6	6
4	People Results	PR1--------PR4	4
5	Society Results	SR1--------SR4	4
6	Customer Results	CR1--------CR4	4
7	Business Results	BR1--------BR7	7
	Total		**50**

The data set contains 50 variables as a TQM-related variable shown on aLikert five-pointscale, 1-5. In contrast,seven demographic-related variables are dichotomous or categorical, requiring nominal and ordinal scales for their representation. To highlight the TQM dimensions, 50 variables which specify the eight latent variables, are used in the factor analysis. Principal component analysis with varimax rotation method is usedto extract the principal componentsare mentioned in Appendix 5. The variables are evaluated for the commonalities. All the variables have extraction valuesof more than 0.5,so there is no need for variable removal. All the variables for communality were found satisfactory. The list is shown in Appendix 5. The cumulative expected variance of the first eight principal components is upto 85.05 %,and the initial Eigenvalues of the eight components are more than 1. Expected variance of first component is 57.8 % whereas for second, third, fourth, fifth, sixth, seventh and eight are 6.4 %,4.7%,4.5 %, 3.5%, 3.1%, 2.88 % and 2.01% respectively. This extraction sum of square loading indicates that components are not evenly loaded, so we must use the rotation extraction method. Varimax Rotation method was used and it was interestingly obvious than expected variances for eight components are 16.8%, 16.2 %,14.8 %, 11%, 10.9%, 7.2%, 6.5%, and 2.01 % respectively. The values are evenly loaded against eight components.

The scatter plotin Appendix 5 also indicates that approximately seven principal components appear, not eight. Component matrix highlighted the eight extracted principal components when the values less than 0.4 were suppressed. But the clear and evenly balanced, and loaded components appear when we use the Varimax Rotation Extraction Method as shown in the Rotation component matrix listed in Appendix 5

The total variance explained shows that initial eigenvalues of the eight components are more than one and represent 85.8 percentcumulative variance.

Model Factors/Principal Components	Indicators/Items
People Results (6)	PR1-0.501, PR2 - 0.533, PR4- 0.521, PR3- 0.486
Employee Training (5)	PT1- 0.428, PT3-0.566, PT4 - 0.715, PT5- 0.775, PT6- 0.774, PT7-0.663
Voice to values (7)	PV1-0.589, PV2-0.714, PT2-0.581
Leadership Role for Society Building (4)	LM1-0.401, LM3-0.625, SR2-0.516, SR3-0.581, PV3-0.699, PV4-0.644
Manufacturing Process and Business Results (2)	BR2-0.770, MP3-0.853, BR3-0.653, MP2-0.691 BR5-0.530, MP4-0.611 BR6-0.540, MP6-0.611 BR4-0.636, MP1-0.602, MP5-0.594
Leadership Commitment for Customer Satisfaction (3)	LM4-0.769, LM5-0.640, LM6-0.763, LM7-0.675,CR1-0.687, CR2-0.655, BR1-0.613, SR4-0.604,
Quality Process and Quality Systems(1)	QP1-0.655, QP2-0.862, QP4-0.771, QP6-0.508, CR3-0.578, CR4-0.940, BR7-0.62,PT1-0.606
Not included parameters	LM2, PV5, QP3, QP5,SR1,BR5

The model factors / Principal Components coined the new names suggested above based on variables mentioned against each component.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.978	.981	66

Reliability statistics indicates the value of the Cronbach's Alpha is 0.978

Confirmatory Factor Analysis

The seven latent variables that have emerged from the exploratory factor analysis are the active candidates for the confirmatory factor analysis (CFA) using AMOS.

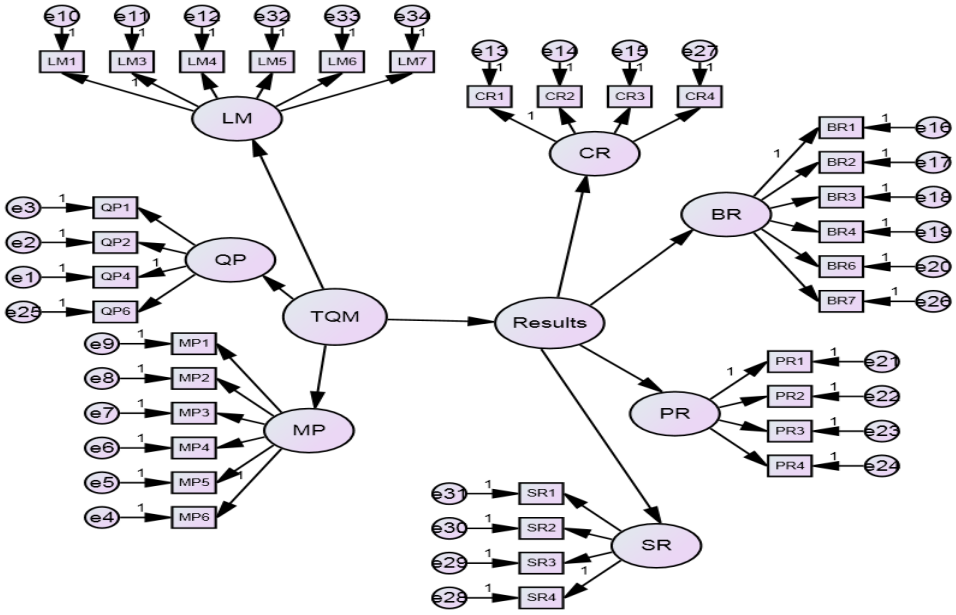

Figure 4. Causal Path Model

Parameter Summary (Group number 1)

	Weights	Co-variances	Variances	Means	Intercepts	Total
Fixed	41	0	0	0	0	41
Labeled	0	0	0	0	0	0
Unlabeled	35	0	35	0	34	104
Total	76	0	35	0	34	145

Minimization History (Default model)

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	8		-.237	9999.000	688.138	0	9999.000
1	e	21		-.071	7.331	442.545	28	.045

Result (Default model)

The model is probably unidentified. It will probably be necessary to impose two additional constraints to achieve identifiability.

Execution time summary

Minimization:	.024
Miscellaneous:	3.078
Bootstrap:	.000
Total:	3.102

Conclusion and further research direction

This paper has two critical parts; one is to find the model factors / principal components which are vital and act as enablers to achieve the results like customer satisfaction (Customer Results), impact on society (Society Results), employee satisfaction (People Results), and overall business results (Business Results) whichrepresent the growth of the company.Varimax rotation principle has effectively grouped the variables linked with each other. People training, people participation, voice to values developing the ethical skills in the individuals are the driving force for continuous improvement in the TQM model that ultimately affects customer satisfaction, improvement in the manufacturing process, and designing and developing the quality assurance process to generate results. ***Component 5*** (PT1- 0.428, PT3-0.566, PT4 - 0.715, PT5- 0.775, PT6-0.774, PT7-0.663) deals with employee training and highlights the importance of training for process improvement whether the processes are manufacturing oriented or quality-oriented. ***Component 7*** (PV1-0.589, PV2-0.714, PT2-0.581) People management giving voice to values for employee development is another significant contributor for achieving the results. PT2 within component 7 is continuous training for non-operational staff reinforces voice to values. ***Component 1*** (QP1-0.655, QP2-0.862, QP4-0.771, QP6-0.508, CR3-0.578, CR4-0.940, BR7-0.62,PT1-0.606) Quality Assurance Process shares the input of quality-related activities; it is interesting to note that CR3, CR4, and BR7 are result linked items, but its strong

association is with Quality Process where we talk about customer satisfaction, customer complaints, warranty claims, and BR7 cycle time reduction initiative. PT1 portrays the training of the managerial staff, so trained managerial staff contributes a lot to designing and developing the quality assurance process. ***Component 2*** (BR2-0.770, MP3-0.853, BR3-0.653, MP2-0.691 BR5-0.530, MP4-0.611 BR6-0.540, MP6-0.611 BR4-0.636, MP1-0.602, MP5-0.594) represents the manufacturing process and its role for business growth. The items related to manufacturing and business results are self-explanatory. BR3 reflects the return on investment, which is high if machine utilization is high; BR5 describes the reduction in waste percentage resulting fromthe efficient manufacturing process; BR4 shows the profit resulting from better machine utilization and reduced wastages. BR2 reflects the market share, resulting ina better company image in an exemplary manufacturing process and reduced wastages.***Component 6***(PR1-0.501, PR2 - 0.533, PR4- 0.521, PR3- 0.486) People results show the degree of employee involvement and participation for quality initiatives, process improvement, and achieving the key performance indicators and contributing for productivity enhancement. ***Component 3*** (LM4-0.769, LM5-0.640, LM6-0.763, LM7-0.675,CR1-0.687, CR2-0.655, BR1-0.613, SR4-0.604) Leadership commitment is emerged as a critical driver for customer satisfaction, ensuring growth in sales and building satisfaction level in the surrounding community/society. ***Component 4*** (LM1-0.401, LM3-0.625, SR2-0.516, SR3-0.581, PV3-0.699, PV4-0.644) Leadership role is further strengthened in this component where management commitment boosts the quality cause, highlighting the safety and health-oriented activities and spreading the wave of cultural and society building issues.

For using such information, we developed the Causal Path Model shown in Fig. 4 using AMOS 20 software, and then we ran the model for analyses purpose. Because of a small data set, we cannot achieve the minimization output with modification indices. We keep working to enhance the response rate by contacting the respondents through personal emails and telephone calls; we are also working for an enhanced sample size to increase the data set for proper analysis. It is our future work that is underway.

Research Limitations

Convenience Sampling and snowball sampling were used due to operational ease. Personal contacts were deployed to get a high response rate, but the response rate was unluckilyprolonged. Out of 140 respondents, only 30 respondents replied. Due to the small size of the data, AMOS 20 software could not achieve minimization, and modification indices cannotbe determined. If we click the checkbox of modification indices in the Analysis Properties showing screen output, the model does not show any output summary and indicates the data is too tiny for model fit. If we uncheck the box of the modification indices, it shows the output mentioned in the paper and shown in Appendix 6. The measurement of the TQM-related variables is highly dependent upon the perception of the individuals, their knowledge about ISO 9001:2008 (Yusuf & Raouf, 2013), and quality practices deployed in the industry. That is why the respondent's answers are 180 degrees opposite even within the same organizations, another essential constraint. Our assumption in the model is all TQM-related, and their associations are linear in nature.

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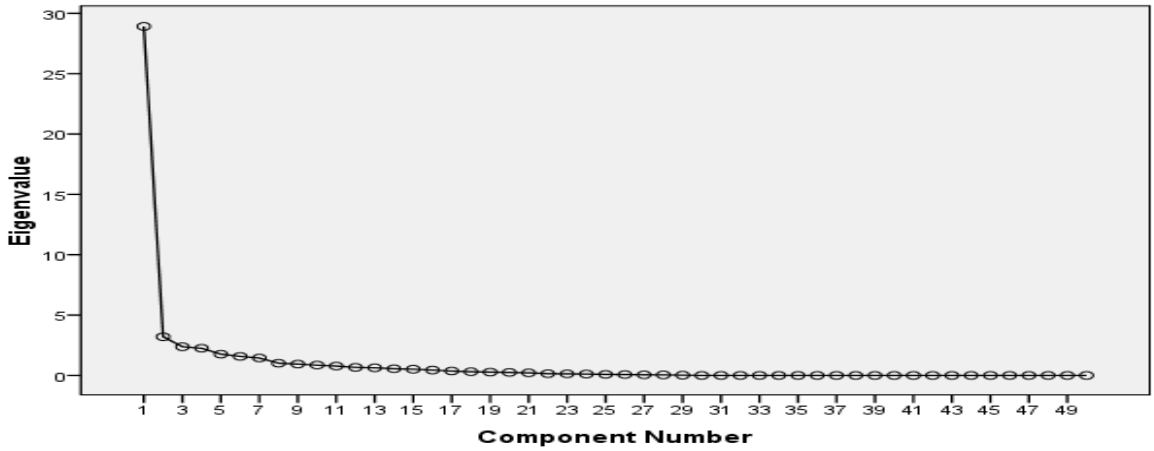
Appendix

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
1	28.912	57.825	57.825	28.912	57.825	57.825	8.118	16.236
2	3.207	6.415	64.239	3.207	6.415	64.239	8.042	16.084
3	2.376	4.752	68.991	2.376	4.752	68.991	7.433	14.866
4	2.250	4.501	73.492	2.250	4.501	73.492	5.513	11.026
5	1.762	3.523	77.016	1.762	3.523	77.016	5.470	10.941
6	1.578	3.157	80.172	1.578	3.157	80.172	3.611	7.221
7	1.442	2.885	83.057	1.442	2.885	83.057	3.261	6.522
8	1.011	2.023	85.080	1.011	2.023	85.080	1.091	2.183
9	.945	1.891	86.970					
10	.856	1.712	88.682					
11	.775	1.550	90.233					
12	.667	1.334	91.566					
13	.631	1.262	92.828					
14	.554	1.108	93.936					
15	.513	1.026	94.962					
16	.445	.890	95.852					
17	.364	.727	96.579					
18	.306	.612	97.191					
19	.275	.550	97.741					
20	.250	.500	98.241					
21	.212	.425	98.666					
22	.146	.291	98.957					
23	.131	.262	99.219					
24	.114	.227	99.447					
25	.085	.171	99.617					
26	.072	.144	99.761					
27	.054	.109	99.870					
28	.043	.087	99.957					
29	.022	.043	100.000					

Extraction Method: Principal Component Analysis



Rotated Component Matrix								
	Component							
	1	2	3	4	5	6	7	8
CR4	.940							
QP2	.862							
QP4	.777							
QP1	.655						.408	
BR7	.620				.413			
PT1	.606				.428			
CR3	.578							
QP6	.508	.423		.450				
SR1								
MP3		.853						
BR2		.770						
MP2		.691						
BR3	.445	.653						
BR4		.636						
MP4	.419	.611						
MP6	.414	.611						
MP1		.602				.421		
MP5		.594	.452					
QP5		.550	.459				.497	
BR6	.501	.540						
BR5	.496	.530						
LM4			.769					
LM6			.763					
CR1	.435		.687					
LM7			.675					
CR2	.537		.655					
LM5			.640					

BR1			.613	.526				
SR4		.424	.604					
PR3		.436	.563			.486		
LM1			.489	.401				
PV3				.699				
PV4		.418		.644				
LM3				.625				
SR3				.581				
SR2		.487		.516				
PT5					.775			
PT6					.774			
PT4					.715			
PT7					.634			
PT3			.552		.566			
LM2					.566	.464		
QP3	.587					.660		
PR2	.439		.462			.533		
PR4	.429	.419				.521		
PV5						.520		
PR1				.438		.501		
PV2							.714	
PV1							.589	
PT2				.454			.581	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.								
a. Rotation converged in 16 iterations.								