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RESEARCH ARTICLE

Determinants of productivity and estimation of production efficiency of workers in knitwear industry

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Abstract

In order to improve the cost efficiencies of knitwear industry and to provide a competitive edge, improvement in labor productivity was extremely important. To bring this improvement, it was first necessary to measure the current productivity level of the industry so that concentrated efforts can be made to bring improvement. The present study made an attempt to identify the current productivity levels in the knitwear industry of Ludhiana by using time study technique. A benchmark was created for individual firms to identify standard available minutes for each operation as the resource allocation in terms of machinery quality and raw material quality differ from product to product and from firm to firm. To calculate labour efficiency in each firm, data was captured for 20 consecutive days by taking the details of number of operators in a production line and the number of working hours. On the basis of this information, total minutes produced by each firm and the total minutes available for the firms was calculated. The data captured through line efficiency estimation technique revealed that the current labor productivity levels in knitwear industry of Ludhiana were estimated as 39.02 percent. The defect rate was also found to be considerably higher which led to a lot of rework negatively affecting the productivity levels of the industry. Defects per hundred units were highest when a new style was started and it tapered after 4- 5 days of working on an individual style.

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INTRODUCTION

Productivity is defined as the level of output produced by per unit of input. As the knitwear industry in general had been extremely labour intensive, the factories in Ludhiana had always been dependent on the skilled workforce for the creation of a diversified range of products. Labour productivity relates to the most important factor of production which affect not only daily output of a firm but also influenced the per capita income of the workers So 'labour productivity' was considered an important tool to measure the productivity of the industry. Hence the present study has been planned with the following objectives:

To develop tools for performance measurement in knitwear manufacturing firms

To analyze the production efficiency in three manufacturing firms.

Materials and methods

A set of "Performance assessment tools" were prepared to capture the data in order to compare the productivity of workers in various operations within a knitwear manufacturing firm. For collecting the data, three firms were selected by "Probability Proportional to Size (PPS)" method and Purposive sampling technique. The selected firms

had more than 200 employees and maximum women worker participation was observed in these firms. The data for key performance indicators like productivity percentage, and defect/rejection rate for men and women workforce employed in the production department was recorded and evaluated.

Results and discussion

Labour productivity was measured in the firm by measuring the number of garments produced by a line of sewing machine operators in a specific time frame. Time study or work study analysis measured the number of minutes required to produce a particular garment and that number was compared to a benchmark.

Determinants of labour productivity

Labour productivity was determined by a range of variables. Some of the structural characteristics which were taken into consideration during the course of study were size of the firm, physical layout of the workspace, workplace design, materials handling, and use of advanced technology (e.g., computer-aided design, pattern-making, or manufacturing; automated fabric spreading or cutting; information technology). These variables were kept similar during the course of analysis. Care was taken that product characteristic such as the complexity of product design remained constant during the course of study. As productivity analysis was done in all the three firms individually, characteristics such as firm's product mix, the degree of concentration of its client base or export markets, the duration of the manufacturing process, whether the firm is accredited by external organizations and the extent to which the firm manages its own sourcing, stayed similar for the study purpose.


The first step in measuring the performance for the analysis purpose was to define the targets while next step was to develop tools for performance measurement. As the output in a knitwear industry was the number of garments produced, the number of garments produced by a line of sewing machine operators in a specific time frame was calculated.

Standard Available Minutes (SAM) estimation for individual firms

SAM was calculated for the three factories by dividing the work into various elements and calculating the cycle time for each element. SAM value was calculated for all the operation related to the manufacturing of that particular garment running in line at the time of the analysis and the values were added to achieve the SAM of the garment.

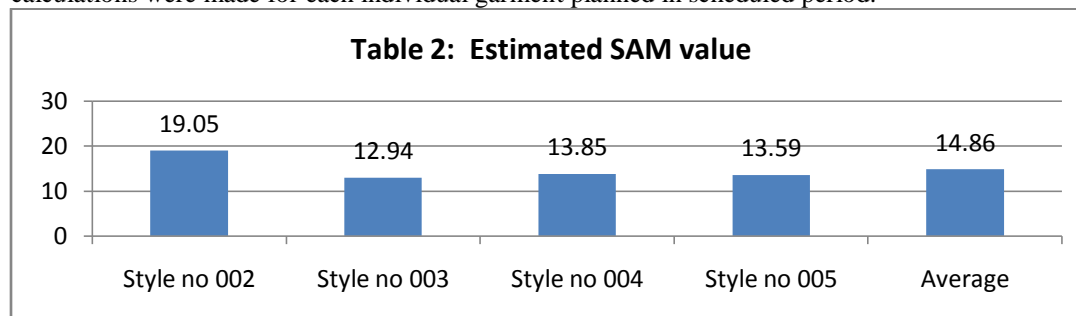
SAM value estimation – Firm 1

The data given in table 1 shows the SAM value estimation for firm 1.


Table 1										SAM VALUE CALCULATION					
Style No : 001										Factory No: 1					
Description: Short sleeve Polo T shirt										Buyer:					
Sl. No	Part	Part SAM		Machine Description	Cycle Time					Average Cycle Time (A)	Performance Rating (B)	Basic Time (A X B = C)	Bundle Allowance (10 %) (D)	Machine and Personal allowance (20 %) (E)	SAM (C + D + E)
					1	2	3	4	5						
			Operation Description												
1	Front		Placket Fusing	Manual	0.64	0.71	0.62	0.61	0.75	0.67	80%	0.54	0.054	0.12	0.71
2			Placket Making	SNLS	0.71	0.69	0.72	0.68	0.75	0.71	80%	0.57	0.057	0.13	0.77
3			Extra Fabric Cut and Marking	Manual	0.48	0.47	0.55	0.46	0.42	0.48	80%	0.38	0.038	0.084	0.5
4			Placket Attach Initial	SNLS	2.91	2.95	2.83	2.65	2.99	2.87	80%	2.3	0.23	0.51	3.04
5		7.6	Placket Finish and Placket Box	SNLS	2.46	2.65	2.41	2.45	2.22	2.44	80%	1.95	0.2	0.43	2.58
6	Back		Main label attach at moon Patch	SNLS	0.36	0.31	0.35	0.39	0.41	0.36	80%	0.29	0.029	0.064	0.38
7			Moon Patch Extra Fabric cut	Manual	0.27	0.34	0.29	0.25	0.27	0.28	80%	0.23	0.023	0.051	0.3
8		1.8	Moon Attach	SNLS	1.04	1.15	1.11	0.95	0.99	1.05	80%	0.84	0.084	0.185	1.12
Total SAM		9.4													

SAM value estimation – Firm 2

In the case of second firm, it was noticed that production run or the number of garments to be produced in each style was considerably less and four styles were planned in the scheduled study period of 20 days. Hence the SAM value calculations were made for each individual garment planned in scheduled period.



SAM value estimation – Firm 3

Table 3		SAM VALUE CALCULATION										
Style No : 006		Factory No: 3										
Description: Short sleeve Polo T shirt		Buyer:										
	Machine Description	Cycle Time					Average Cycle Time (A)	Performance Rating (B)	Basic Time (C)	Bundle Allowance (10 % of C) (D)	Machine and Personal allowance (20 % of D) (E)	SAM (C + D + E)
		1	2	3	4	5						
Operation Description												
Collar cutting	Manual	0.31	0.35	0.37	0.32	0.34	0.34	80%	0.27	0.027	0.06	0.36
Bottom hem	FL	0.42	0.46	0.43	0.45	0.44	0.44	80%	0.352	0.0352	0.079	0.47
Tape cutting	Manual	0.23	0.19	0.24	0.25	0.23	0.23	80%	0.184	0.0184	0.04	0.24
Tape attach	OL	0.41	0.37	0.43	0.39	0.44	0.41	80%	0.33	0.033	0.073	0.436
Tape folding	FL	0.27	0.29	0.3	0.28	0.29	0.29	80%	0.23	0.023	0.05	0.304
Fusing attach	SNLS	0.27	0.3	0.29	0.31	0.26	0.29	80%	0.23	0.023	0.05	0.304
Placket attach	SNLS	1.45	1.23	1.38	1.28	1.39	1.346	80%	1.08	0.11	0.24	1.43
Moon attach	SNLS	0.91	0.85	0.89	0.87	0.8	0.86	80%	0.69	0.07	0.15	0.91
Shoulder attach	OL	0.51	0.53	0.57	0.51	0.52	0.53	80%	0.42	0.04	0.09	0.55
Collar attach final	SNLS	2.57	2.65	2.55	2.63	2.53	2.59	80%	2.07	0.21	0.46	2.74
Placket final	SNLS	2.05	1.99	2.05	2.02	1.96	2.01	80%	1.61	0.16	0.35	2.12
Sleeve hem	FL	0.69	0.72	0.71	0.65	0.68	0.69	80%	0.55	0.06	0.12	0.73
Sleeve attach	OL	1.78	1.72	1.69	1.65	1.72	1.71	80%	1.37	0.14	0.3	1.81
Side seam	OL	1.19	1.21	1.18	1.19	1.15	1.18	80%	0.94	0.094	0.2	1.24
Total SAM												13.65

Labour efficiency estimation for individual firms : To calculate labour efficiency in each firm, data was captured for 20 consecutive days by taking the details of number of operators in a production line and the number of working hours. The daily efficiency detail for a period of twenty days was assembled for each firm. The labour efficiency was calculated with the help of data recorded in these tables.

Conclusion

The benchmark created with the help of SAM value estimation in knitwear firms was helpful in identifying the present level of productivity in knitwear manufacturing firms of Ludhiana. The investigation revealed that the current labor productivity levels in knitwear industry of Ludhiana were estimated as 39.02 percent. The defect rate was also found to be considerably higher which led to a lot of rework negatively affecting the productivity levels of the industry. Defects per hundred units were highest when a new style was started and it tapered after 4- 5 days of working on an individual style

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