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COMPARATIVE EFFICIENCY MEASUREMENT OF THE SELECTED GARMENTS FACTORIES IN BANGLADESH: AN APPLICATION OF DATA ENVELOPMENT ANALYSIS (DEA)

Hamayet Hossain [1], Dr. Md. Mizanoor Rahman [2], Md. Nazmul Huda [3], Dr. Md. Abdus Sabur [4]

[1] Assistant Professor, Quality Education College, Dhaka, Bangladesh
[2] Professor, Department of Accounting and Information Systems, Islamic University, Bangladesh
[3] Assistant Professor, Department of Accounting and Information Systems, Islamic University, Bangladesh
[4] Professor, Department of Accounting and Information Systems, Islamic University, Bangladesh

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Corresponding Author

Md. Nazmul Huda,
nazmuliu07@gmail.com

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ABSTRACT

Readymade garments sector is the largest export earning sectors in Bangladesh. The efficiency of that sector is needed to compete and survive in the competitive global market. For the purpose of identifying the inputs and output variables which are deriving the efficiency of garments factories in Bangladesh, five garment factories have been selected purposively on the basis of availability of data as a sample size. Pearson coefficient correlation has been used to find out significant input variables related with output variable of sales revenue indicating the result that only cost of material and labour has significant impact among four input variables. From the method of CRS input oriented DEA, it is estimated that two garments factory are efficient relative to the(Fawellient factory of the rest three. If it is possible to reduce the excessive used of inputs (percentages) cost of material and labour then rest three inefficient factories would be capable as like as efficient two.

Keywords: Garments, Technical Efficiency, Performance, Input Variables

1. INTRODUCTION

Bangladesh was the 2nd position in the garments manufacturing products exported country in the globe market after china (*www.dhakatribune.com dated 04/08/2019*). But the garments factories had a past glories history for securing that position. In the past, Bangla was famous for Muslin and Silk in the worldwide Lesser

(1988) during 16th- 18th centuries and raw material of this silk and Muslin i.e. special quality of cotton was produced in Dhaka and surrounding area near Dhaka Eaton (1996). Huge amount of silk and cotton was exported from the Bengal to Europe, Indonesia and Japan Richards (1995). More than 50% of textiles were produced in Bengal and Dutch imported silks near 80% from Asia Prakash (2017). During the British period, this sector was decreasing their fame due to damping policy of British companies Cypher (2014), Tong (2016), Broadberry and Gupta (2005). During the Pakistani period in the history of Bangladesh, most of large industries along with textile mills were established and operated by the West Pakishtani people in the East Pakistan. After 1960 Bangli entrepreneurs also started their business in the jute mills and textile mill industries. After the liberation, Bangladesh faced capital problems as well as technical expert problem Lorch (1991). Father of the nation Bangabandhu enacted the Bangladesh Industrial Enterprises (Nationalization) Order, 1972 and took all the textile mills for the purpose of creating a state-owned enterprise (SOE). In the year of 1978, there were only nine export-oriented garment manufacturing units in Bangladesh and first direct export of garments were launched to ship10,000 shirts to a Parisian firm by a Bangladeshi firm Ullah (2014). Until the early 1980s, the state owned almost all spinning mills in Bangladesh and 85 percent the textile industry's assets (not including small businesses) Lorch (1991). The Bangladeshi government began to realize potential for the industry to flourish and offered development stimulus such as duty-free import machinery and raw materials, bonded warehouse facilities and cash incentives Uddin (2014). Desh garments, Reaz garments, Style Craft and Aristocraft were the first garments in Bangladesh. With the help of MFA (Multi-Fibre Arrangement) the garments sectors in Bangladesh were expanding rapidly and became the highest export earning sector in Bangladesh and achieved approximately 83 % of total exports whereas it was only 3.89 % in the year of 1983-84. A comparative statement of RMG export are stated in the following Table 1

Table 1

Table 1 Comparative Statement of Export During 1983-84 To 2021-22 Figure: Million USD

Year	Total RMG Export	Total export from Bangladesh	Percentage of Total Export
1983-84	31.57	811.00	3.89
2012-13	21515.73	27027.36	79.61
2013-14	24491.88	30186.62	81.13
2014-15	25491.40	31208.94	81.68
2015-16	28094.16	34257.18	82.01
2016-17	28149.84	34655.90	81.23
2017-18	30614.76	36668.17	83.49
2018-19	34133.27	40535.04	84.21
2019-20	27949.19	33674.09	83.00
2020-21	31456.73	38758.31	81.16
2021-22	42613.15	52082.66	81.82

Data Source Export Promotion Bureau Compiled by BGMEA

2. STATEMENT OF THE PROBLEM

Performance measurement is an essential tool to ensure the organization how it can be run in the right direction. It is required to achieve the goal of efficiency, productivity, and effectiveness Elgazzar (2013). Companies will not be able to compete and survive in the competitive global market without measuring performance Collin (2003), Chan and Qi (2003). The total export business of garments sectors is increasing over the period of time. In the business organization, there are various methods used to measure the performance that help the management to identify problems. Comparative performance measurement techniques in various modes have been applied to evaluate positions of selected garment factory during the period under review. To identify the performance position of selected garment factories Data Envelopment Analysis method may be used to determine the comparative performance measurement of the material cost, labour cost, overhead cost and operating cost. These are used as input costs and sales proceed is considered as output. The effective and efficient use of these factors by the management of garment factories leads to achieve satisfactory level of returns to reach the desired goal. It is noted that the managements of the most of the garment factory are not able to hold the stable position, upward trends or positive impact on returns resulting the miserable situation of the garment sectors in Bangladesh. Moreover, it is noted that the selected garment factories are failed to achieve homogenous satisfactory level of returns having same types of investment modes. The problems are caused by the lack of uniform situations of utilization of the factors those results to decrease the interest and bar to maximize wealth of the selected garments.

3. OBJECTIVE OF THE STUDY

The main objective of the study is to find out the efficiency of the selected garments factories in Bangladesh. The specific objectives are as follows:

1) To identify the inputs and output variables which are deriving the efficiency of garments factories in Bangladesh.
2) To determine the relative efficiency based on identified variables for the selected garments factories in Bangladesh.
3) To find out the problems of inefficient garments factories compare to the efficient one; and
4) To provide suggestion and recommendations for the betterment of garments factories in Bangladesh.

4. LITERATURE REVIEWS

Different academician, researchers applied the Data Envelopment Analysis for measuring the efficient performance.

Tehrani et al. (2012) stated that every commercial organization had performance measurement system which crated competitive environment. Researchers used 36 companies as a sample for evaluating a model of financial performance. Liquidity, activities, leverage, economic added value was used as inputs of the Data envelopment analysis and profitability was used as output of the said model. After analyzing the data researchers found that 9 companies were efficient based on the five-year data and other 27 companies were inefficient.

Chen and Chen (2007) prescribed that operational performance is the major factors in the industry. On the basis of Data envelopment analysis (DEA) and the balanced scorecard (BSC) analysis, domestic semiconductor manufacturers are efficient in financial prospective, internal process system, learning and innovation prospective and customer prospective.

Rabar (2017) demonstrate that the world is fronting the problem of excess use of natural resources and climate alteration. The prime objectives of the study are found out the socio-economic efficacy of OECD countries using the model of DEA and finally recommendation are given that for measuring the performances of the countries and non-parametric model, DEA should be given more rank.

Shafiee et al. (2013) stated that DEA has been used in many banking industry but time factors is importance to measurement of efficiency are not yet to be utilized. The main contribution of the study to evaluate the efficiency of Iranian banking using dynamic SBM model in DEA during the three consecutive years considering net profit as positive and bad debt of loan as negative link. For checking the validity of described model SBM efficiency is compared with static efficiency and finally decided that further study should be adopted using input bad link and output good link for providing management suggestions.

Saranga and Moser (2010) stated that purchasing and supply management (PSM) influence operational and financial performance. If collected data are not sufficient indicate the mixed result. Under this study, data was collected from 120 firms all over the world and the sales are more than 3 billion USD representing seven industry sectors. A model is developed using the classical and two stage value chain Data Envelopment Analysis models and multiple PSM measures at various stages and provide a single efficiency measure that estimates overall performance of a PSM functions and contribute long term corporate performance in each of these seven industry sectors.

Anupama and Rao (2019) stated that relative performance of the homogenous Decision-making Units (DMU) is measured by Data Envelopment Analysis (DEA) using multiple inputs and outputs. There are some challenges of the DEA like negative data, zero, discrimination power, small of DMUs etc. In this study 18 firms are selected, where 5 years data are considered with nine financial ratios in fuzzy environment. After analysis of the data, the nadir DMU is treated as bad and ideal DMU is considered as best relative efficiency in fuzzy environment according to rank of the DMU.

Yasar et al. (2018) founded the efficiency ratings of airline city pairs market by applying Data Envelopment Analysis (DEA) and Malmquist total factor efficiency indexes. For this study 16 pair market passenger revenue traffic was selected based on input variables like number of seats, number of flights and output variables like passengers' revenue traffic and load factor from the years of 2015-2017. Based on the data Envelopment Analysis (DEA), Athens, New York, Berlin and Tehran markets are effective and other cities vice versa. On the other hand, based on total productivity index Tel Aviv, Frankfruit, and Stuttgard markets have increased effectiveness.

From the reviewed literature it is found that the is a research gap, no comprehensive study has done to measure the driving input costs of the garments factories in Bangladesh which had significant impacts on sales revenues and find out the efficient garments and inefficient garments. The undertaken study will fulfill the gap.

5. METHODOLOGY

Five garment factories have been selected as a sample size for the study and these garments have been chosen purposively on the basis of availability of data. Desh and Style were selected in the first-generation garments and Tosrifa and Generation were selected as middle age and Mahid was chosen as a newly established industry. The year of establishment of the selected garments is shown in the Table 2.

Table 2

Table 2 Name and Year of Establishment of the Selected Garments Factories

Serial No.	Short name	Full name	Year of Establishment
1	Desh	Desh Garments Limited	1977
2	Style	Stylecraft Limited	1983
3	Tosrifa	Tosrifa Industries Limited	2002
4	Generation	Generation Next Fashion Limited	2004
5	Mahid	Mahid Apperal Limited	2013

Source Annual reports and BGMEA

Data have been collected from the annual report of the selected garments covering the financial year 2014-2019 i.e., six years. Collected data were analyzed and interpreted by applying tools Pearson coefficient of correlation and Constant Returns to Scale (CRS) model.

6. ANALYSIS AND FINDINGS

The followings tables are presented to measure efficiency of the selected garments industries in Bangladesh.

Table 3

Table 3 Pearson Coefficient Correlation of Sales Revenue with Each of The Input Variables

Name of the Input Variables			
Cost of Material	**Cost of Labor**	**Overhead cost**	**Operating expense**
0.987**	0.951*	0.148	0.777

Source Compiled from Annual report of selected garments factories; N=5; * Correlation is significant at the 0.05 level (2-tailed). ,**. Correlation is significant at the 0.01 level (2-tailed) and conducted with SPSS version: 22

Table 3 shows the correlations of sales revenue with cost of material, cost of labor, overhead cost, and operating expense where each of the items estimated by the degree of association 0.987**, 0.951*, 0.148 and 0.777 respectively. On the other hand, it is noted that positive significant impact on sales revenue is shown by the two variables cost of material and cost of labor but positive insignificant effect on the output by overhead cost and operating expense. Thus, the selected input variables are taken as cost of material and cost of labor that revealed a positive significant impact on the output variable i.e. sales revenue.

Table 4

Table 4 Measurements of CRS Input Oriented DEA (Figure in Lac BDT)

Garments	Technical	Output	Lambda	Peers	Inputs	Original	Expected	Excess	Excess
Desh	0.751	SR	0.303	4	MC	2936	2206.23	729.77	24.86
Desh		4302	0.112	2	LC	706	530.52	175.48	24.86
Tosrifa	1.000		1.000	2	MC	6382	6382	0	0.00
Tosrifa		14569	-		LC	3006	3006	0	0.00
Style	0.682		2.554	4	MC	27398	18692.74	8705.26	31.77
Style		36479	0.961	2	LC	6618	4515.24	2102.76	31.77
Mahid	1.000				MC	4918	4918	0	0.00
Mahid		8802	1.000	4	LC	637	637	0	0.00
Genaration	0.784		2.914	4	MC	22662	17769.21	4892.79	21.59
Genaration		33497	0.538	2	LC	4432	3475.12	956.88	21.59

Source Compiled from Annual report of selected garments factory during 2014-2019 using DEAP Version 2.1. **Inputs** (MC=Material cost, LC=Labor cost) and **Output** SR=Sales revenue and Peer: (2=Tosrifa, 4= Mahid)

Table 4 indicates the utilization position of input variables such as material cost and labor cost used for the production process of sales revenue as the output variable in the selected garments under the study period. From the method of CRS input-oriented DEA, it was estimated that Tosrifa and Mahid were efficient factories relative to the inefficient factory of the rest three.

7. DISCUSSIONS

The input costs of labour and material usage by the Desh garments are excess 729.77 Lac (24.86%) and 175.48 Lac (24.86%) respectively. Due to this excessive usage of material and labour costs relative to the cost of Tasrifa used in the output process, Desh is inefficient in Decision Making Unit (DMU) which have attained the technical efficiency 0.751 compared to the efficient DMU of Tosrifa 1.00. If it is possible to reduce the inputs cost of material and labour by 24.86 % each, Desh garments will be efficient like Tosrifa.

The excessive usage of cost of material is 8705.26 Lac (31.77%) and the cost of labour is 2102.76 Lac (31.77%) of Style craft compared to the input cost of efficient garments of Tosrifa and Mahid. Style craft is inefficient in decision making unit and that the garments have attained lower technical efficiency (0.682) instead of 1.00 comparing to Tosrifa and Mahid. To be efficient, the excessive usage of inputs costs of material and labour should be maintained.

The input costs which are used in the production process of Generation Next Fashion Limited, material costs 4892.79 Lac (21.59%) and labour costs 956.88 Lac (21.59%) are the excess costs. As a result of usages of excessive input cost comparing to the cost of Tosrifa and Madid, Generation is technically inefficient in decision making. The technical efficiency of Generation is only 0.784 whereas the technical efficiency of Tosrifa and Mahid is 1.00.

If it was possible to reduce the excessive used of inputs (percentages) shown in the above-mentioned table, the three factories would be efficient one like Tosrifa and Mahid. However, Tosrifa and Mahid have shown careful use of input variables i.e., material cost and labour cost efficiently to fulfill the output target over the period under the study.

8. IDENTIFIED PROBLEMS

The following problems are identified:

- Among the four input costs, only material and labour cost have a significant correlation with the output variable i.e., Sales revenue. So overhead costs, operating costs of the selected garments are less important for decision making.
- Due to management inefficiency, the costs of labour of the selected garments are not strictly maintained similarly.
- Material costs of the selected garments are not same in the production process because of the availability of materials regarding transportation costs, storage costs, material handling costs, product differentiation, cost of capital, opportunity cost etc.
- The technical efficiency depends on managerial skill, operational skill, introduce of modern technology, labour management etc., which are not same for the selected garments industries in Bangladesh. For the proper maintains of the above-mentioned issues are the problems for these garments (Desh, Style, and Generation) to become inefficient.
- It is noted that positive significant impact on sales revenue is shown by the two variables cost of material and cost of labor but positive insignificant effect on the output by overhead cost and operating expense, but management are not able to use efficiently that harms to maximize sales revenue.

9. CONCLUSION

The study is an attempt to determine the performance of the selected garments in Bangladesh by measuring of different types of related variables in various aspects. The soundness of most of the components is not homogenous to attain the standard norm or in the declining trends. It is also found that the managements of the garment factories are not capable enough to hold the stable position of ascending trends of the factors that could be helpful to provide positive impact on the performance.

10. SUGGESTIONS AND RECOMMENDATIONS

To uphold the increasing trends of the factors and to overcome the adverse situations of the garment sector in Bangladesh some suggestions are recommended on the basis of identified problems as follows:

- The managements of the garment factories should be given focused to efficient utilization of material and labour costs. Excess material costs leads to increase production costs by ties up capital, storage costs, inventory risk cost, obsolescence, degradation of quality etc. On the other hand, labour should be maintained in optimum levels that provide positive impact on the performance.
- Focus should be given on overhead costs and operating costs for significant impact of sales revenue and reduce excessive labor and overhead cost.
- To enrich the amount of current assets should be that harms to earn enough profits to maximize wealth resulting bar to the regular payments of income tax and managements of the garment factories faced unmanageable situations to have facilities from government agencies.

- To accelerate the Assets Turnover by improving customer's collection, reducing inventories, and selling off surplus assets.
- To improve management efficiency in cost price effectiveness of the operations.
- To recover the management efficiency to make use of available resources and minimize the idle capacity.
- To increase the owned funds of the garments industry.
- The level of satisfaction regarding productions and sales operations should be improved.
- To enhance technical efficiency, technology, managerial efficiency, and scale efficiency.
- To improve total factor productivity to achieve better performance of the garment sector.

CONFLICT OF INTERESTS

None.

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