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Industrial Productivity Scenario: An Evaluation of Industrial Estate at Vitthal Udyognagar in Anand District of Gujarat state, India

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Abstract In the present age of cut-throat competition, it becomes highly necessary for an organization to be dynamic in the globalization era. This is possible only when the employees, employers and organizations are capable enough to cope up with the changing world scenario. In the rapidly changing environment, 'human being' is the most important and valuable resource to play vital role in every organization has in the form of its employees. The present study was conducted in industrial estates at Vitthal Udyognagar (V.U.Nagar) in Anand district of Gujarat, India. The estate was established some times in 1965.At present 1000 odd units are working and around 25000 employments are generated. The units were selected from the members' directory published by Vitthal Udyognagar Industries Association (VUIA), out of which units were located for the study, Questionnaires were distributed / posted and interviews were conducted to know the present status of the industrial scenario. SPSS Software used to carry out various statistical analysis to uncover the factor responsible for the health of the estate in general and industries in particular.

Keywords Competition, Globalization, Scenario, Questionnaire, Employments, Productivity

1 Introduction

A large number of studies have been carried out from time to time to examine the changes in the industrial performance and its impact on economy at the national level. Studies have also been carried out to analyse productivity trends in major manufacturing industries. Most of these studies are generic in nature and not necessarily area specific. Present study is to develop productivity enhance route programmes in the present context of the changed trends of education, technologies, and collaborative partnership between institutions and industries for the mutual benefits of both. Human talent is often cited as a key differentiator for competitive success. As more and more organisations realized that managing and retention of talent human capital effectively is the key to business success; it is a topic of interest to both industry and academia. Talent is important to organisational performance; it is not just a human (capital) complementary issue. A survey is conducted at Vitthal Udyognagar in Anand district of Gujarat state, India and statistical analysis, using SPSS software 17.0 is carried out

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to uncover underlying factors which are responsible for the health and wealth of the industrial estate.

2 Objectives of the Study

The primary objective of this research was to know the status of the existing situations and to assess the industrial performance in the context of the changing industrial scenario of the industrial units of the estate under consideration for this study.

3 Research Methodologies

The present study was conducted in industrial estates of Anand district, Gujarat India. The estate was established some times in 1965.At present 1000 odd units are working and more than 25000 jobs are created at different levels.

The units were selected from the members' directory published by Vitthal Udyognagar Industries Association (VUIA). 250 Questionnaires were distributed / posted and interviews were conducted. The questionnaires were checked for incompleteness, inconsistent, and ambiguous responses. The questionnaires were discarded with unsatisfactory responses, 94 questionnaires were not included in the sample. Of 250 questionnaires 156 found usable for analysis and have resulted in final sample size. The data were cleaned by identifying out-of-range and logically inconsistent. The responses were considered from usable questionnaires only and responses are 62.40% which are considered acceptable for the research study and analysis. The data were collected using five point Likert scale highly dissatisfactory (1) to highly satisfactory (5). These data were analyzed using SPSS software for the various statistical analysis to draw an appropriate conclusion [1-6].

4 Statistical Analyses

SPSS software was used to carry out various statistical analyses to evaluate the various aspects which are influencing industrial 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. *A factor is an underlying dimension that explains the correlations among a set of variables is called factor(variable).*Factor analysis allows us to look at groups of variables that tend to be correlated to each other and identify underlying dimension that explains the correlations. Relationships among sets of many interrelated variables are examined and represented in terms of a few underlying factors. For these features, factor analysis was performed in this study. One of the most widely used interdependency techniques for data reduction is factor analysis [1-6].

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

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were graduates and have educational qualification above it. 5.10 percent of the respondents were Ph.D., 22.40 percent of the respondents were post-graduates, 66 percent of respondents were graduates and the remaining 6.40 percent 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% 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 (26.09%) 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

Reliability comes to the forefront when variables developed from summated scales are used as predictor components in objective models. Since summated scales are an assembly of interrelated items designed to measure underlying constructs, 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 from dichotomous (that is, questions with two possible answers) and/or multi-point formatted questionnaires or scales (i.e., rating scale: 1 = poor, 5 = excellent). The higher the score, the more reliable the generated scale, alpha value 0.7 to be an acceptable reliability coefficient but lower thresholds

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are sometimes used in the literature. If the scale shows poor reliability, then individual items within the scale must be re-examined and modified or completely changed as needed [7].

Table 1 The Cronbach's Alpha (α) and Interpretation

Sr.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 Test statistics of questionnaire

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.816	**0.823**	**17**

Table 1and 2 show that alpha value 0.816 indicates that internal reliability is good and questionnaire is reliable and can be used for statistical analysis.

Table 3 Summary: Item Statistics

Items	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	**3.545**	**2.494**	**4.500**	2.006	1.805	0.224	17
Item Variances	0.767	0.354	1.323	0.969	3.738	0.065	17
Inter-Item Covariances	0.158	-0.119	0.500	0.619	-4.186	0.013	17
Inter-Item Correlations	0.215	-0.129	0.712	0.841	-5.541	0.023	17

Table 4 ANOVA

Source of Variation		Sum of Squares	DF	Mean Square	F Ratio	F Prob.
Between People		511.778	155	3.302		
	Within People	558.474	16	34.905	**57.315**	**0.000**
	Residual	1509.408	2480	0.609		
	Total	2067.882	2496	0.828		
Total		2579.660	2651	0.973		

Grand Mean = 3.545

Table 3: The sample means, with values of High = 4.500, Medium = 3.545 and Low = 2.494 are quite different. Grand mean = 3.545.They have their effects on productivity accordingly.

Table 4: The value of F= 34.905/0.609 =57.315 with 155 and 16 degrees of freedom, resulting in a probability of 0.000. Because the associated probability is less than the significance level of 0.05 the null hypothesis of equal population means is rejected.

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Alternatively, it can be seen from the standard table that critical value is less than calculated value F (57.315), the null hypothesis is rejected.

4.3 Factor Analysis

One good method of screening for efficient items is to run an exploratory factor analysis on all the items contained in the survey to weed out those variables that failed to show high correlation. After factor analysis, it is a common practice to attach a descriptive name to each common factor once it is extracted and identified. The data were analyzed using SPSS statistical package. The data then have been interpreted and meaningful inferences are drawn from the output of the various tests [1-6].

Tests for the appropriateness of the factor analysis: Table 5 shows the results of KMO and Bartlett's tests of sampling adequacy and sphericity.

Table 5 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.760
Bartlett's Test of Sphericity	Approx. Chi-Square	892.016
	Degree of freedom	136
	Significance	0.000

Table 5: Bartlett's test of sphericity is a test statistic used to examine the hypothesis that the variables are uncorrelated in the population. In other words, the population correlation matrix is an identity matrix; each variable correlates perfectly (r = 1) with itself but has no correlation (r = 0) with the other variables under study. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is a measure of sampling adequacy, an index used to examine the appropriateness of factor analysis. The KMO value varies from 0 to 1. High values (between 0.5 and 1.0) indicate factor analysis is appropriate. Values below 0.5 imply that factor analysis may not be appropriate. Small values of the KMO statistic indicate that the correlation between pair of variables cannot be explained by other variables, and hence factor analysis may not appropriate. Generally, a KMO > 0.5 is desirable, here the value of KMO = 0.760, Chi-square = 892.016, Degree of freedom = 136 and Significance level = 0.000, because the associated probability is less than the significance level of 0.05, the null hypothesis of equal population means is rejected, these different measures show that the factor analysis is appropriate [1-6].

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Table 6 Total Variance Explained

Factor	Initial Eigen Values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumula--tive %	Total	% of Variance	Cumula-tive %
1	4.715	27.736	27.736	4.715	27.736	27.736	3.064	18.022	18.022
2	2.168	12.753	40.489	2.168	12.753	40.489	2.508	14.754	32.776
3	1.432	8.422	48.911	1.432	8.422	48.911	2.276	13.389	46.165
4	1.233	7.252	56.163	1.233	7.252	56.163	1.563	9.194	55.360
5	**1.167**	**6.866**	**63.029**	**1.167**	**6.866**	**63.029**	**1.304**	**7.669**	**63.029**
6	0.892	5.249	68.278						

Extraction Method: Principal Component Analysis.

Extracted factors: The five extracted factors that explain 63.029 % of the total variance attributed to each factor presented in Table6. For this, an analysis of the Eigen values is required. The Eigen value represents the total variance explained by each factor. Only those factors are extracted for which the Eigen values are greater than one. Thus, five factors extracted together contribute 63.029 % of total variance. Thus extracting five factors from a total of sixteen variables for measuring the impacts level is good. Thus, 'Factor Analysis was tentatively considered appropriate for analyzing data. Scree plot also confirmed the number of five factors from the start of the scree point (see figure1).

Communality: The amount of variance shares with and portion of variance explained by common factors referred to as communality. Communality is the amount of variance a variable can explain with all the factors being considered. This term may be interpreted as a measure of "uniqueness."A low communalities figure indicates that the variable is statistically independent and cannot be combined with other variables. The extracted communalities greater than 0.5, are acceptable for the variables.

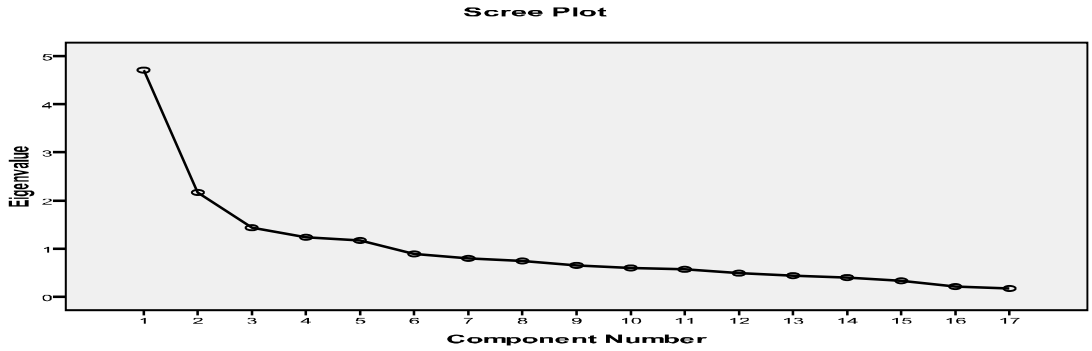

Fig. 1 Scree Plot

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Table 7 Test Communalities & Factor loadings

Item No.	Attributes	Communality	Factor Loadings
I : Job Satisfaction			
1	**Salary**	0.721	0.836
2	**Pay - Performance incentives link**	0.721	0.835
3	**Job security**	0.605	0.746
4	**Recognition**	0.814	0.887
II : Physical Infrastructure			
5	**Land**: availability for industrial development	0.428	0.377
6	**Water**: availability for industrial purpose	0.704	0.746
7	**Power**: availability for industrial requirements	0.736	0.838
8	**Raw materials** availability for industrial requirements	0.641	0.740
9	**Manpower**: availability of skilled / technical manpower	0.616	0.520
10	**Transport**: availability for industrial use -Roads	0.458	0.443
III : Social Infrastructure			
11	**Education**: Educational facilities	0.528	0.655
12	**Shelte**r: Housing facilities	0.568	0.662
13	**Healthcare** : Medical facilities	0.738	0.778
14	**Climate**: Working conditions	0.618	0.731
15	**Human attitude** : Whether people wants business	0.441	0.420
IV: Globalization and Competitiveness			
16	**Globalization** has changed industrial scenario	0.678	0.796
17	**ISO certification** helps to increase productivity.	0.701	0.701
Cumulative % of variance explained			**63.029**
Factor Eigen values(Five factors are extracted)			**1.167**

Extraction Method: Principal Component Analysis.

Table 8 Range and interpretation of correlation coefficient (r)

Positive	Negative	Correlation -Interpretation
+1.00	-1.00	Perfect
+ 0.75 to +1.00	- 0.75 to - 1.00	Very high
+ 0.50 to + 0.75	-0.50 to - 0.75	High
+.025 to +0.50	-0.25 to -0.50	Low
+0 to +0.25	-0 to +0 .25	Very low
0	0	Absent

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Table 9 Correlation of the productivity attributes

Sr. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	**1**																
2	**0.71****	**1**															
3	**0.49****	0.46**	**1**														
4	**0.65****	**0.68****	**0.70****	**1**													
5	0.29**	0.19*	0.28**	0.30**	**1**												
6	0.30**	0.25**	0.27**	0.32**	0.31**	**1**											
7	0.11	0.18*	0.13	0.20*	0.33**	**0.53****	**1**										
8	0.19*	0.16*	0.19*	0.10	0.36**	**0.48****	**0.58****	**1**									
9	0.11	0.06	0.11	0.18*	0.21**	0.21**	0.44**	0.35**	**1**								
10	0.25**	0.24**	0.23**	0.21**	0.26**	0.41**	0.33**	0.28**	0.18*	**1**							
11	0.11	0.07	0.01	0.05	0.27**	0.12	0.17*	0.25**	0.27**	0.14	**1**						
12	0.10	0.15	0.22**	0.18*	0.32**	0.23**	0.21*	0.36**	0.29**	0.35**	0.23**	**1**					
13	0.02	-0.01	0.11	0.07	0.17*	0.25**	0.26**	0.18*	0.01	0.35**	0.01	0.31**	**1**				
14	0.22**	0.21**	0.26**	0.19*	0.43**	0.23**	0.26**	0.35**	0.14	0.28**	0.17*	0.45**	0.44**	**1**			
15	0.32**	0.26**	0.24**	0.29**	0.25**	0.16*	0.24**	0.16*	0.25**	0.20*	0.24**	0.27**	.027**	0.29**	**1**		
16	0-.01	0.01	-0.01	-0.04	0.05	0.19*	0.11	0.02	-0.13	0.16*	-0.01	0.04	0.20*	0.10	0.12	**1**	
17	0.08	0.17*	0.13	0.01	0.18*	0.11	0.15	0.11	0.01	0.06	0.16*	0.13	-0.01	0.15	0.21**	0.16*	**1**

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

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

Table 8 & Table 9:
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 productivity. Here variable 4 & variable 1 of job satisfaction are with high correlation coefficient (r = 0.65) contributing to higher industrial productivity [8].

Rotated Matrix: There are various methods of rotations. The method of rotation used is varimax, which is the most commonly used rotation method in factor analysis. The variance explained by each component after the varimax rotation method and the number of factors extracted based on Eigen value 1 and more. The total variables are associated with five factors and total variance explained is 63.029 % are shown in Tables 6 (Total variance explained and extraction of factors) Table 7 (Test communalities and factor loadings) and Table 10 (Grouping of variables associated with factors).

Model fitness: Correlation matrix, Reproduced correlations and Residuals are known with the help of SPPS and it is observed that there are 58(42%) 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 42% is neither low nor high 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

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less than 50 percent. (Tables of 'correlation matrix',' reproduced correlations' and 'residuals' are not shown) [3].

Table 10 Grouping of variables associated with factors[a]

Sr. No.	Attributes	Factors				
		1	2	3	4	5
1	**Salary**	**0.836**				
2	P**ay** - Performance Incentives	**0.835**				
3	**Job** security	**0.746**				
4	**Recognition**	**0.887**				
6	**Water** availability for industrial development		**0.746**			
7	**Power** availability for industrial purpose		**0.838**			
8	**Raw materials** availability for industrial requirements		**0.740**			
12	**Shelte**r: Housing facilities			**0.662**		
13	**Healthcare** : Medical facilities			**0.778**		
14	**Climate**: Working conditions			**0.731**		
11	**Education**: Educational facilities				**0.655**	
17	**ISO certification** helps to increase productivity.				**0.701**	
16	**Globalization** has changed industrial scenario.					**0.796**
Number of variable associated with factors		**04**	**03**	**03**	**02**	**01**
The following variables are not associated with any of the five factors						
5	**Land**: availability for industrial development	0.247	0.300	0.377	0.365	-0.043
9	**Manpower**: availability of skilled / technical manpower	0.035	0.520	0.083	0.273	-0.512
10	**Transport**: availability for industrial use -Roads	0.210	0.429	0.443	-0.086	0.164
15	**Human attitude** : Whether people wants business	0.292	0.035	0.420	0.420	0.043
	Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 10 iterations.					

5 Interpretations of the results:

The extracted five factors are given suitable names and their contributions are interpreted as below.

Table 11 Naming and interpreting the factors extracted from factor analysis

Factor	Factor description	Variables associated
1	Productivity boosters	Salary, pay - performance incentives, job security, recognition as incentives to the employees.
2	Industrial developers	Water, power and raw materials availability for industrial development.
3	Employees' motivators	Shelter, healthcare and climate -working condition for motivating employees.
4	Knowledge creators	Education and ISO certificate for better performance of employees.
5	Global challenges	Globalization for availing benefits for industrial growth.

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Factor 1: Productivity boosters
Salary, pay - performance incentives, job security, recognition are very essentials in increasing industrial productivity. Human wants and satisfaction should be given prime importance. Satisfied employees will work with more zeal and produce desired target efficiently and effectively. It is essential for betterment of present and future job performance, and improves employees'and industrial productivity.

Factor 2: Industrial developers
Availability of water, power and raw materials are as basic resources, which are very essential for industrial growth. These areas are with abundant water, uninterrupted power supply and required raw materials with satisfactory level.

Factor 3: Employees' motivators
Availability of shelter-housing facilities, Healthcare-hospital, medical treatments facilities for employees and their families and climate-conducive working conditions motivate employees to work more and motivation helps to improve performance and hence productivity and profitability.

Factor 4: Knowledge creators
The education and ISO certificate for better performance help to improve the skill and the image of the company. Educated and Skilled workers-employees are positive aspects of the organization. The use of computers and CNC machines drastically reduce human efforts and help to improve production rate with accuracy and competitiveness.

Factor 5: Global challenges
Globalization has changed industrial scenario, improved job opportunities, productivity and living standards. Liberalization has improved industrial performance and competitiveness, Privatization has improved industrial performance. In the era of globalization, liberalization and privatization have highly increased the competitiveness in the global market scenario, and at the same time it has boosted industrial productivity and living standard of the people.

6 Limitations of the Study

The problems and limitations during this research study were listed as below:

- Non-availability of some secondary data.
- Responses with reservation caused limited co-operation from employees. Top, middle, and lower-levels 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 collecting required data 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 facing at workplace.

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- Lower education, language problem and lack of freedom to disclose the facts were major constraints to the most of the bottom level employees.

7 Conclusions

The study mainly focused on finding out the impacts of globalization and competitiveness on productivity. It is interesting to know that almost everybody in the opinion that globalization has changed the present industrial scenario, and it is the demand of the day. The set attributes regarding globalization, liberalization and privatization, ISO, VRS, Job stresses all attributes have their own effect on the industrial performance. The five factors uncover the associations of the 16 attributes. These factors contribute the market penetration leading to higher productivity of the organization.

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