Calculating Internal Consistency between Efficiency and Optimum- Implementing Quality Circle Way

[1]Kriti Agrawal, Ph.D. Scholar, Department of Business Studies, Central University of Karnataka, Kalaburagi, India, kagrwl86@gmail.com.

[2]Prof.M.V.Alagawadi, Supervisor and Head of the Department, Department of Business Studies, Central University of Karnataka, Kalaburagi, India, mvalagawadi@cuk.ac.in.

ABSTRACT - "Purpose": The aim of this paper is to check internal consistency between two variables of operational efficiency and optimum resource utilization and find out whether there exists any correlation between the two.

"Methodology": A survey method was used by taking responses of 56 employees from top, middle and lower level management. The variables used to measure efficiency among employees were operational efficiency and optimum resource utilization. Conclusion was drawn keeping in mind the common features between efficiency and optimum with respect to their internal consistency.

"Findings": From the descriptive analysis related with "Cronbach Alpha" and Co-variance analysis, it was found out that two selected variables are having respectable amount of internal consistency between them, as the "Cronbach Alpha" value was more than 0.70. Correlation between items was also above 0.50, which can be considered strong. The values derived fulfil the expectation with which this survey was carried out.

"Research Limitations": The attributes selected should have been well defined and categorised further.

Practical Implications: This is a study done on opinions of all three levels of management i.e. top, middle and lower. This can come in handy for the organizations, which are looking forward to applying quality circles program in their workplace.

"Originality/value": This paper is a survey of the attributes of employee efficiency after participating in quality circles program. It fills the research gap of previous literature devoted on quality circles' impact, which have not done any study on attributes of efficiency.

"Existing Issue": The existing issue discussed herewith is related to whether there is congruence between the two variables or not.

"Expected Outcome": The parameter analysed in this research is that of employee efficiency which is expected to increase after employee participation in quality circles program. This was also anticipated by the researcher that there would be harmony between the two variables of operational efficiency and optimum resource utilization.

"Article type": Survey Paper

I. INTRODUCTION

Total Quality Management or commonly known as TQM practices have been said to be sponsored by the discipline of engineering. Quality control of products manufactured is carried out with the statistical tools applied, which were themselves developed by engineers. If TQM or Quality Circles phenomenon are to be discussed, then they are grounded on the principle of "less is more." Few employees in every department are instrumental in the meeting of quality circles. Those few constitute only 20% of whole department. They participate in quality circles meeting and can share their knowledge to solve the issue faced by department. Those ideas can yield 80% of the solutions for the problems faced by department. Here, the

underlying principle is of 80-20, which roughly believes in 80% of effects come from 20% of the causes. This is mostly used in "Cause and Effect Diagram", popular among corporate fraternity as "Ishikawa Diagram." An Italian Economist Vilfredo D. Pareto who in his times noted that 80% of wealth is owned by 20% of population, hence giving rise to capitalist society, developed this. Known by many names like "Pareto Principle", "the law of the vital few" or "the principle of factor sparsity" [1], this principle works in almost life's every sphere. Hence, this is omnipresent. Besides used in the sphere of 20% clients give 80% of sales and 20 % of music generate 80% of the revenue, it can transcend the borders through normal life. For example: 20% of everyone's cooperation can complete 80% of domestic work.

Besides hinging on the principle of 80/20, this also relies on RBV or resource-based view of the firm. RBV or better known as Resource-Based View of the firm is based on pooling all the strategic assets of a firm in order to attain a competitive edge over rival companies and the best motivator for spread of this view was a very crucial work of 1991 titled, " Firm- resources and Sustained Competitive Advantage" written by Barney. According to this theory, heterogeneity of a firm is its advantage because the processes and mix of all capabilities and competencies are different. Firms can never be homogenous if they have to sustain in the long run.

From the above discussion, this can be stated that quality circle fundamentals hinge upon 80/20 principle and Resource-Based View of the firm. Not only that, besides these two principles quality circles also relies on statistical process control, histogram, on Six sigma which forms the roots for TQM too and which believes in 99.999966% quality and with which the quality of manufactured products are compared [2]. In the study that ensues, two variables symbolizing efficiency have been identified which are:

1. Operational Efficiency, and
2. Optimum Resource Utilization.

II.   LITERATURE SURVEY

Before going into the review of literature, it is necessary to understand both the terms and relation between the two. First is **operational efficiency,** which has combination of operation**,** and efficiency. The first can be described as certain activity being performed to achieve a target and the latter in business lingo can be described as the ratio between the output got after investing a particular amount of input. The reasons for increase in operational efficiency can be traced to increasing competition with rivals to manufacture quality product which is less cost-demanding and catering more and more to the needs of customers. Next is optimum resource utilization, which refers to determine an optimal level of supply, which can give desired

satisfaction. Optimal refers to best or favourable, whereas optimum refers to a best combination to arrive at most conducive or favourable outcome.

Phan, Abdallah & Matsui (2011), in their study have given a very vivid description of Japanese quality management practices with special reference to TQM. They have tabled the major contributions of previous research scholars on the importance of TQM and other such quality management practices. Other quality management principles, which found a mention in their study are customer-satisfaction, operating performance which in some studies includes employee morale, customer satisfaction, product quality, improved productivity, service delivery and getting a competitive edge over rival companies. Other efficient techniques studied are financial performance of companies, their market performance, their cost-cutting and their speed of launching product. The results derived from this study were in favour of an enduring quality management system in Japanese companies, which is already prevailing across the companies from half century now. There is a need still to do an in-depth analysis of these practices with special emphasis given to "leadership commitment", "process management", "communication management", and "information-sharing." [3]

Seetharaman, Sreenivasan & Boon (2006), have conducted a secondary research of the factors that affect TQM practices. Though there are several factors that enable its smooth functioning, certain hinder it. TQM implementation requires not only physical amendments to be made in organization, but also psychological i.e. change in attitudes of employees, a penchant for learning new TQM methods, educating of staff related with TQM by top-level management, defining objectives which are SMART ("Specific, Measurable, Agreeable, Realistic, Time-Specified"). Lastly, they have also made a very brief mention of quality circles, which can act as a tool for proper implementation of TQM. [4]

Gunasekaran, Korukonda, Virtanen & Olli (1994), have conducted a study on productivity, how all functions of the organization can be integrated in order to streamline the process and derive quality product. Productivity and efficiency of employees are related with each other. The degree of efficiency is measured by the ratio of input to output i.e., inputs invested and output derived. Quality circles have found a special mention in their study as the current manufacturing practices that are in trend. They have mentioned quality circles in the scenario or "environment" of production and quality control. The traditional practise discussed was quite opposed to what now companies are using. Earlier, there was a separate department existing for quality control of every department. Inspection used to be a discrete operation and there was permission for scrap generation, which was reworked. Now the whole quality

system is integrated, made transparent and zero tolerance for defects prevails. In human resources department too, employees are educated about the techniques of JIT (Just-in-Time), Cross- training cooperation, quality circles, a drive to make the organizational structure flat and instilling computer skills among the employees. Quality circles are also considered a strategic option for assuring the quality and gain a competitive edge over rivals.[5]

Wood, Hull & Azumi (1983), have underlined that QCs are trained to achieve a cost-benefit analysis of the function they are performing. Emphasis during QC implementation is more on productivity, worker-morale, quality of the product, attendance of the worker and cost savings. All these effects are measurable to the extent they can predict about the organizations' success in the time to come. They can provide with an accurate picture. More and more emphasis is there on efficiency where quality circles are functional in order to minimize the cost, maximize the benefit and keep the worker morale intact. [6]

Vashishth, Chakraborty & Antony (2019), did a study on improving operational efficiency of financial institutions. As popular in the literature, Six-Sigma aims at refining the whole system, be it manufacturing or service industry. Journal articles belonging to finance sector and LSS (Lean and Six Sigma) implementation in it was taken for analysis. Procedure used was systematic in nature and all the articles belonging to implementation of LSS in service industry as financial services, banking and insurance were covered. It was reported that more such research needed to be undertaken which can open new vistas for complete putrefaction of these kind of industries which are offering services. In hospitals, they were most required as shown by the data and they were at their maximum in banking industry. In the financial services, the most common tools used for quality analysis are:

1. Value Stream Mapping
2. Pareto Analysis
3. Control Charts
4. Critical-To-Quality Analysis
5. Supplier-Input-Process-Output-Customer (SIPOC)
6. Process Flow Chart
7. Voice of the Customer [7]

These are the main techniques used in financial service institutions for quality mapping. Other researches done based on similar theme are:

Marks, Mirvis, Hackett and Grady Jr. (1986), focussed their study on impact of quality circles implementation on an organization. The variables tested were quality of working life, productivity and absenteeism behaviour of employees, which in the opinion of studied researchers get mostly affected during program implementation. Attitudinal variables identified are communication or participation, "job characteristics" and "growth needs." "Suggestions

offered", "participation in decision-making", "work-group communication" and "organization communication" are all classified under communication or participation. "Meaning", "challenge" and "personal responsibility" are all classified under "job characteristics." "Accomplishment" and "advancement" are kept under growth needs. All the sub-categories form the part of quality of work life. Regression analysis was done with participants and non-participants of quality circles program regarding above-mentioned variables. For participants, quality of work life features for communication did not show any noticeable change, whereas for non-participants, they almost remained same. Instead, they dropped significantly for participants though productivity showed remarkable improvement and absenteeism rates dropped consistently. [8]

Study conducted by **Ricky W. Griffin (1988)** can be considered as a complete work highlighting the each aspect of quality circles and the benefits an organization derives from it. This was an experimental study done in 1988 on 496 employees which were compared to 427 employees taken in the plant not implementing quality circles program. The aspects covered under this study are levels of "job satisfaction", "organizational commitment", "higher level of performance", "fewer intentions to quit on the part of employees", "contribution of employees to organizational effectiveness", "measurable financial returns to organization."Minnesota Satisfaction Questionnaire was used for the study, the scale was developed earlier in 1967. This scale was mostly used to measure job satisfaction among employees, what they like and dislike in their jobs, or what are they expecting or not expecting from their job. The results derived came out to be in favour of quality circles participation as the organization did witness an improvement in working level of its employees and their "reduced intentions to quit". [9]

Banker, Field, Schroeder & Sinha (1996), in their study measured the impact of quality circles and somewhere they have also used the term work teams for this program. The study has used various alike groups, the characteristics of which are somewhat similar to quality circles group. They are semi-autonomous work groups, self-designing teams, self-managing teams. All these were high performing work teams which had to work on 10 modules which were for example: mutual goals, interdependent working relations, team process reviewing, understanding self and others, vision of a competitive factory with future, values related to goals and so on and so forth. One member among HPWTs was permitted to allow the meetings so as to facilitate the communication in his team. It was learnt in these meetings that the teams were functioning effectively and manufacturing performance improved by leaps and bounds. [10]

III.   METHODOLOGY APPLIED

REVIEW OF LITERATURE FORMED THE BASIS:

On the basis of review of literature done above, it can be said that where there is operational efficiency, there is optimum resource utilization and vice-versa. The first term is more consistent with a manufacturing industry, though in contemporary scenario, this can also be used is services industry

CRONBACH ALPHA AS A MEASURE OF CONSISTENCY:

Items which are related together in a powerful way will produce high coefficient value and the items which are

independent of each other will produce a low efficient value. A very high coefficient value can create a uni-dimensionality and a very low coefficient value already indicates that variables are pole apart from each other.

As mentioned earlier, this study has taken operational efficiency and optimum resource utilization as the two variables to measure efficiency of employees, a "Cronbach's Alpha" was conducted to arrive at a conclusion that both variables are made for each other, which is true to the objective of this paper of finding internal consistency measure.

TABLE 1: CASE-SUMMARY

Summary of Cases Processed		Reliability-Statistics		Item-Statistics			
Number of Cases	Valid %	Cronbach's Alpha	Cronbach's Alpha based on Standard Items	No. Of Items	Mean	S.D.	N
56	100%	.757	.758	2	(O.E.) 3.9107	.92002	56
Excluded- 0	.0				(O.R.U.) 3.8571	.98033	56
Total-56	100%						

"Cronbach Alpha" value is 0.75 which is more than 0.70 (0.70 < 0.75), the lower level of "acceptable" level of internal consistency measure. This suggests that there is acceptable internal consistency between both attributes of "operational efficiency" and "optimum resource utilization."Mean value for operational efficiency is 3.9107, which is close to "4" which in a Likert scale converts to response category of "agree" which is denoted by "4."

Similarly, mean value for optimum resource utilization is 3.8571, which indicates that the responses are close to response category of "agree" denoted by "four."

TABLE 2: CORRELATION/ COVARIANCE MATRIX

	Inter-Item Correlation Matrix			Inter-Item Covariance Matrix		
	Operational efficiency	Optimum utilization	resource	Operational efficiency	Optimum utilization	resource
Operational Efficiency	1.000	.611		.846	.551	
Optimum Resource Utilization	.611	1.000		.551	.961	

Correlation value for both items is .611, which can be written as 0.6. Correlation coefficient of 0.6 tells that there is a strong degree of association between two selected items and that they complement each other. This large coefficient value can further substantiate the above-mentioned studies, for example: 1983 study of Wood, Hull and Azumi, which says that, quality circles taught their employees the much required knowledge of cost-saving and boosted their morale. Similarly, a study done by Phan, Abdallah and Matsui in 2011 can further substantiate results of the current study, though in a broad way (more focused on TQM) that all quality management practices including quality circles revolve around cost-cutting, speedy delivery, better market performance, many steps ahead productivity.

TABLE 3: ITEM-TOTAL STATISTICS

Item-Total Statistics				
	Scale Mean If Item Deleted	Scale Variance If Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha If Item Deleted
Operational Efficiency	3.8571	.961	.611	.373	
Optimum Resource Utilization	3.9107	.846	.611	.373	

This value is a correlation between score assigned to a question/ statement and overall assessment score. Corrected Item-total correlation is 0.611, which is more than the threshold value of 0.50. This can be said that there is not very high correlation between the variables and not very low. It falls under the category of **acceptable**. There exists an acceptable degree of association between operational efficiency and optimum resource utilization.

TABLE 4: SCALE STATISTICS

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
7.769	2.909	1.70551	2

IV.   FINDINGS

As discussed above, the mean for "scale of statistics" is 7.769, which is close to eight (sum total of both scale means if the item is deleted). The results gained from this study give the organizations a lesson as to how TQM practices in general and quality circles in particular are highly recommended for contemporary business units for better performance in future. The results gained from this study suggest that TQM practices can well be adopted in organizations and the theoretical aspect of engineering has found practicality with management. Further, this study on 56 employees suggest that the two variables of operational efficiency and optimum resource utilization are hand in gloves with each other and one follows the other.

Also, a study done in the same vein by Seetharaman, Srinivasan and Boon in 2006 highlighted that TQM objectives are SMART meaning they should be to the purpose, they can me measured, they must be agreed by the team, they should not resemble as castles built in air and they should be achievable within a certain specified time i.e. unnecessary expenditure should be avoided. Lastly, they also made a brief mention about quality circles bearing such qualities. The findings after reviewing the literature derived buttress this fact that optimum resource utilization is the first step towards operational efficiency. Study done by Wood, Hull & Azumi in 1983 speaks volumes about the prior statement. The study conducted by Mirvis and

associates and Griffin also brings to light the same fact echoed previously.

V.   SUGGESTIONS AND CONCLUSION

In the end, this can safely be concluded that organizations can rely on the idea on implementing quality circles program or other principles of Total Quality Management. The above conducted study has proved that optimum resource utilization and operational efficiency are closely related, dependent on each other.

REFERENCES

[1] Gaikwad V.V. & Gaikwad A.V.(2009). "Relationship between Psychological Contract & Organizational Commitment in Indian IT Industry". *Indian Journal of Industrial Relations* , Vol. 47, No. 2.

[2] Barney J., Wright M. & Ketchen David Jr. (2001). "The resource-based view of the firm: Ten years after 1991". *Journal of Management*, Vol. 27, No. 6.

[3] Phan, A. C., Abdallah, A. B., & Matsui, Y. (2011). "Quality management practices and competitive performance: Empirical evidence from Japanese manufacturing companies" . *International Journal of Production Economics*, Vol.133, No.2.

[4] Seetharaman, A., Sreenivasan, J., & Boon, L. P. (2006). "Critical Success Factors of Total Quality Management". *Quality and quantity*, Vol.40, No. 5.

[5] Gunasekaran, A., Korukonda, A. R., Virtanen, I., & Yli-Olli, P. (1994). "Improving productivity and quality in manufacturing organizations" . *International Journal of Production Economics*, Vol. 36, No.2.

[6] Wood, R., Hull, F., & Azumi, K. (1983). "Evaluating quality circles: The American application". *California Management Review*, Vol. 26, No.1.

[7] Vashishth, A., Chakraborty, A., & Antony, J. (2019). "Lean Six Sigma in financial services industry: a systematic review and agenda for future research" . *Total Quality Management & Business Excellence*, Vol. 30 3-4.

[8] Marks, M. L., Mirvis, P. H., Hackett, E. J., & Grady, J. F. (1986). "Employee participation in a Quality Circle program: Impact on quality of work life, productivity, and absenteeism" . *Journal of Applied Psychology*, Vol 71, No. 1.

[9] Griffin, Ricky (1988). "Consequences of Quality Circles in an Industrial Setting: A Longitudinal Assessment". *The Academy of Management Journal*, Vol 31, No.2.

[10] Banker, Field, Schroeder & Sinha (1996). "Impact of Work Teams on Manufacturing Performance: A Longitudinal Field Study". *The Academy of Management Journal*, Vol 39, No.4.