

DETERMINANTS OF GLOBAL COMPETITIVENESS ON INDUSTRIAL PERFORMANCE

AN APPLICATION OF EXPLORATORY FACTOR ANALYSIS

T.B Pankhania¹, V.K.Modi²

¹ Associate Professor, ²Lecturer

¹Mechanical Engineering and Head Workshop, B.V.M. Engineering College, Sardar Patel University, Vallabh Vidyanagar, Anand, Gujarat, India, ²Mechanical Engineering, B&B Institute of Technology, Vallabh Vidyanagar, Gujarat, India, tbp@sify.com, modi_vinit@yahoo.com

Abstract

Target market criteria are very important concept to attract the customers and to enhance sales of products produced by the organizations. In the globalization era there is no cross boarder barrier for business and there is highly competitiveness to survive. Quality and prompt services are both equally important. The case study was carried out in the industrial estate in Anand district of Gujarat, India. Data was collected through a five point s Likert type summated rating scales of structured questionnaires from strongly disagree to strongly agree were adopted to identify underlying indicators. There are no compressive and empirical researches in the estate especially on the industrial performance and hence industrial productivity. Sophisticated statistical model as "Exploratory Factor Analysis" (EFA) has been used. The results show four factors extract from the analysis that together accounted 75.352 % of the total variance.

Key words: Competitiveness, Exploratory, Globalization, Organization, Questionnaire, Statistical.

1. INTRODUCTION

In today's highly competitive world retaining employees is the heart of the any organization. The trained employees are vital asset of the organization. At the same time job satisfaction which is covering various attributes play pivotal role in enhancing performance of individual as well as organization as a whole. This study examines indicators which determine the employers-employees relationships for the good health of the company. Findings of this study are useful for the industrial organizations to enhance and build high level of employees' satisfaction and loyalty toward the company. Higher performance leads to generate more revenue will prove one of the determinants of better industrial performance.

2. THE CASE

A case study was conducted at Vitthal Udyognagar, GIDC district, Anand. This research study through the industrial estate is expected to open up new vistas of opportunities in the wide areas of productivity improvement in industries of the estate, where 220 industries have been recorded in 1980 and it has reached to 611 industries have been registered with VUIA out of 1000 odd industries in 2010. Out of these, majorities units are in small scale sector. Many of these industries were sick and closed or about to close. Since 1965, this industrial area has developed by leaps and bounds and now it is one of

the largest engineering estates in Gujarat state, providing employment to nearly 25000 persons in the various industries.

3. RESEARCH METHODOLOGY

The units were selected from the members' directory published by Vitthal Udyognagar Industries Association (VUIA). 250 Questionnaires were distributed among respondents of the representative industries. The data were cleaned by identifying out-of-range and logically inconsistent. Finally, out of 250 questionnaires distributed, 156 found usable for analysis and have resulted in final sample size. The response rate was 62.40% and considered acceptable for the research study and analysis. The data was collected using five point Likert scale: highly dissatisfactory (1), dissatisfactory (2), Neutral (3), satisfactory (4) and highly satisfactory (5). These data were analyzed using statistical software for the various statistical analysis to draw an appropriate doctrine[9,10].

4. STATISTICAL ANALYSES

SPSS 17.0 software was used to carry out various statistical analyses to evaluate the various aspects which are influencing industrial performance and hence productivity. Frequency distribution was carried out to know the demographic details. In research survey, there may be a large number of variables,

most of which are correlated and which must be reduced to a manageable level. Relationships among sets of many interrelated variables are examined and represented in terms of a few underlying factors. Factor analysis allows us to look at groups of variables that tend to be correlated to each other and identify underlying dimension that explain the correlations. For these features, factor analysis was performed in this study. One of the most widely used interdependency techniques for data reduction is factor analysis [9, 10].

4.1 Demographic Characteristics

The respondents: The number of male respondents in the survey were 150(96.20%) and 6(3.80%) were female respondents. Most of the respondents those participated in the survey were graduates and have educational qualification above it. 5.10 % of the respondents were Ph.D., 22.40 percent of the respondents were post-graduates, 66.00% of respondents were graduates and the remaining 6.40 % were undergraduates.

Respondents' work experience: The highest work experience 39.70% between 10-20 years, 23.70% between 21-30 years, 23.10% less than 10 years, 12.20% of respondents were above 30 years of experience and only 1.30% respondents were of age group more than 40 years have participated in this study.

Category of the company: As mentioned earlier majority units are in small scale. The same thing is reflected over here. In this survey 70.51% (110) are in small scale, 19.23% (30) in medium scale and only 10.26% (16) large scale units have participated and provided relevant data for this research study.

Sector of the company: Out of 100% respondents (156 units sample size), 89.20% of units in private sector, 5.10% of public sector, only 0.60% government units, while 5.10% were others have participated and supplied data for the analysis.

Classification of the industry: Estate under study was dominated by 68.30 % (105) engineering units, the other classified units were very few in the dedicated sample: 3.80% electrical/electronics, 5.80% paints, varnishes and 3.20% chemicals industries. Remaining miscellaneous units amount 19.90% of the total, have participated in this research study and supplied the relevant data for this study.

ISO Certificate: The 25.00 % of respondent industries having ISO Certificates, 75.00% of industries were without ISO Certificates .have participated in this study.

Man Power: Out of 156 representative industries and total employee 12092, 97.59% male employees and only 2.41% female employees in the industries of the sample considered.

Markets: Markets scenario shows demands: Indigenous (19.90%), state level (29.50%), national level (23.70%) and international level (26.90%) were recorded of the representative organization of the sample considered. State level demand observed slightly more compared to national and international demands.

Technical collaboration: 82.70% of industries do not have any technical collaboration with third party either nationally or internationally, only 17.30 % industries do have technical collaboration and have responded to the questionnaire for this research study.

4.2 An Index of Reliability

It is very important to know whether the same set of items would bring out the same responses if the same questions are recast and re-administered to the same respondents. Variables derived from test instruments are declared to be reliable only when they provide stable and reliable responses over a repeated administration of the test. An effective tool for measuring reliability is Cronbach's alpha, which is a numerical coefficient of reliability. Alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted. The higher the score, the more reliable the generated scale. Alpha value = 0.7 to be an acceptable reliability [7].

Table -1: The Cronbach's Alpha (α) Value

S.No.	Cronbach's Alpha	Internal Reliability
1	≥ 0.90	Excellent
2	≥ 0.80	Good
3	≥ 0.70	Acceptable
4	≥ 0.60	Questionable
5	≥ 0.50	Poor
6	< 0.50	Unacceptable

Table -2: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.869	0.874	16

4.3 Kaiser-Meyer-Olkin (KMO) Test

Kaiser-Meyer-Olkin (KMO) Test assists to measure sample adequacy. The KMO statistic varies between 0 and 1. A value close to 1 indicates that patterns of correlation are relatively compact and so factor analysis should yield distinct and reliable factors. Kaiser (1974) recommends the accepting values of greater than 0.5. The references are shown in the table below [9].

The reliability test shows that Chronbach's alpha is 0.869 and the questionnaire is reliable Table1&2)

Table 3-: KMO Value and Interpretation

S.No.	KMO Value	Sample Adequacy
1	Greater than >0.9	Excellent
2	Between 0.8 and 0.9	Great
3	Between 0.7 and 0.8	Good
4	Between 0.5 and 0.7	Mediocre
5	Greater than equal to 0.5	Satisfactory
6	Less than 0.5	Improper

Table -4: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.855
Bartlett's Test of Sphericity	Approx. Chi-Square	1767.924
	Degree of freedom	120
	Significance	0.000

The KMO = 0.855 indicates great; factor analysis is appropriate for these data.

The Bartlett's test of sphericity (Bartlett, 1950) is the third statistical test applied in the study for verifying its appropriateness. This test should be significant i.e. having a significant value less than 0.05. The Chi-square value is 1767.924 is significant (Table 3&4).

4.4 The Communalities

After examining the reliability and validity of the scale and testing appropriateness of the data as above, suitability of variables next is identified using a concept called 'communality'. The communalities indicate the amount of variance in each variable that is accounted for (Table5).

Table - 5: Communalities

Var	Attributes	Extraction
1	Work load	0.745
2	Flexibility of Work hours	0.736
3	Flexibility of Times	0.640
4	Physical Working Conditions	0.769
5	Promotion Opportunity	0.707
6	Job security	0.835
7	Salary	0.758
8	Fringe benefits	0.684
9	Bonus	0.710

10	Pay and Performance Link	0.737
11	Recognition.	0.725
12	Globalization	0.760
13	Globalization and Living standards	0.840
14	Liberalization	0.799
15	Privatization	0.767
16	ISO Certification helps improve the image of the company.	0.843

Extraction Method: Principal Component Analysis.

The Table5 shows that initial communalities and extraction communalities .Initial communalities are estimates for the variance in each variable accounted for by all components or factors .Initial communalities are set as 1.0 for all variables in Principal Component Method of Extraction of factors. Extraction communalities are estimates of variance in each variable accounted for by the factors in the solution. Accordingly, all items fit to the factor solution. Because extracted value is more than 0.5 for each items. In this study, Principal Component Analysis (PCA) was used by the Varimax rotation method. When the original sixteen variables were analyzed, four variables extracted from the analysis with an Eigen value of greater than 1, which explained 75.352 % of the total variance (Table 8).

4.5 The Correlation coefficient (r)

The degree of correlation is measured by the coefficients of correlation. It is a measure or index, which speaks the magnitude of relationship between two variables. At the same time correlation coefficient also provides information about the direction of the relationship (whether it is negative or positive). It varies between -1 and +1 keeping 0 in the centre. The broad categories in which this can be classified are given below. Correlation matrix shows the relationship among the attributes which contribute to higher industrial performance and hence productivity (Table6&7).

Table -6: Correlation coefficient (r)

Sr. No.	Positive Correlation	Negative Correlation	Interpretations
1	+1.00	-1.00	Perfect
2	+ 0.75 to +1.00	- 0.75 to - 1.00	Very high
3	+ 0.50 to + 0.75	-0.50 to - 0.75	High
4	+.025 to +0.50	-0.25 to -0.50	Low
5	+0 to +0.25	-0 to +0.25	Very low
6	0	0	Absent

Table -7: Correlation Coefficient

Var	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1															
2	0.70**	1														
3	0.58**	0.61**	1													
4	0.71**	0.65**	0.66**	1												
5	0.45**	0.38**	0.46**	0.56**	1											
6	0.50**	0.45**	0.46**	0.48**	0.68**	1										
7	0.45**	0.39**	0.39**	0.43**	0.58**	0.87**	1									
8	0.59**	0.57**	0.47**	0.59**	0.68**	0.62**	0.59**	1								
9	0.56**	0.54**	0.52**	0.59**	0.67**	0.57**	0.49**	0.67**	1							
10	0.49**	0.38**	0.48**	0.46**	0.68**	0.70**	0.60**	0.63**	0.70**	1						
11	0.65**	0.55**	0.56**	0.68**	0.61**	0.55**	0.47**	0.62**	0.80**	0.70**	1					
12	-0.01	0.06	0.04	0.01	0.04	-0.10	0.06	0.07	0.03	-0.01	-0.04	1				
13	-0.06	-0.05	0.04	-0.09	-0.08	-0.10	0.02	-0.12	-0.05	-0.05	-0.11	0.67**	1			
14	0.01	-0.04	0.13	0.01	0.11	0.03	0.15	0.02	0.02	0.07	-0.05	0.63**	0.72**	1		
15	-0.10	0.00	0.01	-0.02	-0.08	-0.05	0.07	-0.08	-0.12	-0.03	-0.11	0.58**	0.47**	0.43**	1	
16	0.03	0.10	0.14	0.12	0.07	0.02	0.03	-0.00	-0.01	0.05	0.05	0.35**	0.18*	0.24*	0.54**	1

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

* . Correlation is significant at the 0.05 level (2-tailed).

The degree of correlation is measured by the coefficients of correlation. It is a measure or index, which speaks the magnitude of relationship between two variables. At the same time correlation coefficient also provides information about the direction of the relationship (whether it is negative or positive). It varies between -1 and $+1$ keeping 0 in the centre. The broad categories in which this can be classified are given below. Correlation matrix shows the relationship among the attributes which contribute to higher industrial performance.

The Table7 shows that there is high positive correlation when $r = +0.5$, among the variables. There are some of the negative values how negative correlation among the variables and $r = 0.00$ indicates no positive correlation between those variables. For example: V15 (Privatization) and V2 (Fringe benefits). Similarly, $r = -0.00$ indicates that there is no negative correlation between V16 (ISO Certification) and V8 (Physical working condition). For V6 (Job Security) and 7(Salary), $r = 0.87$, there exists very high correlation coefficient.

5. MODEL FITNESS

Correlation matrix, Reproduced correlations and Residuals are known with the help of SPSS and observed that there are 37(30.00%) non redundant residuals with absolute values greater than 0.05 . Lower the percentage of 'the non-respondent residuals with absolute values greater than 0.05 ', higher is the acceptability of the model fit. Here 30 percent is low percentage, so the model is considered as acceptable, data explain the substantially because the number of 'the non-redundant residuals with absolute values greater than 0.05 is less than 50 percent (Tables of 'correlation matrix', reproduced correlations' and 'residuals' are not shown)[9,10].

6. FACTOR ANALYSIS

Factor analysis has been employed to uncover underlying dimensions of the global competitiveness and its effects on industrial performance. In this study Principal Component Method (PCM) was employed by the Varimax rotation. When the original sixteen variables were analyzed by the Principal Component Analysis (PCA), four variables extracted from the analysis with an Eigen value of greater than 1.0 , which explained 75.352% of the total variance (Table 8).

Table - 8: Total Variance Explained

Factor	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.758	42.235	42.235	6.758	42.235	42.235	4.047	25.291	25.291
2	3.009	18.806	61.042	3.009	18.806	61.042	3.961	24.754	50.045
3	1.279	7.994	69.035	1.279	7.994	69.035	2.556	15.977	66.022
4	1.011	6.317	75.352	1.011	6.317	75.352	1.493	9.330	75.352
5	0.732	4.576	79.928						
↓	↓	↓	↓						
16	0.083	0.518	100.000						

Extraction Method: Principal Component Analysis.

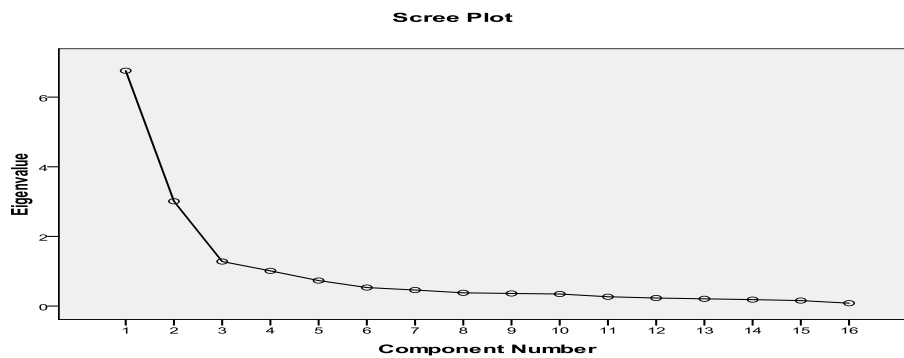


Figure -1: Screen plot

One method to reduce the number of variables into factors that is found by using the 'Eigen value greater than unity' rule is to apply the scree test (Cattell, 1966). In this test Eigen values are plotted against the factors arranged in descending order along the X-axis. The number of factors that correspond to the point at which scree point appears to change slope, is deemed to be

the number of useful factors extracted. This is a somewhat an arbitrary procedure. Its application to this data set led to the conclusion that the first four factors should be accepted. At the scree point numbers of factors are identified equal to four (Figure1).

Table -9: Results of Statistical Analysis-Factor Analysis

Table 9 shows that variables were divided into four groups. Each of these factors is labelled as per the name of the variable which is loaded most heavily. It is worth declaring scaled as shown below (Table 10).

Var	Attributes	Factor				Communalities		Cronbach's Alpha
		1	2	3	4	Initial	Extraction	
6	Flexibility of Work hours	0.877				1.000	0.835	0.857
7	Flexibility of Times	0.847				1.000	0.758	0.855
10	Job security	0.792				1.000	0.737	0.855
5	Work load	0.766				1.000	0.707	0.856

8	Physical Working Conditions	0.645				1.000	0.684	0.854
9	Promotion Opportunity	0.595				1.000	0.710	0.854
2	Fringe benefits		0.834			1.000	0.835	0.854
4	Pay and Performance Link		0.818			1.000	0.684	0.854
1	Salary		0.811			1.000	0.707	0.855
3	Bonus		0.746			1.000	0.758	0.853
11	Recognition.		0.667			1.000	0.725	0.854
13	Globalization and Living standards			0.912		1.000	0.840	0.875
12	Globalization			0.815		1.000	0.760	0.871
14	Liberalization			0.882		1.000	0.799	0.871
16	ISO Certification & Image of the company.				0.905	1.000	0.843	0.877
15	Privatization				0.725	1.000	0.767	0.878
Number of variables associated with Variables		06	05	03	02	-	-	-

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 6 iterations.

Table -10: Factor Loadings and Interpretations

Sr. No.	Factor Ladings	Interpretations
1	More than 0.50	Very Significant
2	0.50	Significant
3	0.40	More Important
4	0.30	Important
5	Less than 0.30	Not Important

The rotated components (factors) loadings (By varimax rotation) for four are grouped and presented in Table10. The variables are arranged group viz in descending orders of factor loadings. For parsimony, only those factors with loadings above 0.50 were considered significant (Pal, 1986, Pal and Bagi 1987; Hari, Anderson, Tatham, and Black, 2003).

Table 11: The higher a factor loading, the more would its test reflect or measure as impacts of global competitiveness on industrial performance. In this study the minimum factor components loadings of 0.595 or higher are considered for significant for Exploratory

Table -11: Factors and their given names (Determinants)

Factor	Title of the Factor	Factor Loadings	Variables
1	Flexibility of Work hours	0.595 – to – 0.877	V6,V7,V10,V5,V9 & V10
2	Fringe benefits	0.667 – to – 0.834	V2,V4,V1,V3 & V11
3	Globalization and Living standards	0.882 – to – 0.912	V13,V12 & V14
4	ISO Certification & Image of the company.	0.925 – to – 0.905	V16 & V15

Factor Analysis (EFA). The variable with highest factor loading becomes the title of each factor and same name given to that respective factor. Accordingly, there are four groups (factors). All these determinants are contributing in enhancing industrial performance (Table11).

7. LIMITATIONS OF THE STUDY

The problems in data collection were many like:

- Non-availability of the some secondary data.

- Responses with reservation caused limited co-operation from some of the respondents. Top level, middle level and lower-level officials, employees responded differently and might have added little or more bias.
- The postponements of the responses were time consuming and tiresome due to busy schedule or unwillingness to disclose certain information by the respondents.
- The investigator was thought to be industry - agent or government authority in spite of avowal was given, so extracting information was difficult initially, too much time was consumed in convincing them for the purpose of the study.
- The time factors, poor awareness of some respondents were other limitations.
- The supervisors and technicians were scared about the disclosing problems they are facing at workplace.
- Lower education, language problem and lack of freedom to disclose the facts were major constraints to the most of the workers.

8. SCOPE OF THE FUTURE WORK

The present study in Vitthal Udyognagar, an industrial estate becomes interesting from two points of views. One the Industrial estate is situated between two big educational townships, namely Vallabh Vidhanagar and New Vallabh Vidyanagar; in real sense the hub of world class education in highly competitive environment. Thousands of students are availing benefits of these infrastructures for higher studies and research. Secondly, educationalists, technocrats and managers with high skills and micro-small-medium to large scale industries formed a cluster of mutual interest and benefits imparting to the society. Since the establishment of this estate it was a demand as to time to study and evaluate the existing scenario, industrial productivity which helps help improving living standard of the people. There is a lot of scope for further study and future research in this area of interest of industrial productivity and potentiality.

9. ACKNOWLEDGEMENTS

In pursuing my research work, we have received help and support from all corners. we convey my sincere thanks to all of them; it may not be possible to personalize each and every one. However, I express my sincere gratitude to all of them. Sardar Patel University, Vallabh Vidyanagar. Industry Commissioner, District Industries Centre, Anand for permitting to use all the records related literatures of industrial scenario of Anand district. Resident District Collector, Anand and staff for providing related literatures of industrial scenario and records of Gujarat state. Executives of Amul Dairy, Anand for their help to furnish details and permit visit of AMUL plants, for the study of their performance enhancement programme. Rupal Books Stall, Vallabh Vidyanagar for timely procuring source materials, books, and references at the ease and speed for my literature survey for research work. Secretariat of V. U. Industries Association, for their all time

help for information and permission to use all available data, references. Corporate executives, who gave permission to study their organizations and helped in getting permissions from various industries of the estate. The researchers also acknowledge the valuable help and suggestions received from individuals, industrialists, executives, managers, engineers, workmen during various stages of this research work and to all the organizations who had responded positively to our questionnaires.

REFERENCES:

- [1].Asthana, Hari Shankar, and Braj Bhushan (2007), Statistics for Social Sciences, Prentice Hall of India, New Delhi.
- [2]. Bartlett, M.S. (1950), Test of significance in factor analysis, British journal of psychology, 3, 77-85.
- [3]. Cattell, R.B. (1966), The scree test for the number of factors Multivariate Behavioral Research, 1,245-276.
- [4]. Goel, Bharat and Dewan, Bhushan (2011), Factors affecting consumer preferences of shopping at organized retail stores in Punjab's Journal of Engineering, Science and Management Education, NITTTR, Bhopal, pp 44-49.
- [5]. Guttman, L. (1954), some necessary condition for common factor analysis psychometrica, 30, 179-185.
- [6]. Jani, H. J., (2004), Ph.D. Thesis, Quality Management in Indian Companies through ISO 9000, Sardar Patel University, Vallabh Vidyanagar.
- [7].Joseph.A. Gliem and Rosemary R.Glien(2003) Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-Type Scales, Midwest Research ro Practice Conference in Adult, Continuing and Community.
- [8].Kaiser, H.F. (1960), The application of electronic computer to factor analysis educational and Psychological Measurements, 20, 141-151.
- [9]. Malhotra, Naresh K., (2009), Marketing Research- an Applied Orientation, fifth edition, Pearson, New Delhi.
- [10].Nargundkar Rajendra (2005). Marketing Research-Text and Cases, Tata McGraw-Hill Pub., New Delhi.
- [11].Pandya, K. J. (2010), Ph.D.Thesis, Consumer Behavior in Two Wheeler Industry: A case study of Motorcycle users in the state of Gujarat, Sardar Patel University, Vallabh Vidyanagar.
- [12].Pankhania T.B. & Modi V.K. (2013), Impact of various aspects on Industrial Performance enhancing Productivity. International Journal of Engineering and Innovative Technology(IJEIT), Feb. 2013 Vol.2,Issue-8, pp.166-171.
- [13].Pankhania, T. B., Jani H.J. (2012), Impacts of Globalization on Industrial Productivity: A Survey Conducted in Industries at Vitthal Udyognagar of Anand District of Gujarat,India,International Journal of Applied Operational Research, Vol.2,No.1,pp.13-22, Spring 2012.
- [14].Pankhania, T. B., Modi, V. K. (2011), Quality Introspects and Productivity: A Survey Conducted at Vitthal Udyognagar in Anand district of Gujarat, India, International Conference on IndustrialEngg-2011,SardarVallabhbbhaiNationalInstitute of Technology, and Surat, India, 17-19 November 2011.

[15].Pankhania, T. B., Modi, V. K. (2011), The role of infrastructure in the perception of industrial productivity -An empirical study, International Conference on Industrial Engineering-2011, Sardar Vallabhbhai National Institute of Technology, Surat, India, 17-19, November 2011.

[16].Pankhania, T. B., Modi, V. K. (2011), Impacts of Globalization and Job training on productivity: A survey conducted in Industries at Vitthal Udyognagar, Anand district of Gujarat, India. Journal of industrial Engineering, Management and science, National Institute of Technical Teachers Training and Research, Bhopal.

[17].Pankhania, T. B., Modi, V. K. (2011), The role of helping hands in Industrial development from stake holders, perceptions: A survey conducted at Vitthal Udyognagar in Anand, district of Gujarat state, India. International Journal IJETAP, USA (Unpublished).

[18].Pankhania, T. B., Modi, V. K. (2012), Factors Influencing Job Satisfaction Leading to Higher Productivity: A survey. International Conference on Information, Knowledge & International Journal of Scientific & Technology Research Volume 1, Issue 3, May 2012, Research in Engineering, Technology & Sciences-2012-ICIKR-ETS-2012, 24-25 March, 2012 at G.K.Bharad Institute of Engineering, Rajkot, pp.407- 412.

[19].Pankhania, T. B., Modi, V. K., (2011), Kaizen improves Quality and Productivity: A case study, International conference on industrial engineering, Sardar Vallabhbhai National Institute of Technology, Surat, India, 17-19 November 2011.

[20].Pankhania, T. B., Modi, V. K., (2011), The Factors influencing Target Market criteria: A survey conducted in industries at Vitthal Udyognagar in Anand District of Gujarat State, India, International Journal of Industrial Engineering & Production Research, September 2011, Volume 22, Number 3, pp.213-220.

[21].Pankhania, T. B., Modi, V. K., (2011), Job satisfaction and Performance: A correlation analysis. Journal of industrial Engineering, Management, and science, National Institute of Technical Teachers Training and Research, Bhopal. Journal of Engineering, Science & Management Education, Vol.5 Issue I, pp.367-371.

[22].Pankhania, T.B., (2011), Ph.D. Thesis, Industrial productivity scenario and potentiality in Vitthal Udyognagar in Anand district of Gujarat, India, Sardar Patel University, Vallabh Vidyanagar Anand, Gujarat, India.

[23].Pankhania, T.B., Modi, V.K. (2012), Assessment of Productivity Scenario at Vitthal Udyognagar in Anand District, Gujarat. International Conference on Information, Knowledge & Research in Engineering, Technology & Sciences-2012-ICIKR-ETS-2012, 24-25, March 2012 at Shri G.K.Bharad Institute of Engineering, Rajkot, pp. 401-406.

[24].Pankhania, T. B., Modi, V. K., (2011), Factors Affecting Job Satisfaction: A Case Study-A Survey Conducted in Industries at Vitthal Udyognagar of Anand district of Gujarat State, International Conference on Industrial Engineering-

2011, Sardar Vallabhbhai National Institute of Technology, Surat, India, 17-19 November 2011.

[25].Velnamby, S.Sivesan (2012), Determinants of Customers Relationship Marketing of Mobile Services Providers in Sri Lanka: An exploratory Factor Analysis, Industrial Engineering Letters, ISSN-2224-6096, Vol.2, No.6, 2012, pp.10-15.

BIOGRAPHIES:



T. B. Pankhania is an Associate Professor in Mechanical Engineering and Head, Workshop at B.V.M. Engineering College, Sardar Patel University, Vallabh Vidyanagar. He obtained his B.E., M.E. and Ph.D. from Sardar Patel University (SPU); Vallabh Vidyanagar. His profile includes a stint of over 36 years of experience. He played a pivotal role in

developing layouts of infrastructural facilities of workshops of various engineering colleges and an industrial training centre. His current areas of research include 'Industrial performance' leading to higher productivity. He has published his 13 research papers in national and international journals and presented six research papers in International conferences. He authored book on Engineering Mechanics for engineering students.

E-mail: tbp@sify.com



V. K. Modi is a Lecturer in Mechanical Engineering at B & B Institute of Technology, Vallabh Vidyanagar. He obtained his master degree from M.S. University, Baroda. His areas of the interest are CAD-CAM and Industrial Engineering. He has 20 years of teaching experience. He has published six research

papers in National and International Journals and presented six research papers in international conferences. He authored three books for the diploma engineering students.

E-mail: modi_vinit@yahoo.com