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THE IMPACT OF ADOPTION OF TQM PRACTICES ON FIRMS' EFFICIENCY AND EFFECTIVENESS: AN ANALYTICAL STUDY OF SAUDI POULTRY PROCESSING PLANTS

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ABSTRACT

This study expressed the impacts of adoption of TQM practices on efficiency and effectiveness of poultry processing plants in Saudi Arabia – Central Region. It also examined the mediating effect of efficiency on TQM and effectiveness linkage. Seven determinants of TQM practices and their impacts were measured against both of efficiency and effectiveness. The determinants included top management commitment, customer focus, rewards & training, continual improvement, cooperation & teamwork, prevention focus and measurement system.

Data was collected by using Questionnaire tool. The Questionnaire is of closed ended questions. It consists of three parts, the first part is the demographic information about the study sample, the second part about implementation of the total quality management and the third part is to measure efficiency and effectiveness. A sample of three poultry processing plants that effectively implemented total quality management were purposively chosen out of eight plants in Saudi Arabia Central Region. The study respondents are purposively chosen which consist of quality team, production supervisors, and Total quality management and production managers. 73 respondents out 75 participated in the survey. The finding indicated that the TQM practices have positive impact on poultry processing plants' efficiency and effectiveness with a partial mediating effect of efficiency on TQM and effectiveness linkage.

KEYWORDS *TQM,* Efficiency, Effectiveness, Poultry Processing Plant (PPP).

I INTRODUCTION

Total quality management (TQM) is one of the most popular and durable modern managerial concept that centered on quality, based on participation of all organizational levels and aiming at long termed success through customer satisfaction and benefit to internal stakeholders.[1]. Suhanshu Bala Singh and R. S. Dhala [2] stated that "Total Quality management acts as Umbrella under which every one in the organization strives for customer satisfaction, reduce cost and wastage and increase the efficiency of services. The concept of quality evolves over time since 1980s when TQM firstly defined by Deming [3], Crospy, [4], Juran [5] from inspection to quality control and total quality management. There are many practices adopted by TQM that constitute effective TQM models such as top management commitment, customer focus, strategic planning, continual improvement, factual approach to decision making, preventive focus etc. Many researchers and practitioners advocated the positive effect of these practices on organizational effectiveness and efficiency [6, 7]. The main objective of this study is to explore the impact o adoption of TQM practices on the efficiency and effectiveness of poultry processing plants in Saudi Arabia a case study of PPP in the central region that effectively implemented TQM. Since the implementation of TQM as a cost added value new managerial concept, no doubt, it creates a suspicious pole for any firm aims to implement this management paradigm. Thereby a clear distinction between the value added from TQM implementation and the corresponding cost value must be clearly clarified. The added value of implementation of TQM in the study was investigated through the impact of adoption of TQM practices on efficiency and effectiveness.

II LITERATURE REVIEW

The main objective of this research is to represent the impact of implementation of TQM practices on poultry processing plants' efficiency and effectiveness in Saudi Arabia a case study of PPP in central region. Efficiency was defined by business dictionary as [8] "a situation in which the organization maximizes benefits and profit while minimizing efforts and expenditure". Abulrahman Tawfique [9] defined efficiency of the firm is the extent of firm success in using available resources such as capital, equipments, raw material and manpower in comparison with the planned values of the same input. Accordingly efficiency can be formulated in the following equation:

$$\text{Efficiency} = \frac{\text{Used Resources}}{\text{Planned Resources}} \times 100$$

Effectiveness actually depends on firm objectives and its results, therefore it can be defined as follow: "Effectiveness is the ratio of the actual output to the expected one as per below formula [9]

$$\textbf{Effectiveness} = \frac{\textbf{the Actual outputs}}{\textbf{The value or Quantity Expected}} \textbf{X 100}$$

From above mentioned formula it is clear that the effectiveness mainly focuses on output of production processes, thus it measures the extent of achieving the provided goals. Hale Kaynak [6] studied the organizational effectiveness in operating USA firms that implemented TQM practices and argued that TQM practices have a positive impact on organizational effectiveness. Mahour Mellat Parast [10] stated that product quality effectiveness internally can be measured in term of defect rate, rework cost, and scrape cost. Daniel I. Prajogo et al [11] have measured product quality effectiveness in term of level of reliability it offers and fitness of use and conformance with expectations. In contrast of the two determinants with productivity, Saurabh S. Deshpande & Stephanic C. Payne [12] defined productivity as a combination of efficiency (quantity of resources used) and effectiveness (achievement of goals), on the other hand effectiveness can be defined as evaluation of the result of the performance [13]. Traditionally efficiency has been defined as "skillfulness in avoiding wasted time and efforts [14]. Formulating the above stated definitions for efficiency and effectiveness, they can be also thought of as "doing things right" and "doing the right things" respectively. In review for the previous researches regarding efficiency and effectiveness, it was found that there is scarcity of researches for the foresaid determinants locally and internationally. Thereby since productivity is a combination of efficiency and effectiveness, researches in productivity and the impacts of TQM practices can be utilized the current study to reflect the impacts of TQM on both determinants. Many academics and practitioners advocate the positive effects of TQM practices on productivity improvement [15, 16, and 17]. Firms with effective TQM implementation can accomplish the internal benefits such as improving quality, enhancing productivity, or realizing better operating income [18, 19]. Arawati Agus et al [20] in their empirical study explored the impact of TQM on productivity and profitability. Their study investigated the following TQM practices as independent variables:-

Top management commitment, customer focus, supplier relationship, training, Employee focus, benchmarking, quality measurement, process improvement and zero defects. They concluded that there were positive effects of all TQM practices on productivity and profitability. The independent variables used in the present study are TQM practices that considered having strong correlation with efficiency and effectiveness measurements. Top management commitment is the main compass that orientates the implementation of TQM towards creating, values, systems and goals to satisfy customer expectation and improve organization effectiveness, efficiency, performance and productivity [21]. The customer focus provides awareness to the business to be updated to any environmental change in the field and undergoes the required change needed for product quality and innovative action. Quality oriented training is the most important practices to accustom employees (internal customers) to quality concept, methods and skills. Likewise the other practices of TQM (measurement system, continual improvement, cooperation and teamwork and prevention focus) are of the same importance and dully advocated by both practitioners and researchers.

III HYPOTHESES DEVELOPMENT

Total quality management is a new managerial philosophy that becomes an urgent need for any organization to outperform over competitors. Since total quality management is a cost factor overall organizational levels, there should a clear explanation of the TQM implementation value added comparatively with quality cost. Efficiency and effectiveness as business excellence determinants has to be measured against degree of implementation of TQM to clarify the importance of TQM implementation and its positive effects on both determinants. Thereby the key question of this study is:

Is the implementation of TQM has a positive effects on poultry processing plants' efficiency and effectiveness?

The above stated question can be considered as a major question of the study but there are some factors may positively affect the organizational efficiency and effectiveness which can be postulated in the following three hypnoses:

H1: TQM practices have a positive effect on plant's efficiency

H2: TQM practices have a positive effect on plant's effectiveness

H3. Efficiency has a mediating effect on TQM and effectiveness linkage.

IV RESEARCH FRAMEWORK & METHODOLOGY

The present study used qualitative statistical method to answer the questions of the study. The study questions mainly depend on the degree of implementation of TQM and the corresponding efficiency and effectiveness measurements. There are four steps used in the methodology:

1. Using appropriate constructs to measure degree of implementation of TQM and the corresponding effectiveness and efficiency.
2. Research population and sample
3. Data collection methods
4. Data presentation and analysis.

1. TQM Measurement

The effective implementation of total quality management was gauged through inspection of TQM practices which used in many previous studies. Suairy, Haifa [22] in her study to the extent of harmonization of employees' values against Quality principles used commitment of top management, customer focus, rewards and training, cooperation and teamwork, measurement system, continual improvement, focus on prevention rather than inspection. Micaela Martínez-Costa and Angel R. Martínez-Lorente, [23] in their study they used Leadership, rewards system, process control, feedback, process management, performance, teamwork and customers orientation as variables for measuring degree of TQM implementation. Many previous researches stated different construct and parameter according to the nature of the study. This study used practices that assume to have positive impacts on efficiency and effectiveness parameter variables. Thereby this study used the followings: top management commitment (MC), rewards & training (RWD&TR), customer focus (CF), cooperation and teamwork (CTWK), measurement system and analysis (MSYS), prevention focus (PrevF) and continual improvement (CIMV).

1-1 Efficiency and Effectiveness

As stated in literature reviews regarding efficiency and effectiveness, they were measured from the feedback of study sample respondents. The feedback was collected by means of questionnaire. The questionnaire question focused on factor that positively or negatively affecting each determinant (efficiency and effectiveness). E.g. factors affecting efficiency such as speed of work, deterioration of raw material, knowledge of different methods to get the job done, access to different tools for doing the job etc. for factors affecting effectiveness that considered in the study questions to measure effectiveness such goal clarity and task priority.

1.2- Research Population and Sample

Three out of eight poultry processing plants that effectively implement total quality management were purposively used to represent the whole community. The sample survey respondents were purposively selected from each plant which encompassed staffs that are aware of TQM requirements and its implementation. The sample consisted of 75 respondents included quality team, production supervisors, quality and production managers and Management representative (MR) in quality council.

1.3- Data Collection Method

Data was collected by using self designed structured questionnaire tool. The questionnaire consisted of three parts. The first part was about the demographic profile of the respondents. The second part was design to measure the degree of implementation of TQM. The third part of the questionnaire was designed to measure the corresponding efficiency and effectiveness.

1.4-Data Presentation and Analysis

SPSS was used to analyze the collected data. Data analysis was undergone in four stages. In the first stage reliability of data was checked using Cronbach's Alpha which measure internal consistency or gage correlation of items in the survey instrument. In the second stage Pearson correlation was applied to assess the strength of the relationship between dependent and independent variables. In the third stage multiple regression analysis was applied to check association of variables with each other and the extent of variance which determines the coefficient of determination independent variables. Finally the mediating effect of efficiency on relationship between effectiveness and TQM practices was calculated.

V- RESEARCH FINDINGS AND DISCUSSION

V-1-Reliability of Data:

The construct was tested by using SPSS. The reliability was tested by using Cronbach's Alpha. Table1 illustrates test results:

Table-1 Reliability Test

SN.	Variables	No. of Items	Reliability coefficient
1.	Top management commitment	4	0.900
2.	Customer Focus	4	0.914
3.	Continual Improvement	6	0.905
4.	Cooperation & Teamwork	6	0.904
5.	Prevention Focus	8	0.897
6.	Measurement System	5	0.914
7.	Rewards & Training	5	0.916
8.	Efficiency	12	0.925
9.	Effectiveness	3	0.913

In review the Alpha coefficients values for constructs variables, it was found that most of the coefficients of independent variables lay in the range between 0.897 and 0.925 which means the constructs were strong and reliable to measure the degree of implementation of quality practices in addition to efficiency and effectiveness.

V.2 RESEARCH SAMPLE DEMOGRAPHIC ANALYSIS

In demographic analysis of the sample, it was found that 91.6% of respondents are less than 40 years and more than 75% percent having qualification of bachelor and above. 45.8% of staff having professional experience more that 5 years where as about 37.5 % having experience varies between 5 and 2 years. This indicates that the study sample is well educated with a good experience in quality management which creates rational answers of questionnaire. Despite that there is a weakness in quality oriented training programs where there were 43.5 % of the respondents have never attended any training program and those attended fundamental courses in TQM course were about 37% and those attended professional course are only 16.7% and the remains are missed answer.

Table-2 Respondents Profile

Variables	Freq.	%	Variables	Freq	%
Nationality			**Specialization Field**		
1- Saudi	42	58.3	Veterinary	9	12.5
2- Non-Saudi	30	41.7	Animal Production	30	41.7
Missed answer	0	0	Food Technology	15	20.8
Total	72	100	Science	12	16.7
Age			Other	6	8.3
Less than 2oyrs	0	0	Missed answers	0	0
20 -30 yrs	33	45.8	Total	72	100
31-40 yrs	33	45.8	**Training in Quality Field**		
Over 40yrs	6	8.4	None	30	43.5
Missed answer	0	0	Fundamental courses	27	37.5
Total	72	100	Professional courses	12	16.7
Academic Qualification			Missed answers	3	4.2
Primary – intermediate	0	0	Total	72	100
High school	0	0	**Experience**		
Diploma	15	20.8	Less Than 1 Yrs	3	4.2
Bachelor	51	70.8	1-2 yrs	18	25
High Studies	3	4.3	Above 2 Yrs.- 5yrs	9	12.5
Missed answer	3	4.3	Above 5 Yrs.	33	45.8
Total	72	100	Missed Answers	9	12.5
			Total	72	100

V.3 CORRELATION ANALYSIS

The correlation coefficient is utilized in assessing the relationship between the dependent variables and independent ones. This coefficient answered the three questions, the first one is there any relationship between the two foresaid variables, if so what the direction of this relationship (positive or negative impact etc.) and it also answer the magnitude of this correlation [24].

V3-1 CORRELATION BETWEEN TQM PRACTICES AND EFFICIENCY

The values of correlations between dependent variable efficiency and independent variables TQM practices were found that there is a positive correlation between efficiency and TQM practices in the construct as illustrated in Tab.3

Table-3 Correlation between TQM practices and efficiency

	Efficiency	MC	CF	CTWK	MSYS	CIMV	RWD&TR	PrevF
Efficiency	1							
MC	0.317**	1						
CF	0.488**	0.706**	1					
CTWK	0.402**	0.744**	0.785**	1				
MSYS	0.504**	0.758**	0.755**	0.751**	1			
CIMV	0.271*	0.736**	0.417**	0.617**	0.332**	1		
RWD&TR	0.263*	0.690**	0.311**	0.569**	0.376**	0.860**	1	
PrevF	0.538**	0.802**	0.824**	0.893**	0.670**	0.737**	0.699**	1

*correlation is significant at 0.05 level (2-tailed)
** Correlation is significant at 0.01 level (2-tailed)

Value of correlation of dependent variable efficiency with management commitment (MC) is 0.317, 0.488 with customer focus (CF) and the same manner with cooperation and teamwork, measurement system and prevention focus (PrevF) all of them shows positive correlation which are statistically significant at 0.01 level. Continual improvement and rewards and training show positive correlations but they are little weak comparatively with the foresaid variables and statistically significant at 0.05 level. High correlations were found between efficiency and measurement system and preventive focus 0.504, 0.538 respectively. As generally we deduced that there is correlation statistically significance between efficiency and the proposed TQM practices. This result validates the first hypothesis of the study (H1).

V3-2 Correlation between effectiveness and TQM practices

The values of correlations between dependent variable effectiveness and independent variables TQM practices were found that there were positive correlations between efficiency and TQM practices in the construct as illustrated in Table.4

Table-4 Correlation between TQM practices and effectiveness

	Effectiveness	MC	CF	CTWK	MSYS	CIMV	RWD&TR	PrevF
Effectiveness	1							
MC	0.611**	1						
CF	0.437**	0.706**	1					
CTWK	0.512**	0.744**	0.785**	1				
MSYS	0.426**	0.758**	0.755**	0.651**	1			
CIMV	0.746**	0.708**	0417**	0.617**	0.332**	1		
RWD&TR	0.630**	0.690**	0.311**	0.569**	0.376**	0.860**	1	
PrevF	0.627**	0.802**	0.824**	0.893**	0.0.670**	0.736**	0.699**	1

** Correlation is significant at 0.01 level (2-tailed)

Value of correlations of dependent variable effectiveness with management commitment (MC) is 0.611 , 0.437 with customer focus (CF) 0.512 with cooperation and teamwork, 0.426 with measurement system, 0.747 with continual improvement, 0.630 with rewards and training and 0.627 with preventive focus. All correlations between effectiveness and TQM practices are statistically significance at 0.01 levels and have positive impact on dependent variable (effectiveness). In contrast of correlation indexes of both efficiency and effectiveness it is clear that correlation of the last dependent are stronger compared with those of the first dependent. High correlations were found between effectiveness and continual improvement of o.747. In review of the above mentioned results as dully illustrated in table 4 we find that there is a positive relationship which is statistically significance between effectiveness and all TQM practices. This result validates the acceptance of the second hypothesis of the study (H2).

V.4 MULTIPLE REGRESSION ANALYSIS

Multiple regression analysis is a technique that used to explore the nature of a relationship between two groups of continuous random variables. Regression model is used to quantify the relationship between the two groups. Multiple regression equation method involves a linear combination of explanatory variables (independent) [25]. The present study consists of seven independent variables which encompass top management commitment, Customer focus, measurement system and analysis, cooperation and teamwork, continual improvement, prevention focus and Reward & training. Accordingly two multiple regression equations were developed to measure the relationships between TQM practices and the two dependent variables (efficiency and effectiveness as follows:

FIRSTLY: EFFICIENCY

$$\textbf{Efficiency} = \beta_0 + \beta_1 \textbf{MC} + \beta_2 \textbf{CF} + \beta_3 \textbf{MS} + \beta_4 \textbf{CTWK} + \beta_5 \textbf{CIMV} + \beta_6 \textbf{PrevF} + \beta_7 \textbf{RWD\&TR} + \varepsilon$$

Whereas:
Efficiency = Mean efficiency
β_0= constant of proportionality
T-MC= management commitment
CF= Customer Focus
ε = error
MS= Measurement System and analysis
CTWK= Cooperation & Teamwork
CIMV= Continuous Improvement
PrevF= Prevention Focus
RWD&TR= reward and training

The regression equation can be stated as follow as per details in table. 6

$$\textbf{Efficiency} = 1.633 + .0.370\textbf{MC} + 0.178\,\textbf{CF} + 0.510\textbf{MS} + 0.210\textbf{CTWK} + 0.115\textbf{CIMV} + 0.674\textbf{PrevF} + 0.0361\textbf{RW\&DTR} + \varepsilon$$

In the model summary Tab.5 shows the result on entering of seven independent variables against efficiency. R (0.732) is a correlation of the seven dependent variables with efficiency. Taking in consideration the interaction and correlation between the dependents variables, the regression models shows R^2 as (0.536) which indicated that 54% of variation in efficiency value of the studied sample can be explained by the seven dependents variables. This value of R^2 substantiates the model and the hypotheses of the study H1.

Table-5 Model Summary

Model	R	R-Squared	Adjusted R Squared	Std. Error of the Estimate
1	0.732[a]	0.536	0.485	0.28997

Reference to the first developed hypotheses regarding the independent variables which advocate the positive relationship with plant's efficiency, tab. 6 shows the values of β-coefficients of these predictor variables.

Table-6 Coefficients [a]

Model	Un-standardized Coefficients		Standardized Coefficients		
	B	Std. Error	B	T	Sig.
1 constant	1.633	0.397		4.111	0.00
MC	-0.370	0.103	-0.735	-3.605	0.001
CF	-0.178	0.192	-0.219	-0.925	0.358
CTWK	-0.210	0.095	-0.443	-2.72	0.026
MSYS	0510	0.110	0.775	4.647	0.00
CIMV	0.115	0.110	0.210	1.046	0.30
RWD&TR	-0.073	0.080	-0.198	-0.919	0.361
PrevF	0.674	0.185	1.197	3.645	0.01

The values of β-Coefficients of Top management (MC), cooperation and teamwork (CTWK), measurement system (MSYS) and prevention Focus (PrevF) are statistically significant and dully substantiate our hypotheses regarding these four variables. Where Rewards and training β-Coefficients is not statistically significant and of less contributions in the in the regression equation that measured the efficiency. The customer focus β-Coefficient is of considerable value in the regression equation and its statistical significance can be estimated in a considerable range.

SECONDLY: EFFECTIVENESS:

Similar to data analysis as stated in efficiency data, the regression equation can be stated as follow as per details in table. 8

$$\textbf{Effectiveness} = 1.036 + .0.086\textbf{MC} + 0.034\textbf{CF} + 0.403\textbf{MS} + 0.174\textbf{CTWK} + 0.972\textbf{CIMV} + 0.202\textbf{PrevF} + 0.108\textbf{RWD\&TR} + \varepsilon$$

In the model summary Tab.7 shows the result on entering of seven independent variables against effectiveness. R (0.776) is a correlation of the seven dependent variables with efficiency. Taking in consideration the interaction and correlation between the dependents variables, the regression models shows R^2 as (0.602) which indicated that 60% of variation in efficiency value of the studied sample can be explained by the seven dependents variables. This value of R^2 substantiates the model and the hypotheses of the study (H2).

Table-7 Model Summary

Model	R	R-Squared	Adjusted R Squared	Std. Error of the Estimate
1	0.776[a]	0.602	0.559	0.58567

Reference to the first developed hypotheses regarding the independent variables which advocate the positive relationship with plant's effectiveness, tab. 8 shows the values of β-coefficients of these predictor variables.

Table- 8 Coefficients [a]

Model	Un-standardized Coefficients		Standardized Coefficients		
	B	Std. Error	B	T	Sig.
Constant	-1.036	0.802		-1.292	0.201
MC	-0.086	0.208	-0.078	-.413	0.931
CF	-0.034	0.388	-0.019	-0.087	0.681
CTWK	-0.174	0.186	-0.168	0.933	0.354
MSYS	0.403	0.222	0.281	1.818	0.074
CIMV	0.972	0.221	0.816	4.390	0.00
RWD&TR	-0.108	0.161	-0.133	-0.668	0.506
PrevF	0.202	0.364	0.160	0.541	0.590

The value of β-Coefficient of continual improvement (CIMV) is statistically significant and high contribution in the regression equation which dully substantiates our hypotheses regarding this variable. Whereas top Management commitment (MC) and customer focus (CF) β-Coefficients are not statistically significant and of less contributions in the in the regression equation that measured the effectiveness. The cooperation and teamwork, measurement system, rewards and training, prevention focus β-Coefficients are of considerable values in the regression equation and its statistical significance can be estimated in a considerable range.

V-5 THE MEDIATING EFFECT OF EFFICIENCY ON THE RELATIONSHIP OF TQM AND EFFECTIVENESS

It was found that there are significant relationships between TQM practices and efficiency as well as TQM practices and effectiveness. In this part the question is directed at examining whether efficiency mediates the relationships between TQM and effectiveness. In testing the mediating effects, TQM scales were substituted by a single variable obtained from the mean of these scores.

Regression analyses were conducted separately to test the mediating effect of efficiency on TQM and effectiveness linkage (Tab 9). Model 1 shows the relationship between QM and effectiveness without inclusion of efficiency (Mediator). Model 2 exhibits the relationship between TQM and the mediator (efficiency). Model 3 is the mediating regression that shows the relationship between TQM and effectiveness with inclusion of the mediating variable (efficiency).

Table- 9 Mediating Effect

Independent Variable	Mediating Variable	Beta Coefficients		
		Model 1	Model 2	Model 3
Mean TQM	Efficiency	0.235*	0.399**	0.217*

For mediating effect to exit, the value of beta coefficient of independent variable with inclusion of mediator should be less that of with dependent variable without inclusion of mediator [21]. Since Beta Coefficient of TQM in model 3

(0.217) is less than the value of that in model 1 (0.235) we can argue that the efficiency of firm mediates the relationship of TQM with effectiveness. This finding substantiates the study hypothesis regarding the mediating effect of efficiency to TQM relationship with effectiveness (H3). Referring to beta coefficient significance of model 3, it was found that the value is significant at 0.05. level This significance value indicated that efficiency partially mediates the relationship of TQM with firm's effectiveness.

VI - CONCLUSION

In review to the above cited analyses, it is clear that this study is a correlation and causal study. The correlation study findings presented a positive correlation between all dependant variables (TQM practices) with plants' efficiency and effectiveness. Regarding causal study, it was undergone using multiple regression analysis. The findings of multiple regression analysis of efficiency equation indicates that some independent variables such as prevention focus (PrevF), Management commitment (MC) and measurement system and analysis and cooperation and teamwork are considered as major and critical determinants of efficiency parameter. For the remaining independents variables it was found that customer focus (CF) and continual improvement (CIMV) are of the required significance to be considered as critical factors. These findings validate the previous studies that reviewed in the present study. In reference to effectiveness regression equation the findings indicates that continual improvement (CIMV) is considered as major and critical determinant in effectiveness equation where as cooperation and teamwork (CTWK), measurement system, reward and training and prevention focus (PrevF) although it is statistically not significant but they have high values of contribution in effectiveness regression equation and their significances to some extent are considerable. Regarding the mediating role of efficiency for the TQM and effectiveness, the present study indicated a partial mediation for the stated linkage. This study can be utilized by firms that target to maximize their efficiency and effectiveness by using and activating the critical factors in both parameters.

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