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AN EMPIRICAL STUDY OF FACTORS AFFECTING PRODUCTIVITY OF SOLAPUR BASED TERRY TOWEL MANUFACTURING TEXTILE INDUSTRIES (SMEs)

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ABSTRACT

This paper is an attempt to find the factors responsible for productivity of ‘Solapur based Textile SMEs’. A survey work of 164 textile manufacturing SMEs was carried out. The collected data was analyzed with statistical tools and suitable software which shows that there are eight factors affecting productivity of this sector. The paper is structured as: Review of literature on factors affecting productivity is carried out, identification of research gap and objective of the work is finalized, research methodology is given. Analysis of data, results and discussion are presented. Finally the conclusions are drawn and scope for future work is written.

Keywords: Productivity, Factors, Terry Towel Manufacturing Textiles, India.

1. INTRODUCTION

The Indian textile industry is one the largest and oldest sectors in the country and among the most important in the economy in terms of output, investment and employment. The sector employs nearly 35 million people and after agriculture, is the second-highest employer in the country. Its importance is underlined by the fact that it accounts for around 4 % of Gross Domestic Product, 14 % of industrial production, 9 % of excise collections, 18 % of E in the industrial sector, and 16 % of the country’s total exports (Ex) earnings. (E. Bhaskaran, 2013).

The textile sector comprises clothing, apparel, garments, chaddars and bedsheets, terry towels and allied products. Amongst these products, Solapur (Maharashtra-India) is well known for manufacturing of terry towels and allied products. Infact, terry towels from Solapur has a market share of approximately 80% of the total international demand (for yarn dyed terry towel on Jacquard power loom)(TDF, 2012). Most of the units in solapur are of SME categories. In spite of very good potential for improving productivity of this sector, very few studies are reported. Therefore, the study is undertaken to improve the productivity of Solapur based textile SMEs. The present study aims to determine the factors affecting productivity of Solapur based textile SMEs.

In this paper, we start with literature review. Then research methodology is discussed. The data collection and analysis is done to find out the factor responsible for productivity. Finally, the discussion and conclusion is presented.

2. LITERATURE REVIEW

2.1 Review of existing literature

The factors influencing productivity for manufacturing sector (including textiles) are studied. Then the factors specific to textile manufacturing sector are reviewed. The summary is presented below.

Thomas P. Triebs and Subal C. Kumbhakar (2012) have studied the level of technical change and level of management practice. They have classified the management levels into five groups (from 1 to 5). They found that technical change is higher; the lower is the level of management practice. Technical change is highest for management practice level-2. Lower quality of management correlates with more organization flexibility which in turn makes it easier to exploit opportunities for technical change.

Hector Salgado Banda and Lorenzo Ernesto Bernal Verdugo (2011) have analyzed determinants of productivity growth for Mexican manufacturing environment. They have used the variables such as input use intensity (capital, electricity and transport), technology adoption, human capital intensity, concentration, and exports. They further concluded that technology adoption and human capital promote productivity.

Mohamed Goaid and Rym Ben Ayed Mouelhi (2000) have studied Tunisian textile clothing and lather industry. They have done efficiency measurement with unbalanced panel data. The estimation method is used to examine technical efficiency in Tunisian textiles. The results suggest that instrumental variables method produce more accurate estimates of the unknown firm level technical efficiency.

Erol Taymaz and Golin Saatci (1997) have studied technical change and efficiency in Turkish manufacturing industries. They have focused on measuring and understanding the technical progress and efficiency. They have identified sector specific factors influencing technical efficiency of manufacturing plants.

Chiranjib Neogi and Buddhadeb Ghosh (1994) have studied intertemporal efficiency variation in Indian manufacturing industries. They have used time varying frontier production function approach with both fixed and variable reading models in Indian industries to test the hypothesis. They concluded that skill, labor productivity and profit play significant positive role in technical efficiency and Total Factor Productivity (TFP).

Gokhan H. Akay and Can Dogas (2012) have studied the effect of labor supply changes on output. They have conducted empirical studies for U.S industries. The study has focused on relationship between labor supply and industry level output. The study showed that the industry output is predicted to expand more when the size of the labor force grows. The study reveals that the increase in the labor supply has varying effect on output in

different sectors. They noted that a small impact on work output is observed in industries as compared to service sector.

Rajesh Bheda, et al. (2001) have studied 22 variables and grouped them in 5 factors for improving productivity of apparel industry. The correlation and ANOVA methods were used. The factors were Quality, Age of workers, Number of machines, Technology and Lead time. They further concluded that technology and quality were more important factors.

Rajesh Bheda, et al. (2003) have studied the variables affecting productivity in apparel manufacturing industry and critical success factors were determined using descriptive statistics. The factors were number of machines installed, WIP, quality. Further they have recommended strategies for productivity improvement.

R. N. Joshi and S. p. Singh (2010) have compared productivity growth in the Indian garment industry, both scale wise and region wise. The study was conducted using the variables such as net fixed assets, wages and salaries, Raw material, energy and fuel and gross sales. The study revealed that small scale firms are more productive as compared to medium and large scale firms. Technical efficiency is a major factor affecting productivity of all types of industries.

Shu-Hwa Lin, et al. (1994) have studied the productivity and production in apparel industry using descriptive statistics and found that technology and product type are the important factors for improving productivity.

Nicholas Bilalis, et al. (2006) have done an analysis of European textile sector and found that key performance indicators of the textile sector are quality, flexibility, supply chain management, strategy formulation / implementation and human resource management.

Nicholas Bilalis, et al. (2007) have studied the benchmarking the competitiveness of European textile firms using seven factors namely formulation of strategy, suppliers, customer demand, modern HRM practices, employee recognition programmes and incentives and existence of processes for performance improvement initiatives. Out of these seven factors three factors- existence of processes for performance improvement initiatives, suppliers and modern HRM practices have been recognized as more significant as they have highest Crombach Alpha coefficients.

Kongkiti Phusavat(2008) has recommended guidelines for measurement of productivity of manufacturing industries in Thailand. He has analyzed the parameters like quality, customer focus, delivery, flexibility, maintenance services and technical know how. The analysis was done using descriptive statistics. The paper concludes that delivery, quality and customer focus are the priorities for deciding the operational strategies for improving productivity.

It is observed from literature that various researchers have considered different variables/factors and tools for improving productivity of textiles. There are some common variables (such as leadership, top management commitments, technology, quality, H.R., labor etc.) used by almost every sector (clothing, apparel, garment, knitting etc). There are factors affecting productivity which are sector specific. Therefore, the common factors have been considered for the present study and sector specific (textile) factors have been evolved by interacting with experts in the field. These have been considered during preparation of structured questionnaire.

2.2 Literature gap and identification of the problem

The literature review reveals that very little studies have been reported for manufacturing of terry towels, chaddars and bedsheets, especially on Jacquard power looms. Further it is particularly noted that there are less studies for Solapur based Textile SMEs

(Yarn dyed terry towels on jacquard power looms). Hence, the authors have undertaken a research in this area.

The purpose of the study is to determine the factors for affecting productivity of this sector. The paper aims at finding these factors using a survey based technique.

3. METHODOLOGY

Methodology adopted for carrying out the research work is as: After carrying out the literature review, the variables have been identified (from available literature and discussion with academicians, researchers and filed experts). The questionnaire is designed and data is collected through survey. The analysis of data and conclusions are presented. Briefly the steps followed are:

- | | |
|----------------------------------------|-------------------------------------------------|
| 3.1 Identification of Variables | 3.2 Selection of research method |
| 3.3 Design of structured questionnaire | 3.4 Data collection |
| 3.5 Analysis of Data | 3.6 Findings and discussion |
| 3.7 Conclusion | 3.8 Recommendations to manufacturing industries |

The details of these steps are as follows:

3.1 Identification of Variables

A list of common variables (that could affect productivity of textiles) were extracted from the literature review covering most of the variables. Additional variables which are specific to the terry towel manufacturing units in Solapur SMEs were selected from the field visits, expert opinions and discussion with consultants and academicians. Total 39 variables were finalized to design the questionnaire.

3.2 Selection of research method

A survey based technique is used to identify the factors for productivity. An experience survey is designed and conducted. Since the focus of the research is exploratory, 'Structured questionnaire for opinion survey method' is selected. It helps to ensure that important variables and their relationships are identified.

3.3 Design of structured questionnaire

Based on above variables a structured questionnaire is prepared. The ratio scales of 7 points was used for evaluating every question statement. The scale was assigned values from -3 to 3. -3 indicates highly negative impact on productivity, -2 and -1 indicate moderately negative and marginally negative impact on productivity respectively. 3 indicates highly positive impact on productivity, 2 and 1 indicate moderately positive and marginally positive impact on productivity respectively. It is decided to use 'profitability' as a measure of change in productivity, since it is the most appropriate in the given contest of Solapur based textile SMEs. Literature review also indicates use of this variable (profitability) as a measure of productivity.

3.4 Data collection

a. Selection of respondents

To collect the information of textile manufacturing companies regarding name, address, phone number etc. the list from Textile Development Foundation (TDF), Solapur

and Yantramaag Dharak Sanghatana (YDS), Solapur is used. The companies were selected randomly from the list.

b. Method of data collection

‘Snow-ball method’ of data collection is used. In this research the collection of data is done through a questionnaire survey. The questionnaire is directly communicated to the top management cadre of the companies. They were asked to give response for all the questions on a 7 point ratio scale.

c. Collection of data

Out of 194 companies contacted, 169 companies responded. Out of these 5 questionnaires were eliminated from subsequent analysis as they had given incomplete information. Thus the research is based on the data provided by 164 companies which leads to 84.53 % response rate. This data will be used for further analysis.

3.5 Analysis of Data

The data analysis uses reliability tests, validity tests and factor analysis. The analysis is performed by using SPSS software. The internal consistency of a group of measurement items refer to the degree to which the items in the group are homogenous. In this study, the internal consistency is estimated by Crombach’s alpha reliability coefficient. The Chrombach alpha value for 38 variables is 0.74, which is higher than 0.6, therefore it suggests a satisfactory reliability.

The factor analysis is used to reduce the multiple relationship that may exist amongst variable statements. The principal component extraction method is selected to analyze the correlation matrix and to extract Eigen values above 1. For easier interpretation of the data, the varimax rotation is applied. Only the factor loadings those have value greater than 0.4 are considered. The factor analysis for 38 variables is performed, since the last 39th factor (profitability) is an output variable ‘y’.

To test the suitability of data for factor analysis, Kaiser-Meyer-Olkin(KMO) test and Barlett’s test of sphericity have been conducted (refer Table No. 1)

Table No. 1: KMO and Barlett’s test

KMO measure of sampling adequacy		0.782
	Approx. chi-square	3478.864
Barlett’s test of sphericity	Df	703
	Sig.	0.000

We note that the value of overall KMO measure of sampling adequacy (KMO measure) is equal to 0.782, (greater than 0.5) and significant level of Barlett’s test is 0.000 (equal to or less than 0.05) which indicates the suitability of data for further analysis.

The factor analysis is done using SPSS software and the total number of 38 variables is reduced to 8 factors. (refer Table No. 2)

Table No. 2: Factor Analysis

Sr. No.	Variables	Factor-1	Factor-2	Factor-3	Factor-4	Factor-5	Factor-6	Factor-7	Factor-8
		Varimax rotated loadings							
1	Top mgt. commitment	0.590							
2	Well defined org. structure	0.808							
3	Defined Productivity targets	0.855							
4	Review of productivity issues	0.828							
5	Preventive Maintenance		0.505						
6	Breakdown Maintenance		0.617						
7	Yarn quality			0.846					
8	Dye quality			0.810					
9	Water quality			0.760					
10	Warp quality (Beam)			0.801					
11	Weft quality (Shuttle)			0.658					
12	Stitching quality			0.582					
13	Defined authority / resp.				0.422				
14	Training to employees				0.661				
15	Policy for motivation				0.787				
16	Perf. appraisal system				0.506				
17	Occupation health				0.787				
18	Complaints handling system				0.708				
19	Involvement of employees				0.468				
20	Salary Structure				0.432				
21	Manufacturing process					0.806			
22	Dyeing process					0.830			
23	Beam lifting in your unit					0.501			
24	Stitching process					0.817			
25	Use of renewable energy					0.758			
26	Labour Absenteeism						0.887		
27	Carelessness of labours						0.853		
28	young generation's reluctance						0.765		
29	Use of scientific tools							0.789	
30	Use of SPC tools							0.886	
31	Continual improvement							0.520	
32	Presence of systems like ISO								0.416
33	Defined system of records								0.618
34	Corrective action								0.836
35	Preventive action								0.867
36	work instructions								0.523
37	Eigen Values	8.269	4.326	3.113	2.203	1.985	1.792	1.512	1.429
38	Cumulative % of Variance	10.911	21.298	30.905	39.39	47.546	53.699	59.155	64.38

3.6 Findings and Discussions

The first factor is labeled as '**synchronization of management processes**', it consists of top management commitment, setting up of organization structure, defining the productivity targets/ goals and review of productivity related issues.

The second factor labeled as '**TPM for weaving and dyeing**'. It represents two major variables- Preventive maintenance and breakdown maintenance. TPM covers both of these types of maintenance and is related to productivity.

The third factor represents all quality related variables. Input quality (yarn) has higher loading (0.846) and is a major contributor in all further processes. Process quality also consists of dyeing process which has a loading of 0.810. All other variables are a part of process quality; therefore the factor is named as '**input and process quality**'

The fourth factor is representing HR related variables namely authority and responsibility, training, policy for motivation, performance appraisal, occupational health and safety, complaints and grievance handling systems etc. so the factor is named as '**HR policies for textile SMEs**'.

The fifth factor is labeled as '**process technology**'. Dyeing, beam preparation, weaving, stitching and finishing are the main processes used in manufacturing of terry towels. The technology which can be used may be manual/ semi-automatic/ automatic. Also the energy input for these processes can be conventional or renewable (like solar, wind etc.) hence these variables can be conveniently called as process technology.

The sixth factor is typical to textile SMEs in Solapur, which is named as '**labour behavior**'. Labour absenteeism, carelessness of labour are considered under this factor.

The seventh factor is '**use of scientific tools for improvements**'. This factor involves variables related to improvements. Tools such as six sigma, lean, TOC, SPC etc. are considered here.

The eighth and last factor is worded as '**system deployment**'. Systems such as ISO 9000, corrective and preventive actions and their related records are all grouped under this factor.

3.7 Conclusion

After literature review, designing the questionnaire, data collection and analysis the following conclusions can be drawn:

There are eight important factors which can affect the productivity of textile SMEs: synchronization of management processes, TPM for weaving and dyeing, input process quality, HR policies for textile SMEs, process technology, labor behavior, use of scientific tools and techniques and systems deployment.

The outcome of this empirical study can form an important reference to continue the research for investigating the relationship between output variable and input factors.

3.8 Recommendations to manufacturing industries

It is suggested that, the study can be helpful to the textile manufacturing industries for improving the productivity as it will give direction for suitable action plan. The study clearly reveals the factors along with their weightages, so that the organization can focus on these factors for improving productivity.

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