INTERNATIONAL JOURNAL OF HYDROPOWER AND CIVIL ENGINEERING

E-ISSN: 2707-8310
P-ISSN: 2707-8302
IJHCE 2020; 1(1): 20-25
Received: 11-11-2019
Accepted: 15-12-2019

Tekalign Lemma Woldesilassie
Department of Industrial Engineering, Institute of Technology, Ambo University, Ambo, Ethiopia

Venkata Mallikhajuna Kishan Ivatury
Department of Industrial Engineering, Institute of Technology, Ambo University, Ambo, Ethiopia

Corresponding Author:
Venkata Mallikhajuna Kishan Ivatury
Department of Industrial Engineering, Institute of Technology, Ambo University, Ambo, Ethiopia

Quality management and its impact on product quality in manufacturing sectors in Ethiopia, Africa

Tekalign Lemma Woldesilassie and Venkata Mallikhajuna Kishan Ivatury

Abstract
This research document was intended to detect the impacts of quality management elements on product quality in manufacturing sectors. The research identified nine QM elements; - EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT that impact PRQ. Self-administered structural questionnaires were prepared and distributed to 73 manufacturing sectors in Ethiopia, 57(78.2%) papers were filled and returned back. The questions were loaded in SPSS v20 and descriptive statistic, correlation and regression analysis were conducted for data analysis purpose. The result of this paper confirmed that 9 predictor variables accounted for 78.1% of the variation in PRQ. The outcome of the result confirmed that COI, QUT, PRM, QUP, EMI, CBU and SUM positively and to grate extent impacts Product quality of manufacturing sectors. While LED and HRM have no contribution for product quality in this sectors.

Keywords: Quality Management, Product Quality, predictor variable, impact, hypothesis

Introduction
It is usual for the firm to be competent in the market to continue in their position. In a competitive market the only way for the firm to be successful is to keep the customers satisfied with their products by improving their product quality [1]. For the firm to be competent in the market and satisfy customer need product quality plays a vital role. According to [2] Quality management practice is a driver and source of National as well as international competition. It has systematic impacts on firm's product quality and performance [3]. According to [4] Quality Management factors are classified in to 'soft' and 'hard' factor. The study of [5] relates soft factors in to people based aspect and hard factors in to technical aspects of quality management. This paper investigates and focused on soft factors that affect (impact) product quality in manufacturing sectors in Ethiopia, East Africa.
Product Quality According to [6] is the whole thing that are obtained in market to get consideration, purchased or consumed that can satisfy the desires or needs of customers. Products are purchased by consumers because they can meet certain needs or provide certain benefits. It is the structure of manufactured article well matched with eight dimensions (scope) includes: - performance, features, conformance, reliability, durability, serviceability, aesthetics, and customer-perceived quality. According to different research work and scholars product quality is affected by quality management practice. Quality Management System (QMS) is defined by [21] as a management system to direct (manage) and control (monitor) a firm with regard to quality. The aim of QMS is to setup a frame work of reference points to ensure that whenever a process is performed, the same information, methods, skills and controls are used and applied in a consistent manner. Moreover, for making the firm's performance stronger QMS offer quality requirement plan and management.
According to [3] Quality management practices or soft factor including leadership, human resource (HRM) management, quality planning (QUP), customer focus (CUB), process management (PRM), supplier management (SUM), quality tools (QUT), continuous improvement (COI) and learning have consistent impacts on firm's performance and Product Quality.
According to the investigation of [7, 8] leadership, strategic planning, customer focus, information and analysis, people management and process management, human resource management and continuous improvement have direct effects on product quality.

Leadership in the Manufacturing Sectors will improve product quality performance by giving support for employee development, by establishing multipoint communication, by using information effectively and efficiently. Additionally leader participate employees in decision making and empower worker in the organization [9]. According to [10] top leadership commitment is the most vital factors for the success of product quality performance. According to [11] Customer Focus (CF) helps the firm to improve product quality in determining customer expectation, requirement and performance. It is used to investigate present and future customer performance by developing procedure to acquire (to get) information. It is the level to which the organization unceasingly fulfills client expectation and needs [12]. Human Resource Management has an undeviating positive interaction with product quality and organizational performance [7, 11, 13]. It is centered on human resource practice and adapted to clients plan and direction which seeking excellence by using competency and talents in the firm work force.

According to [13, 14] Process Management related with evaluating the organized system companies used to control its product and it incorporate production and distribution requirements, and it manages provider performance. According to Supplier Management principle improving supplier interactions increases the performance of both dealer and consumer [3, 15]. For consistent (effective) supply management dealers would be selected based on the quality of supplied product and service [16]. According to [17] establishing procedures for dealer assessment, choice, association and organization will realize the intended objectives these interns improve firm product quality and performance. Continuous improvement plays a vital role for any organizations; it highlights the current audit process, management reviews of organizational performance and improvement process depending on the result [18]. The improvement in the firm should be precisely planned and carried out based on real by using systematic documentation. For the success of continuous improvement in the organization, there should be top management commitment and support, a structure that support all the activities in the organization, team work encouragement, effective communication system, employees reward and recognition. According to [9] employee involvement describe confirming employees are motivated and perform their jobs as per the required standards. To confirm employee's loyalty to the organization, motivation and to improve work performance, the firm should provide effective training to their employees. Employee relations are important to promote teamwork and workforce management in the organization. Employee training is positively related to operational performance, employee performance, innovation performance, customer results, market and financial performance.

Employee involvement in quality management system execution process or activity will improve product and organizational performance. Quality planning aims at achieving consistent and persistent firm's excellence through integrating quality into firm's strategic plans [11]. It is used to Cascade strategic objectives all over the firm. Quality planning integrate Customer requirements, Dealer competence and needs of other participant during policy making, objective and developing plans of the organization. Similarly, according to [19, 20] Quality Tools help employees to identify variations within processes outputs and its sources, and systematically thoroughly results in enhancing performance of product quality and or process.

Theoretical model and hypothesis development

Theoretical model

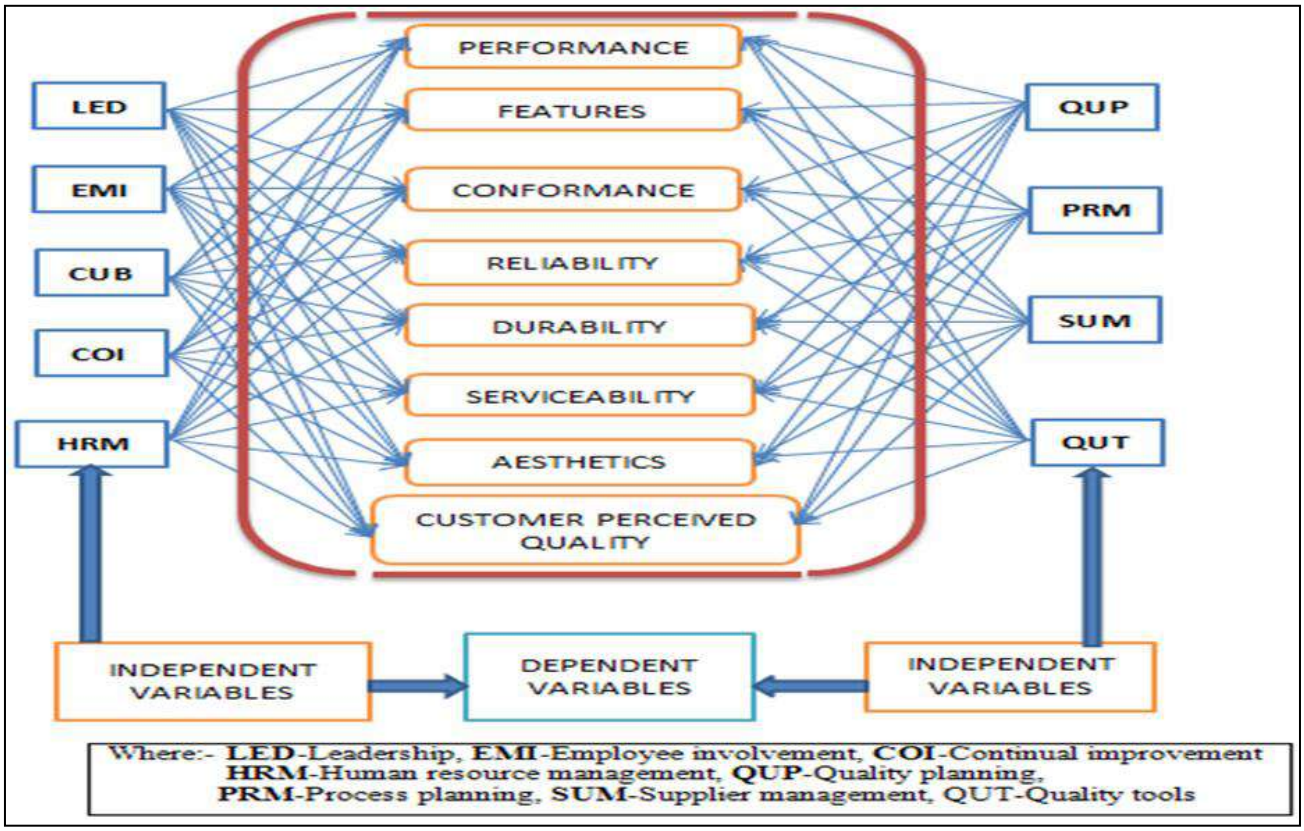

Fig 1: Theoretical model constructed by the researcher

Hypothesis development

The following nine research hypotheses were hypothesized based on the theoretical model to test the effects of predictor variables on product quality in manufacturing sector.

H1: Leader Ship has a positive effect on product quality

H2: Continual Improvement has a positive effect on product quality

H3: Human Resource Management has a positive effect on product quality

H4: Quality Tools have a positive effect on product quality

H5:-Process Management has a positive effect on product quality

H6: Quality Planning has a positive effect on product quality

H7: Employee Involvement has a positive effect on product quality

H8: Customer Focused has a positive effect on product quality

H9: Supplier Management has a positive effect on product quality

Research methodology

A. Research design, target population and response rate

This research work used both descriptive and inferential statistic for analyzing the data. The researcher was distributed self-administered structured questionnaire to the respondent. Totally 73 questionnaires were prepared and randomly distributed to:- Metal Product Manufacturing 20 (27.39%), Furniture Manufacturing 16 (21.920%), Paint Manufacturing 8 (10.95%), Pulp and Paper Manufacturing 8 (10.95%), Plastic Manufacturing 11 (15.06%) and Building (construction) material manufacturing 10(13.69%) in Ethiopia. All quality control managers, supervisors and managers from the selected sectors were participated for filling and responding the questionnaires. From the distributed 73 papers 78.02% of the papers were filled and returned.

B. Data Collection and Analysis Instrument

The survey questionnaire was used as the main primary data gathering instrument in this research study. The questionnaire used a 5 point Likert scale sorted starting from 1 = strongly disagree to 5 = strongly agree having 44 items under nine predictor (EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) variables and 32 items under eight dependent variables (PE, FE, CO, RE, DU, SE, CPQ and AE). Correlation Strength Interval and Mean Measuring Scale were developed for descriptive and Pearson's Correlation analysis as shown in table 1. Data was analyzed using mean, standard deviation, correlation and regression analysis methods.

Table 1: Correlation strength interval and mean measuring scale

Correlation Strength Interval			Mean Measuring Scale		
	Value	**Strength of relationship**		**Explanation**	**Interval**
	1.0 < r < 0.5	Strong		Strongly Unhappy	1.00 < Mean < 1.80
	0.3 < r < 0.5	Moderate		Minimum Degree	1.81 < Mean < 2.60
	0.1 < r < 0.3	Weak		Moderate Degree	2.61 < Mean < 3.40
	0.0 < r < 0.1	Very Weak		High Degree	3.41 < Mean < 4.20
				Absolutely True	4.21 < Mean < 5.00

Data analysis

A. Reliability analysis

This research paper used reliability analysis to check (to test) the consistency and stability of the research questionnaires. The researcher tested the reliability of the questionnaire by using SPSS version 20.Tables 2 shows the reliability result of the questionnaire before and after some of the questionnaires were removed. As per the result of the analysis the value of Cronbach's alpha (α) was fall from 0.611 to 0.895, which indicated higher reliability of the questionnaire.

Table 2: Reliability analysis result

Explanation		After [before]	Cronbach's Alpha	
			Before item is deleted	After item is deleted
Independent Variables (Quality Management)	Continual Improvement (COI)	8[9]	0.746	0.750
	Human Resource Management (HRM)	4[7]	0.803	0.893
	Quality Tools (QUT)	3[6]	0.772	0.895
	Process Management (PRM)	6[7]	0.736	0.756
	Leadership (LED)	5[7]	0.506	0.680
	Quality planning (QUP)	4[5]	0.608	0.620
	Employee Involvement (EMI)	6[8]	0.560	0.674
	Customer Focused (CUB)	4[7]	0.752	0.845
	Supplier Management (SUM)	4[5]	0.584	0.678
Dependent Variables (Product Quality)	Performance (PE)	5[5]	0.664	0.664
	Feature (FE)	4[6]	0.584	0.674
	Conformance (CO)	4[7]	0.644	0.810
	Reliability (RE)	6[8]	0.748	0.812
	Durability (DU)	3[7]	0.455	0.611
	Serviceability (SE)	4[5]	0.811	0.846
	Aesthetics (AE)	3[6]	0.338	0.619
	Customer perceived quality (CPQ)	3[4]	0.534	0.628

B. Descriptive analysis

Table 3 indicates the descriptive analysis result of the respondents showing the execution practice of the predictor variables (EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) in the firm. And the result investigated the causes for poor performance (practice) of these variables. The result in table 3 revealed that:-

1. **COI are poorly practiced due to:** lack of internal and external audits, lack of effectiveness in continuous improvement process, lack of up to date continues improvement program review, lack of emphasis to continuous improvement from all departments, lack of immediate corrective action with respect to non-conformity and area of improvement and lack of continuous monitoring of the process and product.
2. **LED are inadequately practiced due to:** lack of support from top management for long term quality improvement process, lack of setting clear future strategic direction, lack of encouragement from top management, lack of communication and lack of ensuring the required resource to all the department.
3. **EMI are inadequately exercised due to:** lack of participation from all department in quality management program, lack of motivation, communication, and involvement of employees in quality management program, employees unaccountability for their own performance, lack of employees clear job description for quality management program, lack of team work and lack of employees opportunity to improve their competency, knowledge and experience.
4. **CUB are inadequately carried out due to:** lack of employees awareness about customers need, lack of striving to meet customers need and expectation, lack of idea about market orientation.
5. **HRM are insufficiently practiced due to:** lack of consideration for physical and ergonomic factors to quality management personnel, lack of periodic training for quality management system personnel and lack of improving employee's skill and experience.
6. **QUP are poorly practiced due to:** lack of communicating and supporting mission statement through the company, lack of reviewing short and long term planning process goals and lack of planning customer requirement, suppliers capability and need of other stakeholders
7. **PRM are inadequately exercised due to:** lack of using effective quality manual, lack of recording organizational activities and their result to provide evidence, lack of maintenance procedures for different process of the firm and lack of reliability of the process.
8. **SUM are poorly practiced due to:** lack of treating the materials provided from the customer and suppliers equally, lack of supplier involvement in new product development process.
9. **QUT are poorly exercised due to:** lack of structured and comprehensive quality control planning process, lack of using statistical quality control for equipment and process on shop floor level and lack of using statistical techniques for reducing variance in the process.

Table 3: Summary of descriptive analysis result

Predictor variable	Mean	Std Dev	Rank	Interpretation
Continual Improvement(COI)	4.0022	.42514	1	Absolutely true
Human Resource Management(HRM)	3.9518	.73546	2	High degree
Quality Tools(QUT)	3.8421	.67551	3	High degree
Process Management(PRM)	3.8041	1.05939	4	High degree
Leadership(LED)	3.4737	.69897	5	High degree
Quality planning(QUP)	3.4123	0.8844	6	High degree
Employee Involvement(EMI)	3.3275	.74476	7	Moderate degree
Customer Focused(CUB)	3.2895	.81292	8	Moderate degree
Supplier Management(SUM)	2.9561	.94092	9	Moderate degree

C. Correlation analysis

The study used to examine the strength of the relationship between LED, EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) and Product Quality (PRQ). The result in table 5 revealed that EMI, COI and PRM have strong positive impact on Product quality while LED, CUB, HRM, QUP, SUM and QUP have moderate positive impact on Product Quality.

D. Regression analysis

This research paper used regression analysis for evaluating the appropriateness of the model and to investigate fundamental relationship between predictor variables (LED, EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) and Product Quality (PRQ).

The result in Table 4 indicated that the identified nine predictor variable (LED, EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) accounted for 71.8% of the variation in product quality and the rest 28.2% are unidentified variables by this research work. The result of model 2 indicated in Table 4 revealed that the importance of the model by the value of *F*-statistics (p = 0.000), and F = 13.296 which indicated that there were strong relationship between Product quality and Quality Management (LED, EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) in the case the case manufacturing sectors. AS shown in Table 5 β sign of seven predictor variables (EMI, CUB, COI, QUP, PRM, SUM and QUT) revealed positive influence on Product Quality of manufacturing sectors. Increasing the practice of (EMI, CUB, COI, QUP, PRM, SUM and QUT) in the company results in increasing or improving Produce Quality. But LED and HRM have negative impact on Product Quality. The result of this research revealed that seven predictor variables (EMI, CUB, COI, QUP, PRM, SUM and QUT) influencing Product Quality in manufacturing sectors.

Table 4: Model summary and ANOVA

Model 1 (mode summary)		**Explanation**		**Value**		
		R		0.847		
		R^2		0.718		
		Adjusted R^2		0.664		
		R^2 Change		0.718		
		df1		9		
		df2		47		
		Sig F Change		0.000		
Model 2 (ANOVA)	**Model 2**	**Sum of squares**	**DF**	**Mean square**	**F**	**Sig**
	Regression	7.267	9	0.807	13.296	0.000
	Residual	2.854	47	0.061		
	Total	10.122	56			

Table 5: Regression and Correlation result of the study

Predictor variable	Unstandardized coefficients	Standardized coefficients	Sig value	Correlation result	
	β	β	p	r	p
LEDM	-.704	-1.218	.031	.488	.000
EMIM	.407	.646	.000	.651	.000
CUBM	.106	.264	.059	.486	.000
COIM	.188	.309	.057	.633	.000
HRMM	-.188	-.207	.651	.443	.000
QUPM	.279	.489	.397	.479	.000
PRMM	.081	.155	.553	.548	.000
SUMM	.200	.376	.229	.424	.001
QUTM	.186	.412	.331	.437	.000

(Constant) Unstandardized Coefficients (β) 1.053
Dependent Variable: PQM

E. Hypothesis testing

The hypothesis testing was used to and examines the impact of (LED, EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT) to Product quality. The result of the hypothesis analysis of this research work was summarized in table 6 below. This result indicated that H2, H4, H5, H6, H7, H8 and H9 supported that COI, QUT, PRM, QUP, EMI, CBU and SUM positively and significantly affects Product quality. But LED and HRM have no significant impact on Product quality.

Table 6: Hypothesis Result of the study

Hypothesis	β(p)	Result
H1: LED has a positive effect on product quality	-0.704[0.031]	Rejected
H2: COI has a positive effect on product quality	0.188[0.057]	Accepted
H3: HRM has a positive effect on product quality	-0.188[0.651]	Rejected
H4: QUT has a positive effect on product quality	0.186[0.331]	Accepted
H5: PRM has a positive effect on product quality	0.081[0.553]	Accepted
H6: QUP has a positive effect on product quality	0.279[0.397]	Accepted
H7: EMI has a positive effect on product quality	0.407[0.000]	Accepted
H8: CUB has a positive effect on product quality	0.106[0.059]	Accepted
H9: SUM has a positive effect on product quality	0.200[0.229]	Accepted

Conclusion

The aim of this research document was to identify (detect) the impacts of LED, EMI, CUB, COI, HRM, QUP, PRM, SUM and QUT on PRQ in manufacturing sectors. The influential factors of PRQ were explained by 9 predictor variables that accounted for 78.1% of the variation in PRQ. From the nine Predictor Variables 7 variables: EMI, CUB, COI, QUP, PRM, SUM and QUT have positive and significant impact on product quality in manufacturing sectors. For the firm to be competent in the market and to improve the quality of their product the identified 7 predictor variables play a vital role. Therefore the manufacturing firm should give due attention to improve the performance of these variables.

Reference

1. Elonen S, Artto KA. Problems in managing internal development projects in multi-project environments, International Journal of project management. 2003; 21(6):395–402.
2. Sohal AS, Prajogo DI. The relationship between TQM practices, quality performance and innovation performance an empirical examination, International Journal of quality & reliability management. 2003; 20(8):901-918.
3. Kaynak H. The relationship between total quality management practices and their effects on firm performance, Journal of operations management. 2003; 21(4):405–435.
4. Brennan L, Vecchi A. Quality Management: A cross-cultural perspective based on the GLOBE framework, International Journal of operations and production management. 2011; 31(5):527-553.
5. Bullock P, Rahman S. Soft TQM, hard TQM and

organizational performance relationships an empirical investigation, Omega. 2005; 33(10):73-83.
6. Keller KL, Kotler P. Manajemen Pemasaran, Jilid 1, Edisi ke 13, Jakarta: Erlangga, 2009.
7. Molina J, Tari J, Castejon J. The relationship between quality management practices and their effects on quality outcomes, European journal of operational research. 2007; 183(2):483-501.
8. Hong S, Prajogo DI. The effect of TQM on performance in R & D environments: a perspective from South Korean firms Tec novation. 2008; 28(8):855-863.
9. Davis SB, Goetsch DL. Quality Management for Organizational Excellence. New Jersey: Pearson, 2010.
10. Al-abedallat AZ, Jaafreh AB. The effect of quality management practices on 2013.
11. Organizational performance in Jordan. An empirical study, International journal of financial research, 4:1.
12. Lee SM, Rho BH, Lee SG. Impact of Malcolm Baldrige National Quality Award criteria on organizational quality performance, Int. J production research. 2003; 41(9):2003-2020.
13. Bichanga WO, Karani SR. effects of total quality management implementation on business performance in service institutions: A case of Kenya wildlife services, International journal of research studies in management. 2012; 1(1):59-76.
14. Samson D, Terziovski M. The relationship between total quality management practices and operational performance, Journal of operations management. 1999; 17(4):393-409.
15. Lindsay W, Evans J. The Management and Control of Quality Cincinnati OH: South-Western College Publishing, 1999.
16. Flynn B, Schroeder R, Sakakibara S. The impact of quality management practices on performance and competitive advantage decision sciences. 1995; 26(5):659-691.
17. Hoyle D. ISO 9000 Quality systems handbook, Oxford: Butterworth–Heinemann, 1998.
18. Collier D, Shin H, Wilson D. Supply management orientation and supplier/buyer performance, Journal of operations management. 2000; 18(3):317–333
19. Zakuan N, Muniandy S, Saman NZ, Mdarif MS. Critical success factors of total quality management implementation in higher education institution: a review, International journal of academic research in business and social sciences. 2012; 2:12.
20. Sitkin S, Sutcliffe K, Schroeder R. Distinguishing control from learning in total quality management: a contingency perspective, Academy of management review. 1994; 19(3):537-564.
21. Deming W. Quality, productivity, and competitive position Cambridge: MIT center for advanced engineering study, 1982.
22. ISO 9001. International standard, quality management systems requirements, international standards organization, 2008.
23. Ramesh Prasad Tharu. Multiple regression model fitted for job satisfaction of employees working in saving and cooperative organization. Int J Stat Appl Math 2019;4(4):43-49.