

Increasing Efficiency: Case Study of Ready Made Garments in Bangladesh

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Abstract:

In this article, we look at recent developments in the Bangladesh garment industry on the issue of efficiency and productivity. First, we were looking for new ideas. How are companies trying to improve their efficiency? Then, we were trying to see if there was a relationship between a companies' (x) efficiency and cost saving (a) and increased revenue (y). Of course, intuitively, we would all hypothesise that there must be some relationship between efficiency and reduction of cost of manufacturing and ultimately increased revenue. Further, we would all probably hypothesise that the slope of the function describing that relationship must be significantly higher than zero. Nevertheless, we tried to document the connection so that companies can believe it and give it more attention. Theoretical relationships are one of the weakest ways to try to persuade CEOs of the existence of anything. Show them the numbers, only then they will agree. This paper is an attempt to persuade a readymade garments manufacturing unit to increase efficiency to cut cost and increase revenue, we show that there is a direct causal relation to efficiency and revenue earnings.

Keywords: Efficiency, Cost Reduction, Competitive Advantage, Bangladesh Ready Made Garments.

1. Introduction

Today's manufacturing industries are operating in a new paradigm of volatility, uncertainty, complexity (chaotic), and ambiguity, known as VUCA atmosphere. Therefore, to save operational costs, most industrialists will try to maximise efficiency. This means bulk production of standardised products, reduced workforce and shorter lead time where they need to be more efficient, effective and provide variety of good quality products at lower prices. This is a difficult goal to achieve since good quality products are associated with rise of operational costs.

Ready Made Garments (RMG) of Bangladesh (BD) is troubled with poor efficiency. The efficiency of RMG BD is an average of 45% comparing to its competitors who fair an average of more than 65%. Lack of efficiency leads to increased lead time which is 45 days to 90 days for RMG BD. Lack of

efficiency not only results to increased lead time but also cost money and therefore, RMG BD has a higher cost of manufacturing despite having the advantage of the world's cheapest labour.

This is an attempt to address issues that affects efficiency by increasing attributes that compliment and by minimising factors that inhibit efficiency. We quantify the factors having direct impact on efficiency and measure ways to increase the impact. Finally, we generalised the quantification of our measures for readymade garments.

2. The Research Problem

Efficiency is an important attribute because inputs are scarce and it cost money. Therefore, it is essential for any organisation to achieve their targeted productivity by using limited resources like operators (men/women), materials, machines, money and time. Because of poor sewing efficiency, XYZ (not original Name) Knitting (Pvt.)

Ltd.'s cost of manufacturing is higher comparing other manufacturing units in the RMG BD. The reason is they failed to achieve their daily targets and also daily sewing efficiency level which has a direct effect on revenue earnings.

2.1 Research Question

What are the relationship between Efficiency, Cost, and Revenue in the RMG BD?

3. Literature Review

What is efficiency?

The ratio of the useful work (output) performed by a man, machine or in a process to the total input taken in.

Productivity

Productivity is the measure of output per unit of input.

Workstation

An ideal workstation in the apparel industry is a machine layout which consist of minimum motion, travel, waiting (least movements and minimum length of every action) and ergonomically comfortable. A machine workstation looks like following:



Figure 1: Workstation

Line Layout

The sewing line layout is a sequential formation where sewing workstations are placed on the sewing floor to produce an output. Materials start flowing from the back to the front in a straight single line layout. There are modular line layouts, and U shaped line layout or Section layouts, too. Some also use circular and zigzag shaped layout. One directional linear single line layout is as follows:

A—B—C—D—E—F

1—2—3—4—5—6



Workstation and line layout

Pic: Denim Experts Bangladesh

Bottleneck in Production Line

In a production sewing line, where input flow is not flowing smoothly, and production goes under capacity. Meaning input-capacity-flow-output is not balanced or one part is performing below. In other words a piled up WIP –work in process is the sign of a bottleneck. The following diagram shows bold marks are bottlenecks.

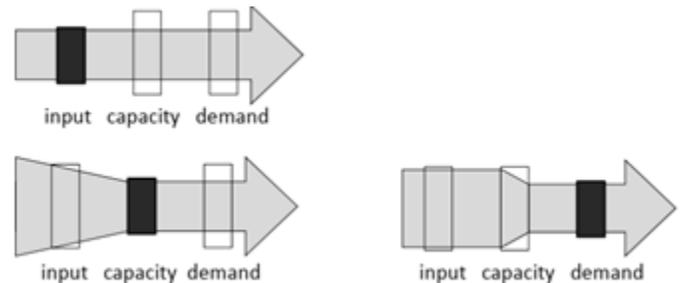


Figure 2: Bottleneck

Line Balancing

In a balanced line, input will flow smoothly and no time will be lost in waiting for work. Balancing the line means jobs assigned to the workstations in a way that there is no piled up work/input in one workstation and other workstation is waiting for work, so each workstation has input, WIP according to workstation cycle time, and idle time across all workstations are minimized. Simply stating minimising the bottlenecks will make a line balanced.

Standard Minute Value (SMV)

Standard Time (also referred to as the “Standard Minute Value” or “SMV”), is the time required for a qualified worker working at “Standard

Performance” to perform a given task. The SMV includes additional allowances for Rest and Relaxation, Machine Delay and anticipated Contingencies

Multi-skilled operators

Operators who can perform multiple sewing operations and can work in a major process like bartack, overlock, kansai, flatlock machines etc.

4. Factors Affecting Efficiency

Following are the factors considered to increase efficiency:

- 1) Good Leadership
- 2) Automation.
- 3) Layout to reduce SMV
- 4) Assign multi-skilled operators to do multiple operations
- 5) Incentive for high performance to reduce OT
- 6) Right first time quality-no rework.
- 7) PO wise batch wise size wise output.
- 8) Reduce and have required Work In Process - WIP.
- 9) Reduce or eliminate Non Productive Time - NPT.
- 10) Operators’ skill development through training.

On the other hand, followings are factors that inhibit sewing efficiency:

- 1) Poor Leadership
- 2) Operator Working Skills
- 3) Working Experience
- 4) Job satisfaction
- 5) Machine Breakdown
- 6) Assigned Quality Targets
- 7) Physical Working Environment
- 8) Training and Development
- 9) Supply Chain Problem and Material Quality
- 10) Change Over time

Automation



Fig 3: Automation with an attachment/device

An overlock machine with KS attachment saves 18.2 seconds in each cycle time of operation. Therefore, 200 pieces per hour would see a savings of (200 X 18.2 X 60 X 60 seconds) 3,640 minutes = 60 hour, that’s 2 and a half day. The automation and use of folders will reduce the SMV, too.



Fig 4: Folders

Along with folders to minimise cycle time and reduce SMV we can use auto trimmers and other automation to reduce work cycle time.



Fig 5: Manual vs Automatic thread trimming

Line Layout

One direction sewing machine single layout

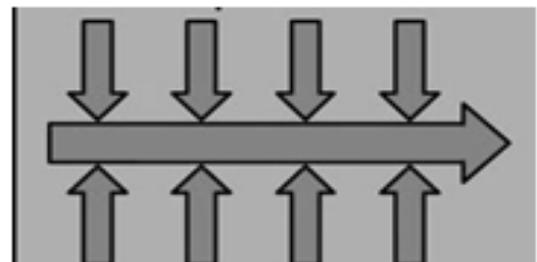


Figure 6.1: Single Line

After observing the motion study the work study team has to find out the bottleneck and put machines or men to address the bottleneck. This layout can be modified as below

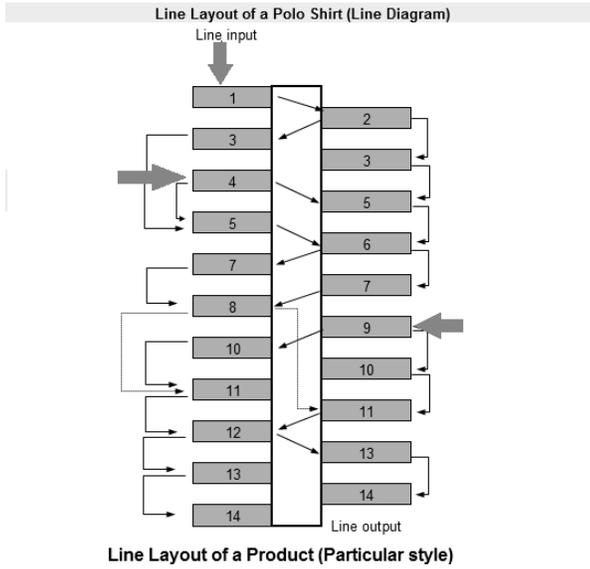


Figure 6.2: Modified Line Layout

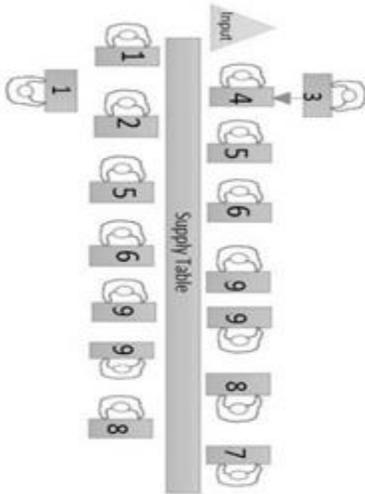


Fig 6.3: Modified Line Layout

Layout Assigning Multi Skilled Operators

The layout depends on the space of the factory, the number of multi skilled operator available, and depends on the single piece flow approach or batch system flow approach. In all cases the objective will be to reduce motion, reduce waste, and reduce travel time and Work In Progress (WIP). Multi skilled operators work in a U layout as below, and reduce men, machine by doing multiple operations. Below dotted lines show multiple operations in a U shaped layout:

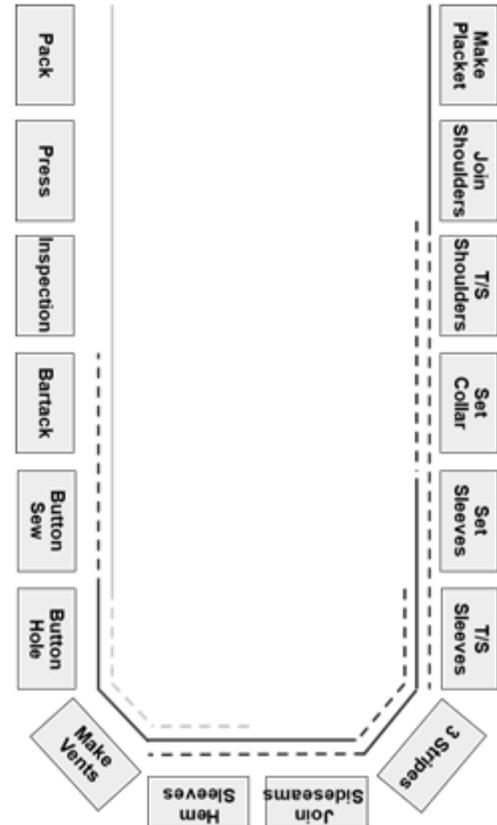


Fig 7: Layout of Multiple Operations

This layout is the most suitable, productive and cost effective layout which enables multi-skilled operators to work up to 65% of their efficiency (average efficiency of Bangladesh RMG operators are 45%)

If the factory is running same product family in the lines then these are adaptive lines, we may also use flexible lines for product families that are same type-body and same SMV, may be the colour will be different. However, the zero changeover time has to be implemented to derive maximum efficiency.

Incentive for high performance to reduce Over Time (OT)

In Bangladesh RMG, the cost of making a Polo tee shirt is plus-minus 3\$ where the operators and workers work generally 10 hour, 8 hour work shift and 2 Hour OT.

An OT is double payment per hour than the general hours. If a worker works 2 hour per day then his/her total OT per month will be 48 hours (2 hour x 6 days x 4 weeks), however the country's compliance audit reports show 68, even some cases 70 hours of OT. Again, any holiday work has to be compensated by

an off day in addition to OT, making it almost 4 X times than the general pay. Therefore, any incentive to minimise OT will be profitable for the factory. Any amount of OT will make the cost of manufacturing higher.

Man Machine Ratio- MMR

In RMG BD the operators, helpers, and iron men are the direct manpower, the notion is anybody behind the needle is direct manpower and adds value. The indirect manpower are: quality checkers, finishing men, industrial engineers, and non-value added manpower are: securities, administrative personnel etc. So to keep the MMR cost effective we look at a man machine ratio of 1:1.8. Here also automations can reduce manpower. For example, physical securities can be replaced by CCTV cameras and monitored from a single monitoring room. RFID tags may be used to make store inventory and reduce store manpower.

Right first time quality-no rework

RMG BD works in an accepted quality level method (AQL) however, any quality defect has direct impact and needs to do rework which increases cost of manufacturing. Not only it cost money, it cost time, it cost material and even failure to ship goods for not meeting required quantity.

PO wise batch wise size wise output

RMG products are normally orderd size wise and purchase ordedr include size wise ratio, therefore if the input is given likewise then we do not lose time to compile and close orders PO wise.

Work In Process -WIP

Adequate WIP is the pre-requisite to have targeted output, generally the WIP is to be one day production, and the flow will be one day production out and one day production in-and one day as WIP

Non Productive Time -NPT

Followings ate the probale reasons that we have non- productive times NPTs:

Meetings

Compliance meetings HR Meetings Production Meetings Fire Drills

Trainings marketing issues

Merchandising issues Cutting delay – input delay Print delay

Embroidery delay Fabric delay

Reworks

Machine breakdown Power failure

Operators' skill development through training

All operators' skill assessment done and a register maintained. Apprentices receive special training. Operators with single skill are trained to become multi- skilled operators. Critical and non-critical operations are segregated to train better. Appropriate skill level required to perform an operation is measured. Machine used are: Single Needle Lock Stitch, over edge, semi-automatic machine or Flat Lock machine. Moreover, operators are trained to handle little break down of machines. Specialised, suitably trained instructors are to impart and conduct training. Training shall have initial training area before they are put into the lines.

Poor Leadership

Opposite of the warmth of good leadership any organisation can feel the grunt of poor leadership who fails to plan properly and therefore, the implement becomes difficult and costly.

Operator Work Skills, Training and Development, Work Experience, Job satisfaction, Physical Working Environment, Assigned Quality Targets - all these factors are interrelated.

Likewise Machine Breakdown, Supply Chain Problem and Material Quality all are inter related factors that affect the efficiency.

Changeover time

Changeover time in sewing line is the time taken from producing the last piece of the completing style to the time taken in producing the first piece for the new style with good qualities.

Changeover Time=Time of first good quality piece for the new style – Time of last good quality piece of the completing style

Putting a product family in one line will ensure reduced change over time.



Flexible Cell design will also reduce change over time.



Data showing reduced change over monitoring

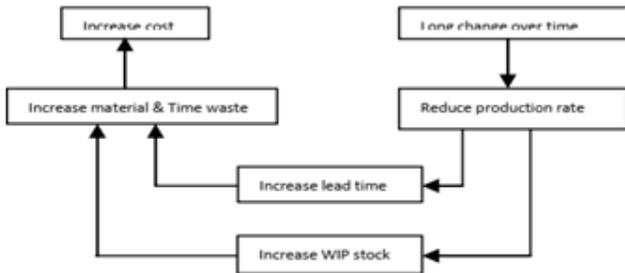


Fig8 3: figures showing impact of change over time

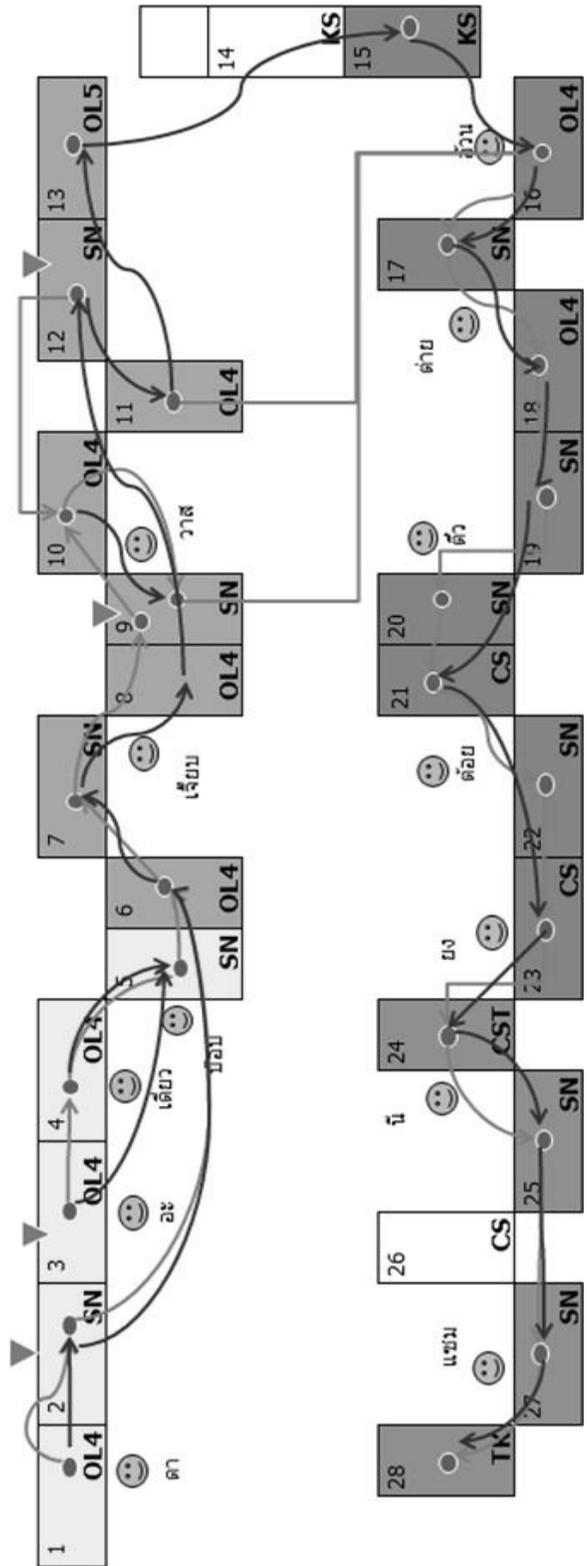


Fig 9: Cell approach reduced change over or zero time

5. Methodology

The conceptual framework for the statistical analysis of increasing efficiency in the readymade garments in Bangladesh

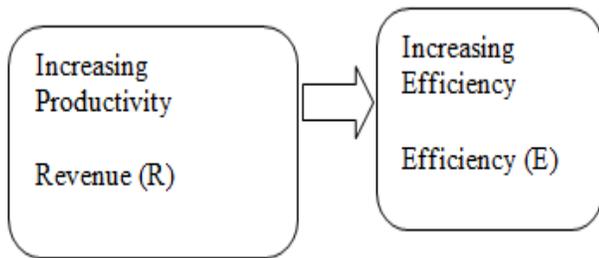


Fig 14: Concept for Statistical Analysis

<i>Increasing Productivity</i>	<i>Increasing Efficiency</i>
<ul style="list-style-type: none"> • Revenue (R) • Manufacturing Cost (MC) 	<ul style="list-style-type: none"> • Efficiency (E)

The statistical process involved in the study is multiple regression analysis using all the two productivity related factors of readymade garments factories, as considered in the study, as the predictor variables and one effects of efficiency as response variable individually. Thus, the regression equation has been attempted to be constructed as under:

Productivity related factors in the readymade garments factories = f [Revenue (R), Manufacturing Cost (MC)]

i.e. Productivity related factors in the readymade garments factories = $\alpha + \beta_1 * R + \beta_2 * MC$

The values of the predictor and respondent variables were on ordinal scale. For constructing the regression equation we have used ordinal data.

The efficiency of the regression equation has been tested on the basis of the following parameters:

- a. Adjusted R²
- b. Statistical significance of the F-statistic of ANOVA tested at 5% Level of Significance
- c. Statistical significance of the t-statistic of the regression coefficients of each of the predictor variables tested at 5% Level of Significance
- d. Durbin-Watson statistic for checking the problem of autocorrelation, if any

e. Variance Inflation factor (VIF) of each of the predictor variables to test any probable problem of multicollinearity.

The dependent variable i.e. Efficiency (E) has been regressed using all the 2 predictor variables i.e. R and MC simultaneously.

While constructing the regression equation, the coefficients of the predictor variables have been tested for their statistical significance by framing the following hypotheses:

H₀: The coefficient of the predictor variable is not statistically significant

H₁: The coefficient of the predictor variable is not statistically significant

The predictor variables having statistically insignificant coefficients i.e. the absolute value of t-statistic for which is less than 2 and the p-value is less than or equal to 0.05, have been rejected and the regression equation has again been constructed with the statistically significant predictor variables only.

The robustness of the final regression equation thus formed for the dependent variable, has been tested by framing the following hypotheses:

H₀: The regression equation is not statistically robust
H₁: The regression equation is statistically robust

The null hypotheses is rejected at all p-values of less than 0.05.

The regression equation has considered to be free from the problem of autocorrelation if the Durbin-Watson statistic has been found to lie between 1.20 to 2.10.

The regression equation has been considered to be free from the effects of multicollinearity if the values of the VIF (Variance Inflation Factor) statistic of the predictor variables in the final regression equation have been found to be below 10.00.

Ultimately, the distribution of the residuals of the regression equation has been tested whether they follow a normal distribution. The greater degree of conformity of the distribution of residuals bear to a normal distribution, the more robust the regression equation is deemed to be.

6. Results

From the above research we found, Net FOB Cost is to

28.25 (from 28.97\$) = .72\$ reduced per dozen i.e. .06\$ per piece.

Cost of making is reduced to 3.55\$ (from 4.20\$) = .65 \$ So per piece cost is reduced by $.65/12 = .054$ \$

If we have 50,000 pcs orders per PO (purchase orders) then 5 POs will have 250,000 pcs tee shirt, i.e we are able to reduce 13,500 \$ (reduction in cost of making), and 15,000\$ reduction in FOB cost. Let us see how by explaining factors one by one:

Modification of processes, decreased SMV reduce the Cost of Manufacturing

O p e r a t o r	Operation	SMV	 Product
1	Hem	0.98	
2	Attach Placket	0.15	
3	Make Placket	1.58	
4	Join Shoulders	0.38	
5	T/S Shoulders	0.36	
6	Set Collar	0.98	
7	Set Sleeves	0.78	
8	T/S Sleeves	0.72	
9	Join Side seams	0.57	
10	Hem Sleeves	0.25	
11	Make Vents	1.13	
12	Buttonhole/Butt on sew	0.60	
13	Bartack	0.58	
14	Inspect	0.98	
15	Press	0.58	
16	Pack	0.38	
	Total	11.68	

Table 1: Calculating SMV of a tee shirt

Cost Sheet of manufacturing as per SMV 11.68

CM CALCULATION		Sales Contract 0001	
Factory/Unit		XYZ KNITTING LTD	
SMV	11.68		
Number of Machines per Line			19
Factory cost per machine/line		Tk.	1400
Production per line per day (10 hrs)		Pcs	2000
Production cost per dozen in taka		Tk.	160
Production cost in DznUS\$ (\$=Tk. 78)		USD	4.20
A. Material Cost			
Particulars			
1. Fabric Cost with comm		\$12.97	
2. Accessories with comm		\$6.22	
Total Material Cost		\$19.19	
B. Production Cost			
Particulars			
1. Factory cost		\$4.20	
2. Washing Cost		\$1.00	
3. Garment/Over Dyeing		\$0.00	
4. Dry Processing		\$0.00	
5. Printing		\$2.00	
6. Embroidery		\$0.00	
7. Others (if any)		\$0.00	
Total Production Cost		\$7.20	
C. Cost of Goods			
Particulars			
Cost of Goods Sold (A+B)		\$26.40	
D. Overhead			
Particulars			
1. HO & Admin Cost		\$0.13	
2. Merchandising & Mktg Cost		\$0.13	
3. Test & Courier		\$0.66	
4. Export commercial/finance		\$0.26	
5. Others(if any)			
Total Overhead		\$1.19	

E. Final Cost of Goods				
Particulars				
Final Cost of Goods		\$27.59		
F. Corporate Profit				
Particulars				
Corporate Profit (5%)		\$1.38		
G. Net FOB Cost				
Particulars				
NET FOB COST		\$28.97		
H. Calculated CM				
Particulars				
Calculated CM		\$6.77		
ACTUAL CM		\$7.21		
Factory CM			\$1.80	
Corporate CM			\$7.71	
Actual CM			\$7.21	

Table 2: Cost sheet

Reducing SMV after modification by industrial engineering as follows:

Op	Operation	SMV	After Modification
1	Hem	0.98	Operation minimised
2	Attach Placket	0.15	Operation minimised
3	Make Placket	1.58	1.58
4	Join Shoulders	0.38	0.38
5	T/S Shoulders	0.36	0.36
6	Set Collar	0.98	0.98
7	Set Sleeves	0.78	0.78
8	T/S Sleeves	0.72	0.72
10	Join Sideseams	0.57	0.57
11	Hem Sleeves	0.25	0.25

1	Make Vents	1.1	1.13
2		3	
1	Buttonhole/Buttons	0.6	0.6
3		ew	
1	Bartack	0.5	0.58
4		8	
1	Inspect	0.9	0.98
5		8	
1	Press	0.5	0.58
6		8	
1	Pack	0.3	0.38
7		8	
	Total	11.68	9.87

Table 3: SMV Reduced by modification

SMV reduced by: 11.68 - 9.87 = 1.81 minutes

CM CALCULATION		Sales Contrac-06	
Factory/Unit		XYZ KNITTING LTD	
SMV	9.87		
Number of Machines per Line			17
Factory cost per machine/line		Tk.	1400
Production per line per day (10 hrs)		Pcs	2000
Production cost per dozen in taka		Tk.	143
Production cost in Dzn US\$ (\$ = Tk. 78)	USD		3.55
A. Material Cost			
Particulars			
1. Fabric Cost with comm		\$12.97	
2. Accessories with comm		\$6.22	
Total Material Cost		\$19.19	
B. Production Cost			
Particulars			
1. Factory cost		\$3.55	
2. Washing Cost		\$1.00	
3. Garment/Over Dyeing		\$0.00	
4. Dry Processing		\$0.00	
5. Printing		\$2.00	
6. Embroidery		\$0.00	
7. Others (if any)		\$0.00	
Total Production Cost		\$6.55	

C. Cost of Goods				
Particulars				
Cost of Goods Sold (A+B)		\$25.75		
D. Overhead				
Particulars				
1. HO & Admin Cost		\$0.13		
2. Merchandising & Mktg Cost		\$0.13		
3. Test & Courier		\$0.64		
4. Export commerce/finance		\$0.26		
5. Others (if any)				
Total Overhead		\$1.16		
E. Final Cost of Goods				
Particulars				
Final Cost of Goods		\$26.91		
F. Corporate Profit				
Particulars				
Corporate Profit (5%)		\$1.35		
G. Net FOB Cost				
Particulars				
NET FOB COST		\$28.25		
H. Calculated CM				
Particulars				
Calculated CM		\$6.06		
ACTUAL CM		\$7.21		
Factory CM			\$1.80	
Corporate CM			\$6.51	
Actual CM			\$7.21	

Table 4: Revised cost as per reduced SMV

Modified Operation Bulletin to decrease men and machine as per revised cost and SMV

N	OPERATION	M/C	SMV
1	CARE LABEL ATTACH	SNL	0.12
2	PLACKET ATTACH	MNL	0.25

	POSITION MARK		
3	PLACKET ROLLING & MARK	SNL	0.32
4	PLACKET ATTACH	SNL	0.4
5	PLACKET CUT & NOSE TK	SNL	0.27
6	FRONT & BACK PART MATCH	MNL	0.15
7	SHOULDER JOINT	4OL	0.3
8	NOSE NECK RIB MEASURE & CUT	MNL	0.2
9	NOSE NECK RIB TK WITH BODY	SNL	0.32
10	NOSE NECK RIB JOIN	4OL	0.32
11	NECK TS	FL	0.25
13	PLACKET CLOSE & 1/16 UPPER	SNL	0.32
12	PLACKET CLOSE & 1/16 LOWER	SNL	0.32
14	PLACKET BOX	SNL	0.4
15	NECK PIPING	FB	0.23

16	MAIN LBL ATTACH WITH	SNL	0.32
	FOLD		
17	SLV HEM	FL	0.33
18	SLEEVE AND BODY	MNL	0.15
	MATCH		
19	SLEEVE JOINT	4OL	0.45
20	ARM HOLE T/S	FL	0.32
21	SIDE SEAM	4OL	0.7
22	SLEEVE CLOSE & OPEN	SNL	0.37
	TACK		
22	BODY HEM	FL	0.33
22	BUTTON HOLE	BH	0.3
22	BUTTON ATTACH MARK	BS	0.27
22	BUTTON PUSH	MNL	0.2
22	FINAL THREAD CUT	MNL*	0.5
	STICKER REMOVE		
	TOTAL		8.41

Table 5: Operation Breakdown/Bulletin (OB) of the Tee Shirt with Required Machines

Above factors and methods save $9.87 - 8.41 = 1.46$ minutes
 Total Save = $1.81 + 1.46 = 3.27$ minutes

Factors Influencing Increasing Efficiency	Impact	Factors Influencing Negatively and Decreasing Efficiency	Weightage
Good Planning and Leadership	Direct	Poor Planning and Leadership	5
Automation.	Direct	Machine Breakdown	5
MMR	Direct	Change Over time	5
Layout to reduce SMV	Direct	Operator Working Skills	5

* SNL- Single Needle Machine, MNL-Multiple Needle/2Needle machines, FL- Flatlock, OL-Overlock, 4OL-4Thread-Overlock

Assign multi-skilled operators to do multiple operations	Direct	Working Experience	5
Incentive for high performance to reduce OT	Direct	Physical Working Environment	4
Reduce and have required Work In Process -WIP.	Direct	Supply Chain Problem and Material Quality	4
Reduce or eliminate Non Productive Time -NPT.	Indirect	Job satisfaction	3
Operators' skill development through training.	Indirect	Training and Development	3
Right first time quality- no rework.	Indirect	Assigned Quality Targets	3
PO wise batch wise size wise output.	Indirect	Imbalanced input	3

Table 6: Summarising the factors

Factor	Actions	Savings
Good Planning and Leadership	PO Wise input Marker Savings Cutting Savings	Fabric which is 60% of the total cost
Automation	Reduce SMV	Cost of work hour
MMR	Reduce Manpower	Cost of Labour
Layout	Reduce WIP Reduce SMV Reduce Men	Cost of Labour
Assign Operators	Reduce Manpower Reduce machine	Labour Cost
Reduce OT	Reduce Work hour	Labour Cost

Table 7: Summary of Factors

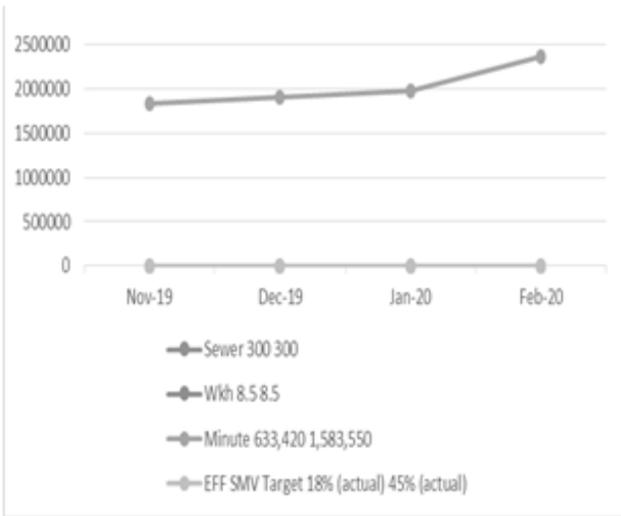


Fig 10: the climb of efficiency graph

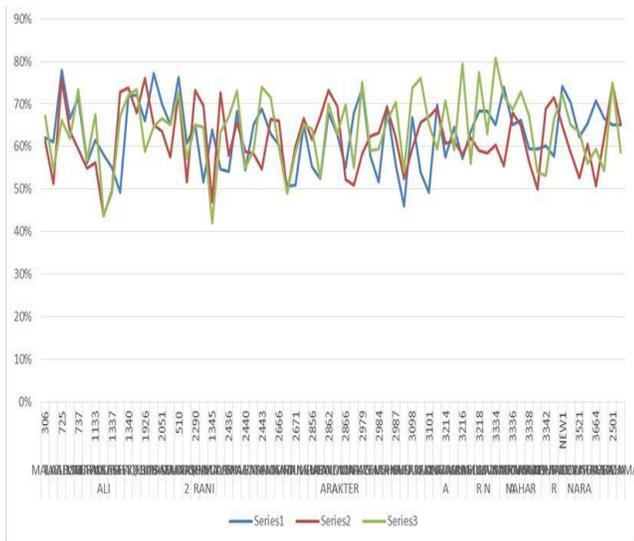


Fig 11: last 3 months skill overlapping

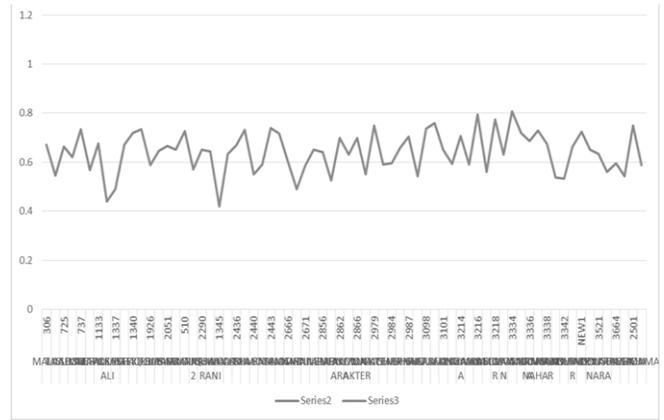


Fig 12: Last month

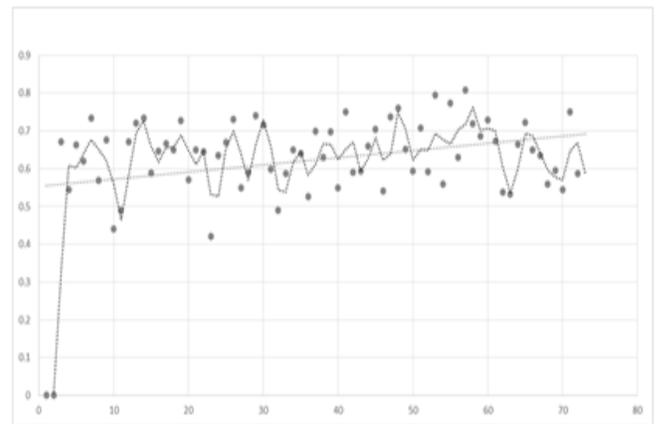
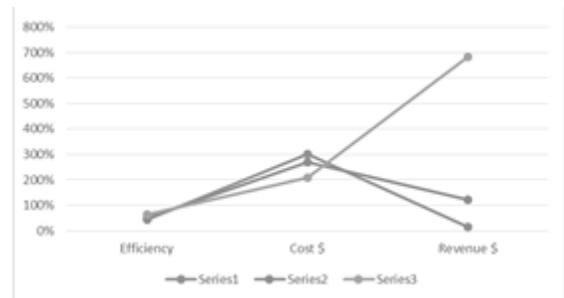


Fig 13: Efficiency

Efficiency (X) is increasing while Cost of manufacturing

(A) is decreasing and Revenue Earnings increasing (Y)

Efficiency	Cost \$	Revenue
45%	3	0.15
50%	2.7	1.215
65%	2.076923	6.813346



7. Discussion and Analysis

Explanation of the rationale for Statistical Analysis used in the study

Model Summary^b

Model	R	R	Adjusted	Std. Error	Durbin-Watson
		Square	d R Square	of the Estimate	
1	.591 ^a	0.349	0.343	7.09%	1.298

a. Predictors: (Constant), Manufacturing Cost, Revenue

b. Dependent Variable: Efficiency

ANOVA^a

Model	Sum of Squares	df	Mean Square	F
Regression	5570.071	2	2785.036	55.465
1Residual	10394.071	207	50.213	
Total	15964.142	209		

a. Dependent Variable: Efficiency

b. Predictors: (Constant), Manufacturing cost, Revenue

Coefficients^a

		Standardized			
		Coefficients			
		Unstandardized Coefficients			
				Sig.	
Model		B	Std. Error	t	
1	(Constant)	45.267	0.872	51.9	0
				0	0
	Revenue	1.166	0	1.55	10.51
		E-006			4
	Manufacturing cost	-	0	-1.399	-
		1.763			9.489
		E-006			

Collinearity Statistics

95.0% Confidence Interval for B		Collinearity Statistics	
Lower Bound	Upper Bound	Tolerance	VIF
43.547	46.986		
0	0	0.145	6.913
0	0	0.145	6.913

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	24.35%	66.63%	45.64%	5.16%	210
Residual	-	15.66%	-	7.05%	210
Std.					
Predicted Value	-4.123	4.067	0	1	210
Std.					
Residual	-3.187	2.21	0	0.995	210

a. Dependent Variable: Efficiency

The adjusted R2 value was at 0.343. This indicated that 34.3% of the variations in Efficiency (E) could be explained by the predictor variables of Revenue (R) and Manufacturing Cost (MC). The adjusted R2 value is too low because the other factors should not be considered in this study.

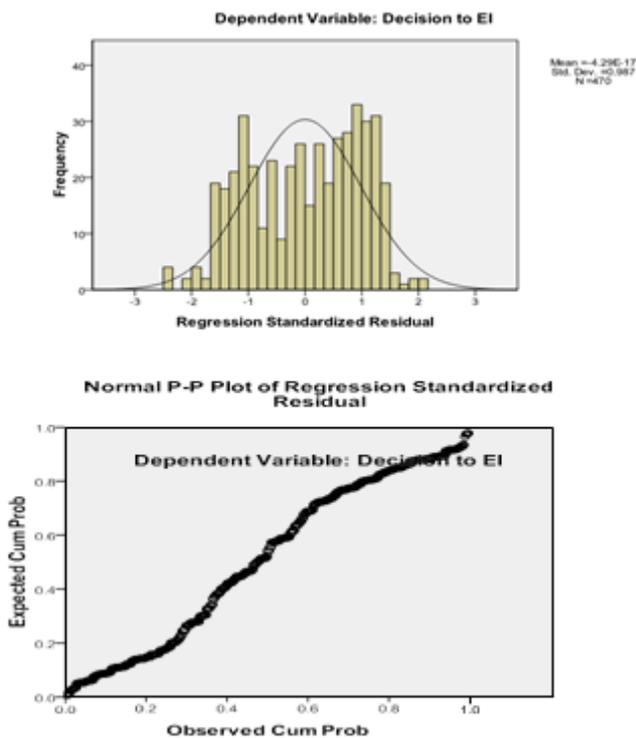
The regression equation was found to be robust with rejection of the null hypotheses. None of the equation was found to suffer from the problems of autocorrelation and multicollinearity as has been evident from the Durbin-Watson statistic lying between 1.20 and 2.10 and the VIF for the predictor variables were around 10.00.

A synopsis of the dependent variable and the concerned statistically significant predictor variables is given below:

Dependent Variable	Predictor Variables	
	Revenue (R)	Manufacturing Cost (C)
Efficiency (E)	✓	✓

It has been observed that Efficiency (E) influences by Revenue (R) and Manufacturing Cost (MC). It has been found that Revenue (R) is positively correlated with Efficiency (E) which indicating that if the efficiency of the readymade garments factories increased the revenue also been raised. It has also been seen that the Manufacturing Cost (MC) is negatively correlated with Efficiency (E) which revealed that if the efficiency of the readymade garments factories grown up the cost was ultimately decreased.

The distribution of the residuals of the regression equation is given below which represents that though the adjusted R2 are low, still the regression equation is or less robust.



8. Conclusion

The efficiency is the most important performance indicator of any industry especially in the readymade garments industry which helps to make revenue grow. An efficient garments industry increases the productivity and as a result the

earnings rise. From the study it can be concluded that the efficiency is positively correlated with revenue and negatively related with manufacturing cost. Finally it may be said that if the efficiency of the readymade garments industry in Bangladesh increases as the productivity grows and the revenue rises, too but the manufacturing cost decreases. The factors be considered for increasing the efficiency are: good leadership, automation, assigning multi-skilled operations, incentive for high performance to reduce OT, right first time quality-no rework, PO wise batch wise size wise output, reduced and have only required work in progress, reduce or eliminate non-productive time are confirmed by the study.

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