Textile & Leather Review

ISSN 2623-6281 | www.tlr-journal.com | 10.31881/TLR

Exploration of Barriers and Success Factors of Sustainability at Producer Level in Textile Industry: A Study of Bangladesh Perspective

Nasrin Akter, Lal Mohan Baral, Sumaya Khan Auntu, Md. Abdul Alim, Mohammad Faizur Rahman Rashed

How to cite: Akter N, Baral LM, Auntu SK, Alim MA, Rashed MFR. Exploration of Barriers and Success Factors of Sustainability at Producer Level in Textile Industry: A Study of Bangladesh Perspective. Textile & Leather Review. 2022; 5:430-450. https://doi.org/10.31881/TLR.2022.40

How to link: https://doi.org/10.31881/TLR.2022.40

Published: 9 September 2022

Exploration of Barriers and Success Factors of Sustainability at Producer Level in Textile Industry: A Study of Bangladesh Perspective

Nasrin AKTER[1], Lal Mohan BARAL[1], Sumaya Khan AUNTU[2*], Md. Abdul ALIM[3], Mohammad Faizur Rahman RASHED[1]

[1]Department of Textile Engineering, Ahsanullah University of Science and Technology, Dhaka, Bangladesh
[2]Faculty of Economics and Business, Kaunas University of Technology, Gedimino g. 50, Kaunas 44029, Lithuania
[3]Department of Textile Engineering, Khulna University of Engineering & Technology, Khulna -9203, Bangladesh
*sumaya.auntu@ktu.edu; ska.sumaya@gmail.com

Article
https://doi.org/10.31881/TLR.2022.40
Received 9 June 2022; Accepted 26 August 2022; Published 9 September 2022

ABSTRACT
The article describes the challenges and success factors of implementing sustainability in the Bangladeshi textile industry. The main purpose was to identify the barriers and change them to success to maintain a satisfactory and pleasant environment in the industry. Implementing and ensuring sustainability in the Bangladeshi textile industry is a priority. The barriers and success factors of sustainability in Bangladeshi textile industry through a survey based was evaluated. The survey was carried out through questionnaires of managers in the Bangladeshi textile industry. The test was carried out at the producer level of the industry based on the three pillars of sustainability (social, economic, and environmental). The 5-point Likert scale was used to receive the responses. We surveyed a total of 26 people from 7 different factories. SPSS software was used to analyse the surveyed data and quantify the barriers and success factors of sustainability. Data were statistically analysed using reliability tests, multiple regression analysis, ANOVA, coefficients, regression equation development, and Pearson's correlation. The analysis illustrated the socio-environmental aspect as the most important predictor, while the environmental-economic and economic-social aspects were the least important to the managers of the Bangladeshi textile industry. The performance of any industry depends on the management and their way of handling situations. Our research goal was to find out the challenges that the management faces and what could be possible solutions for these challenges. The article shows the ways of finding out the existing barriers to sustainability by conducting a survey of the textile industry and the possible solutions to these barriers to ensure a better work environment. The article also shows how to keep the industry performance updated, improved, and satisfactory. The report would be beneficial to the Bangladesh textile industry administration to identify industry barriers to implementing sustainability and changing it to success.

KEYWORDS
aspects of success, barriers factors, Pearson correlation, SPSS, sustainability, textile industry

INTRODUCTION

The rapid growth of industry and the use of natural resources have made an impact on the environment. The growth of industry is needed for developing and poor countries. Industrialization offers direct and indirect employment to the people of these countries reducing the unemployment

rate.The concept of sustainability has been introduced to maintain natural harmony, and at the same time resolve unemployment problems. Today, sustainability has become a burning issue for both the environment and humans for a better future [1–4]. In the case of a manufacturing factory such as the textile industry, sustainability is needful. Industry uses huge natural resources, namely air, water, energy, and chemicals, and produces huge amounts of waste as well. The textile industry produces waste at each step of garment manufacturing. These wastes cause harm to the environment and human life if not properly disposed of [5]. Therefore, the implementation of sustainability in the textile sector is necessary.

Despite the increasing consensus around the world on sustainability and the green environment, its implementation has not yet been fully completed. Many reasons are lack of proper inspection, lack of proper instructions, lack of awareness among people, negligence of industry owners, cost factors, etc. Although the term "sustainability" was previously limited only to environmental perspectives now expands its limits. Sustainability now encompasses three dimensions, including social and economic aspects along with environmental aspects. Sometimes, a fourth dimension named technology can be introduced [3,6].

Textiles is a diverse and multidisciplinary sector. From fiber to garment finishing, there is a detailed supply chain in this sector that includes fiber process, yarn spinning, fabric manufacturing, dyeing, finishing, and garment manufacturing. Environmental sustainability defines biodiversity, ecosystem maintenance, stable resources, etc. Economic sustainability defines the management of resources for the future without compromising the present ones. Social sustainability defines ensuring equality, providing opportunity, ensuring basic needs, and gender impartiality. The sector also faces a lot of difficulties if the supply chain is not properly managed. The environmental impacts include the use of huge water, energy, and chemicals in the manufacturing process and the release of a large amount of toxic, harmful effluents, and the release of greenhouse gases [7]. In addition to waste from dyeing, waste from finishing also has a huge impact on the environment. Maintaining balance, reducing waste disposal, and ensuring proper waste management is necessary for a clean and green environment.

Sustainability in Bangladeshi textile industries has progressed. Various types of discrimination were present, such as poor wages for workers, overtime work, gender inequality, poor safety measures, and risk factors. To attract foreign buyers, the owners offered less manufacturing costs. As a result, the workers received poor pay. The profit went to the owners only. The safety and security measures were very poor. Many workers died due to poor safety and security factors, building collapses, fire accidents, etc. The buyers stopped their orders due to the lack of safety measures. Then sustainability and sustainable supply chain management in the textile sectors have been introduced with proper safety and security factors [8]. Sustainable supply chain management implies sustainable development.

Economic, social, and environmental concerns for human development are some of the components of sustainable development that have an impact on the supply chain and long-term business plans. To boost overall performance and obtain a competitive advantage in the rising market, industries have been urged to adopt sustainable practices in their supply chain operations by creative market, government laws, and growing awareness [9]. Figure 1 indicates the three spheres of sustainability.

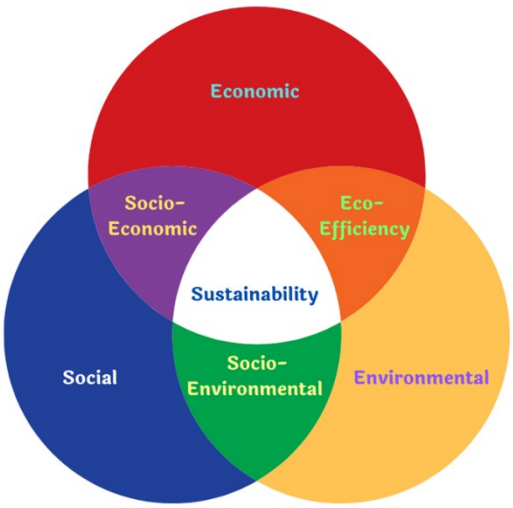


Figure 1. Three spheres of sustainability.

Many barriers stand in the way of long-term sustainability. In 2010, Connell [10] categorized potential barriers into two categories, namely internal, and external barriers. According to Connell, internal barriers are dependent on the consumers' behavior, whereas external behavior is not dependent on consumers' behavior. Lack of environmental concern, non-positive impact toward sustainable garments, inadequate understanding of garment impact on the environment, etc. are the internal barriers to sustainability. Age, education, motivation, values, etc. are also included in the internal barriers. Price, infrastructure shortage, and social and cultural norms are the external barriers to sustainability [11–13]. Sustainability ensures demand for the present and future. Effective waste management is necessary to reduce the environmental impact and promote sustainability. Several researchers have investigated the practical implementation and obstacles to sustainability in different interpretations of sustainability. Islam et al. [14] investigated the environmental performance of various Bangladeshi branded T-shirts. They used a standard sustainability evaluation tool named the Higg index to evaluate the performance. They concluded that Bangladeshi T-shirts manufactured by foreign brands show superior performance compared to Bangladeshi T-shirts manufactured by local brands. The foreign-branded Bangladeshi-made T-shirt addressed environmentally sustainable issues

at every step of manufacturing, such as eco-friendly, non-carcinogenic dyes chemicals, low impact finish, sustainable packaging materials and third-party verified, and so on.

In this article, we have statistically analyzed the data using SPSS software and determined the potential barriers and success factors related to the textile industry. The main objectives of the present work are to observe the evolution of sustainability of the textile industry and to assess the statistical analysis of barriers and success factors of sustainability in different aspects of sustainability.

METHODOLOGY

In this study, a survey test was conducted using a questionnaire on managers from the Bangladeshi textile industry. The test was carried out at the producer level of the industry based on the three pillars of sustainability (social, economic, and environmental) and a 5-point Likert scale was used to receive responses from them. We briefed them about our survey and then provided them with questions. The questions were about the social, economic, environmental, socio-environmental, environmental-economic, and social-economic aspects of the Bangladeshi textile industry and its environment for workers. Then we collected the responses from the respondents and analysed them. The SPSS tool was used to analyze the data. Very suitable and persuasive responses were found from managers of the Bangladeshi textile industry. We surveyed a total of 26 people from 7 different factories. The textile industries for our survey were Ahsan Textile Mill Ltd., Knit Concern composite Ltd., Rahim Textile Mills Ltd., Raising Group, DBL ltd, APS Apparels Ltd, and In-tramex Textile Mills Ltd. Then SPSS software was used, and the statistical data were analysed in terms of reliability test, multiple regression analysis, ANOVA, coefficients, regression equation development, and Pearson correlation. The analysed data was used to discover the barriers and success factors of each aspect.

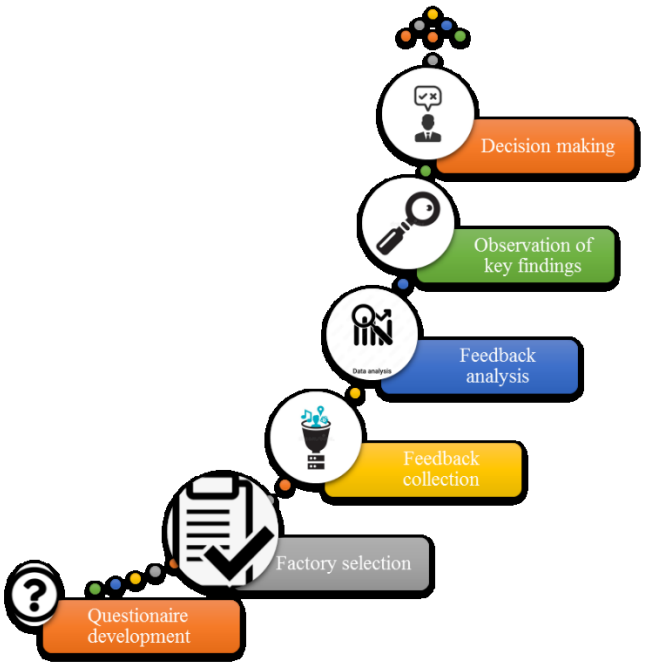
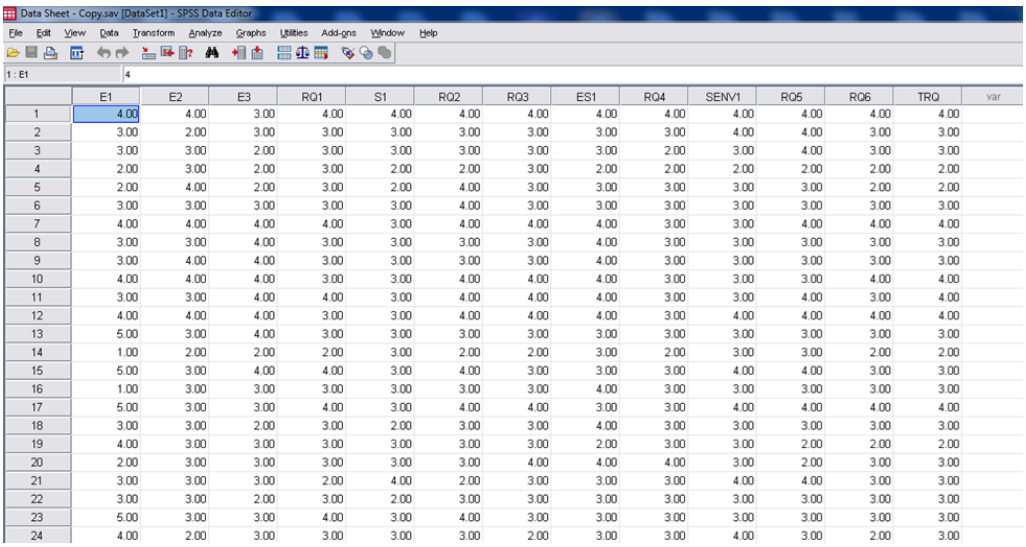


Figure 2. Process diagram of feedback collection and execution.

DATA ANALYSIS TOOLS

SPSS

The statistical package for social sciences, commonly known as SPSS, was created by IBM Corporation. The software is very popular for statistical analysis among researchers and academicians around the world. For parametric and nonparametric statistical techniques, this statistical program performs comparison and correlation statistical tests for univariate, bivariate, and multivariate analysis [2,15].


Data Sheet - Copy.sav [DataSet1] - SPSS Data Editor

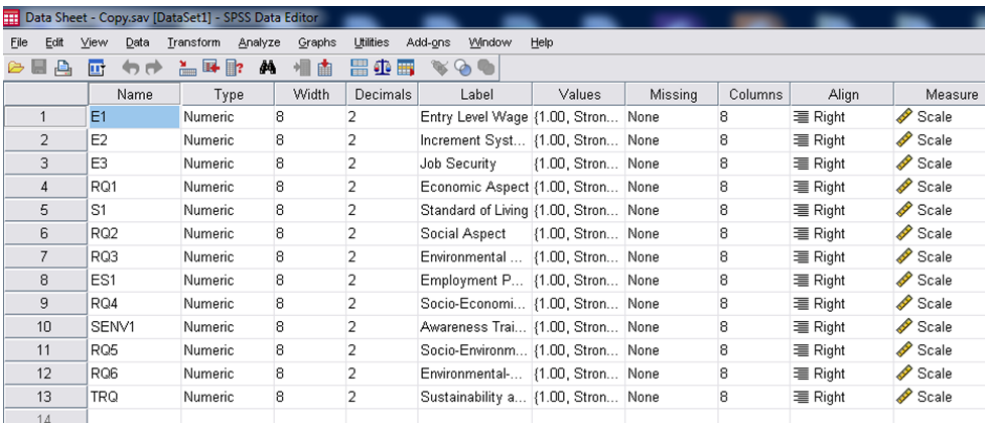
File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

1 : E1 4

	E1	E2	E3	RQ1	S1	RQ2	RQ3	ES1	RQ4	SENV1	RQ5	RQ6	TRQ	var
1	4.00	4.00	3.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	
2	3.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	3.00	3.00	
3	3.00	3.00	2.00	3.00	3.00	3.00	3.00	3.00	2.00	3.00	4.00	3.00	3.00	
4	2.00	3.00	2.00	3.00	2.00	2.00	3.00	2.00	2.00	2.00	2.00	2.00	2.00	
5	2.00	4.00	2.00	3.00	2.00	4.00	3.00	3.00	3.00	3.00	3.00	2.00	2.00	
6	3.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
7	4.00	4.00	4.00	4.00	3.00	4.00	4.00	4.00	3.00	3.00	4.00	4.00	4.00	
8	3.00	3.00	4.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	
9	3.00	4.00	4.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	
10	4.00	4.00	4.00	3.00	3.00	4.00	4.00	4.00	3.00	3.00	3.00	4.00	4.00	
11	3.00	3.00	4.00	4.00	3.00	4.00	4.00	4.00	3.00	3.00	4.00	3.00	4.00	
12	4.00	4.00	4.00	3.00	3.00	4.00	4.00	4.00	3.00	4.00	4.00	4.00	4.00	
13	5.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
14	1.00	2.00	2.00	2.00	3.00	2.00	2.00	3.00	2.00	3.00	3.00	2.00	2.00	
15	5.00	3.00	4.00	4.00	3.00	4.00	3.00	3.00	3.00	4.00	4.00	3.00	3.00	
16	1.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	
17	5.00	3.00	3.00	4.00	3.00	4.00	4.00	3.00	3.00	4.00	4.00	4.00	4.00	
18	3.00	3.00	2.00	3.00	2.00	3.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	
19	4.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	3.00	3.00	2.00	2.00	2.00	
20	2.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.00	2.00	3.00	3.00	
21	3.00	3.00	3.00	2.00	4.00	2.00	3.00	3.00	3.00	4.00	4.00	3.00	3.00	
22	3.00	3.00	2.00	3.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
23	5.00	3.00	3.00	4.00	3.00	4.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
24	4.00	2.00	3.00	3.00	3.00	3.00	2.00	3.00	3.00	4.00	3.00	2.00	3.00	

Figure 3. Data view in SPSS

From Figure 3, It can be seen the questionnaire's question number and their corresponding answers to the target population. The answers were converted in such a way that they could be put in the software and analysed. In the variable view, this software shows the types of question and their characteristics.


Data Sheet - Copy.sav [DataSet1] - SPSS Data Editor

File Edit View Data Transform Analyze Graphs Utilities Add-ons Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	E1	Numeric	8	2	Entry Level Wage	{1.00, Stron...	None	8	Right	Scale
2	E2	Numeric	8	2	Increment Syst...	{1.00, Stron...	None	8	Right	Scale
3	E3	Numeric	8	2	Job Security	{1.00, Stron...	None	8	Right	Scale
4	RQ1	Numeric	8	2	Economic Aspect	{1.00, Stron...	None	8	Right	Scale
5	S1	Numeric	8	2	Standard of Living	{1.00, Stron...	None	8	Right	Scale
6	RQ2	Numeric	8	2	Social Aspect	{1.00, Stron...	None	8	Right	Scale
7	RQ3	Numeric	8	2	Environmental ...	{1.00, Stron...	None	8	Right	Scale
8	ES1	Numeric	8	2	Employment P...	{1.00, Stron...	None	8	Right	Scale
9	RQ4	Numeric	8	2	Socio-Economi...	{1.00, Stron...	None	8	Right	Scale
10	SENV1	Numeric	8	2	Awareness Trai...	{1.00, Stron...	None	8	Right	Scale
11	RQ5	Numeric	8	2	Socio-Environm...	{1.00, Stron...	None	8	Right	Scale
12	RQ6	Numeric	8	2	Environmental-...	{1.00, Stron...	None	8	Right	Scale
13	TRQ	Numeric	8	2	Sustainability a...	{1.00, Stron...	None	8	Right	Scale

Figure 4. Variable view in SPSS

Cronbach's Alpha

The reliability of any scores is calculated using the Cronbach alpha test method. Internal consistency and reliability measurement is needed, where the 5-point Likert scale method is used for questionnaires. Therefore, Cronbach's alpha coefficient measurement method is crucial. Cronbach's alpha was applied to estimate the reliability of bulk items, not individual ones [16,17]. A formula (Equation 1) is used to analyze the reliability test result.

$$\text{Cronbach's alpha (CA)} = \frac{rm}{[1+(m-1)r]} \quad (1)$$

The r = The mean of the inter-item correlations, and m = The number of items considered. The reliability test is calculated using a value range from 0 to 1 to assess the score. CA > 0.9 = Excellent, CA > 0.8 = Good, CA > 0.7 = Acceptable, CA > 0.6 = Questionable, CA > 0.5 = Poor and CA < 0.5 = Unacceptable [18].

Sometimes lower reliability may show in the Cronbach alpha value for scores that have a smaller number of items. The results can also be varied due to the sample size [19].

Regression

Regression analysis, a statistical method, is mainly used for forecasting the relationship among variables (independent and dependent) which have cause and effect relationships. Based on the

number of independent variables, regression analysis can be classified as univariate (used one independent variable) and multivariate (used more than one independent variable) regression analysis. The main purpose of univariate regression analysis is to create a linear relation equation between dependent and independent variables by investigating their relationship. The connection between a dependent variable and more than one independent variable is investigated by multivariate regression analysis [20].

Coefficient of Determination (R square/R^2)

The coefficient of determination is a statistical measurement that measures how variations in one variable may be expounded by differences in another. R^2 also measures the linear relationship between the variables. R^2 is the proportion of the variance in the dependent variable that can be anticipated using the independent variables.

The value of R^2 ranges from -∞ to +1. R^2 has a range of non-negative is [0,1]. Where 0 means no variability in the available data and 1 means perfect anticipation. And a negative value, meaning the poor performance of the regression model. But it is hard to say how poorly a model performs. If R^2= -0.4, it cannot be said how bad the model performs as the lower limit of the model is -∞.

The formula for calculating R^2 is stated below.

$$R^2 = 1 - \frac{\sum_{n=1}^{m}(X_n - Y_n)^2}{\sum_{n=1}^{m}(\bar{Y} - Y_n)^2} \quad (2)$$

$$\bar{Y} = \frac{1}{m}\sum_{n=1}^{m} Y_n \quad (3)$$

$X_{n=}$ the forecasted nth value, Y_n= the actual nth value. For each Y_n element in the ground truth dataset, the regression approach predicts the X_n element [21].

Analysis of variance

Analysis of variance (ANOVA) is a parametric tool that is applied to assess the variations between several different groups and thus bypass the problems of making numerous comparisons between the groups. ANOVA is a complex and subtle method and cannot offer a clear idea about the comparisons of the numerous groups [22,23].

Univariate ANOVA is a reduction of multivariate ANOVA (MANOVA). Each condition provides a single measurement in univariate ANOVA. In MANOVA, the number of measurements should be greater than the number of variables. MANOVA is an expansion of ANOVA [24]. In repeated measures,

ANOVA, every level of multiple factors is quantified on the same subject. It is also known as factors within the subject. In between-subject factors, the levels should not be quantified every time; the levels are independent. Mixed ANOVA is a combination of both within-subject factors and between-subject factors. Additional covariates are added in the analysis of covariance (ANCOVA), where conditions are determined [25]. ANCOVA is applied in between-subjects factors, within-subjects factors, or mixed-model factors [26].

Beta

The slope of the line that connects the predictor and the dependent variables in a regression table is characterized by the value of Beta [19].

Multicollinearity

The term multicollinearity occurs in multiple regression analysis systems that signal a linear relationship among independent variables. The variables used in the regression analysis are considerably correlated to the dependent variables and each other [27]. Multicollinearity is noticed when a variable is included or removed, or data are changed or deleted [28].

Tolerance

Tolerance is derived using an initial linear regression analysis, which quantifies the influence of an independent variable on all other independent variables. In this first-step regression assessment, tolerance is specified as $T = 1 – R^2$. There may be multicollinearity in the data if T is less than 0.1, and there is multicollinearity if T is greater than 0.01 [19].

Variance inflation factor

When independent variables are correlated, VIF (Variance Inflation Factor) calculates how much the variance of an expected regression coefficient increases. When VIF= 1, multicollinearity is absent and no factors are correlated, when VIF> 1, regressors are comparatively correlated. The correlation becomes high for VIF= 5-10, which is challenging. If due to multicellularity, regression coefficients are incorrectly predicted, then the VIF would be above 10 [29].

Pearson correlation

Pearson’s correlation is a statistical technique for defining the relationship between two arbitrary variables. The changes in the magnitude of the two variables are interrelated. The change of one variable influences the other either in the same (positive correlation) or opposite direction (negative correlation). Pearson's correlation is applied in bivariate normal distributions. The value of r measures

the relationship between the variables. When r= 0, means that there is no linear relationship between the variables, with increasing the value of r, the relationship becomes stronger, and when r= ±1, the relationship becomes a straight line [30].

The following formula (Equation 4) is used to compute the Pearson correlation:

$$\frac{N(\sum xy)-(\sum x)(\sum y)}{\sqrt{[N\sum x^2-(\sum x)^2][N\sum y^2-(\sum y)^2]}} \quad (4)$$

Where, r = Pearson correlation coefficient; N = No. of observations; ∑xy = sum of the multiplication of x & y scores; ∑x = sum of x scores; ∑y = sum of y scores; $\sum x^2$= sum of squared x scores; $\sum y^2$= sum of squared y scores [27].

RESULTS AND DISCUSSION

STATISTICAL EVALUATION

Reliability Assessment

Using the Cronbach alpha (CA) method, the reliability of the collected data was calculated. CA signifies the general reliability of a set of variables. The standard value of CA is 0.70. In this study, we found that the CA is 0.939 which illustrates a high level of internal consistency for the scale of this sample.

Table 1. Reliability statistics

CA	CA based on standardized items	No. of items
0.937	0.943	7

Multiple Regression Analysis

In multiple regression analysis, two or more independent variables (predictors) affect a single dependent variable. As there is a dependent variable that is sustainability at the white-collar workers level and six predictors are the environmental-economic aspect, socio-economic aspect, socio-environmental aspect, social aspect, environmental aspect, and economic aspect. Therefore, this regression is a Multiple Regression. The value of R^2 in the model summary table is 0.950 which indicates taken as a set that the predictors account for 93.4% of the variance in the sustainability at the managers level.

Table 2. Multiple regression analysis

Model	R	R^2	Adjusted R^2	Std. error of the estimate
1	0.975[a]	0.950	0.934	0.18895

ANOVA

a. Predictors: (constant), social-economic, social, environmental, environmental-economic, economic, and socio-environmental.

b. Dependent variable: sustainability at the producer level (managers).

From the ANOVA Table 3 it is clearly observed that, $F(60032) = 25$, $p < 0.001$, $R^2 = 0.950$. Above these results indicate that our regression analysis was statistically significant. When we take those six predictors as a group, they predict sustainability at the white-collar person level significantly.

Table 3. ANOVA

Model	Sum of squares	df	Mean square	F	Sig.
Regression	12.860	6	2.143	60.032	0.000[a]
Residual	0.678	19	0.036		
Total	13.538	25			

Coefficient

In coefficient table 4, the constant is not important, and we must focus on the significance columns which are p values for each of the predictors. Therefore, we will evaluate each of these predictors based on α (0.05). It was found that the p-value for all predictors or independent variables is 0.000 which means $p < \alpha$. As a result, we can say that all independent variables are a significant predictor of sustainability at the managers level. From the coefficient table, it can be said that all the predictors of sustainability aspect have a great impact on sustainability at the managers level. Here, the sequence of the significance of the predictors on the dependent variable can be expressed as follows:

Table 4. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity test	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-0.020	0.024		-0.862	0.391		
	Social research dimension	0.179	0.010	0.212	17.328	0.000	0.412	2.428
	Economic-Social Research dimension	0.212	0.011	0.235	18.598	0.000	0.386	2.598
	Economic Research Dimension	0.169	0.010	0.201	17.316	0.000	0.458	2.181
	Environmental-Economic Research Dimension	0.172	0.011	0.235	16.355	0.000	0.298	3.351
	Environmental Research Dimension	0.206	0.011	0.237	19.635	0.000	0.423	2.365
	Socio-Environmental Research Dimension	0.062	0.007	0.091	8.705	0.000	0.566	1.767

a. Dependent Variable: Sustainability at managers Level.

Economic Aspect> Social Aspect> Socio-Economical Aspect> Socio-Environmental Aspect> Environmental Aspect> Environmental-Economic Aspect.

If the tolerance value <0.1 and VIF= 10 or more, then multicollinearity is present in the analysis, which means a very high intercorrelation between the predictors. The presence of multicollinearity in the data causes a disturbance. The data may not be reliable. From the table of coefficients 4, we can clearly say that our analysis is free from multicollinearity.

Regression Equation

Sustainability at the managers level = -0.020 + (0.179 × Social aspect) + (0.212 × Economic-social aspect) + (0.169 × Economical aspect) + (0.172 × Environmental-economic aspect) + (0.206 × Environmental aspect) + (0.062 × Socio-environmental aspect)

From the above equation, it is clear that '1' point increase in the dimension of economic-social research corresponds to '0.212' unit increase in sustainability at the level of managers.

Pearson Correlation

The Pearson's Correlation table exhibits a correlation matrix. Here, we can see a perfect correlation between sustainability at the managers level and with socio-environmental aspects. On the other hand, we can see a high-level correlation between environmental aspects, economic aspects, and social aspects with the dependent variable, whereas moderate correlation between the dependent variable through environmental-economic aspect and economic-social aspects.

Table 5. Pearson correlation

		Sustainability at the producer level	Social	Economic	Environmental	Socio-environmental	Environmental-economic	Social-economic
Sustainability at the producer level	Pearson Corr.	1	0.807**	0.741**	0.782**	0.885**	0.822**	0.852**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000
	N	26	26	26	26	26	26	26
Social	Pearson Corr.	0.807**	1	0.691**	0.681**	0.748**	0.702**	0.570**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.002
	N	26	26	26	26	26	26	26
Economic	Pearson Corr.	0.741**	0.691**	1	0.390*	0.775**	0.715**	0.663**
	Sig. (2-tailed)	0.000	0.000		0.049	0.000	0.000	0.000
	N	26	26	26	26	26	26	26
Environmental	Pearson Corr.	0.782**	0.681**	0.390*	1	0.616**	0.580**	0.601**
	Sig. (2-tailed)	0.000	0.000	0.049		0.001	0.002	0.001
	N	26	26	26	26	26	26	26
Socio-environmental	Pearson Corr.	0.885**	0.748**	0.775**	0.616**	1	0.702**	0.728**
	Sig. (2-tailed)	0.000	0.000	0.000	0.001		0.000	0.000
	N	26	26	26	26	26	26	26
Environmental-economic	Pearson Corr.	0.822**	0.702**	0.715**	0.580**	0.702**	1	0.716**

		Sustainability at the producer level	Social	Economic	Environmental	Socio-environmental	Environmental-economic	Social-economic
Environmental-economic	Sig. (2-tailed)	0.000	0.000	0.000	0.002	0.000		0.000
	N	26	26	26	26	26	26	26
Social-economic	Pearson Corr.	0.852**	0.570**	0.663**	0.601**	0.728**	0.716**	1
	Sig. (2-tailed)	0.000	0.002	0.000	0.001	0.000	0.000	
	N	26	26	26	26	26	26	26

**. Correlation is important at the 0.01 level (2-tailed).

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

Table 6. Analysis of Pearson co-relation

		Sustainability at the examinee level	Social research dim.	Economic-social research dim.	Economic research dim.	Environmental-economic research dim.	Environmental research dim.	Socio-environmental research dim.
Sustainability Issue	Pearson Corr.	1	0.652****	0.550***	0.733****	0.573***	0.610****	0.821*****
	Sig.(2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*			0.000-0.200			Almost no correlation/very low		
**			0.210-0.400			Poor Correlation		
***			0.410-0.600			Moderate Correlation		
****			0.610-0.800			High-level Correlation		
*****			0.810-1.000			Perfect Correlation		

ANALYSIS OF FEEDBACK FROM RESPONDENTS

The feedback received from the managers of the industry is shown in Table 7. The feedback was taken based on the various aspects of sustainability. The success and barriers to sustainability have been measured from the feedback of the respondents.

Table 7. Responses from respondents

Research Question Number	Aspect	Percentage of Respondents				
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)
1	Economic	35	50	15	0	0
2	Social	46	42	12	0	0
3	Environmental	50	50	0	0	0
4	Economic-social	61	20	15	4	0
5	Socio-environmental	46	39	15	0	0
6	Environmental-economic	46	42	12	0	0
	Target research question	47	40	10	3	0

Respondent Feedback on Economic Aspect of Industry

From Figure 4 it is seen that 35%, 50%, and 15% of the managers strongly agreed, agreed, and neutral, respectively, with the development of sustainability in the economic aspect of their industry. However, no one disagreed or strongly disagreed with the assertion. The main barrier to the development of sustainability in economic aspects may be the insufficient investment in the textile industry of the factory owners. Those who were neutral were confused about the statement, or they could not want to disclose the fact. And that turned toward the disagreement of the statement. Nobody disagreed and strongly disagreed with the statement. This means that the maximum number of respondents believe that the development and implementation of sustainability in the economic sector of the industry are satisfactory.

Respondent Feedback on Social Aspect of Workplace

From figure 4, the column graph explains that 46%, 42% and 12% of the managers strongly agreed, agreed, and neutral, respectively, that the social aspect of their workplace was suitable and satisfactory for them. However, 0% of the managers disagreed and strongly disagreed with the statement. The main barrier to sustainability in the industry in terms of social aspects may be the lack of facilities. The social status, health, and hygiene security, educational facilities, daycare facilities for female workers, zero child labor, etc. make the social aspect of the industry satisfactory.

Respondent Feedback at Environmental Aspect Workplace

Half of the managers strongly agreed and half of them agreed, respectively, with the development of sustainability in the environmental aspect of their workplace was suitable and satisfactory for them.

On the other hand, no one remains neutral, disagreed, or strongly disagreed with their opinion of the statement. Everyone is in favor of sustainability in the industry. The reason behind the barriers to implementation of 100% sustainability in environmental aspects may be a lack of adequate knowledge about sustainability and its impact on the environment. The development and implementation of sustainability is necessary for the textile industry, as it emits huge amounts of waste, carcinogenic chemicals, etc.

Respondent Feedback on Economic-Social Aspect of Industry

The graph presented in figure 4 shows that 61%, 20%, 15%, 4%, and 0% of the managers strongly agreed, agreed, neutral, disagreed, and strongly disagreed, respectively, with the development of sustainability in the economic-social aspect of their industry. They (managers) indicated very few problems which act as barriers to the social-economic aspect of the development of sustainability in Bangladeshi textile industries. Bangladesh is a low-cost labor country. So, the manufacturing cost of the textile industry becomes less in Bangladesh rather than in other countries. The buyers also prefer Bangladesh for low-cost quality products. The quality of products depends on the skill, experience, quality of the raw materials, and the balanced management of the workers.

Respondent Feedback on Social-Environmental Aspect of Workplace

The 46%, 39%, and 15% of the managers strongly agree, agree, and are neutral, respectively, with the development of sustainability in the social-environmental aspect of their workplace that was suitable and satisfactory for them, as shown in Figure 4. On the other hand, 15% of the respondents remain neutral in their opinion. However, none of the managers disagreed or strongly disagreed with the assertion. The textile industry uses a huge amount of natural fibers including cotton, jute, etc. The processing of these fibers produces huge amounts of wastewater and effluents. Besides, every step of garment manufacturing produces a lot of waste. During dyeing, various carcinogenic and environmentally harmful chemicals are used that generate polluted water. All of these wastes are discharged into the river or nearby locality. The majority of factories do not have ETP or WTP plants. Those that have do not use it regularly. This poses a huge threat to the environment. Steps must be taken to properly discharge waste and effluents and ensure a clean, green, and healthy environment for all.

Respondent Feedback on Environmental-Economic Aspect of Workplace

From Figure 5, it is evident that 46%, 42%, and 12% of the respondents strongly agree, agree, and neutral, respectively, with the development of sustainability in the environmental-economic aspect of

their workplace that was suitable and satisfactory for them. However, none of the managers disagreed or strongly disagreed with the assertion. The environment and economy play an important role because both are equally needed for a balanced structure. The main barriers to sustainability in this respect are the use of hazardous, harmful chemicals, and raw materials in textile processing, the use of low-cost materials, the lack of proper maintenance, and the failure to use the ETP or WTP regularly. We can use alternative methods to overcome the situations. Using dry dying, eco-friendly processes, less energy utilization, and implementation of 3Rs (Reduce, Reuse and Recycle).

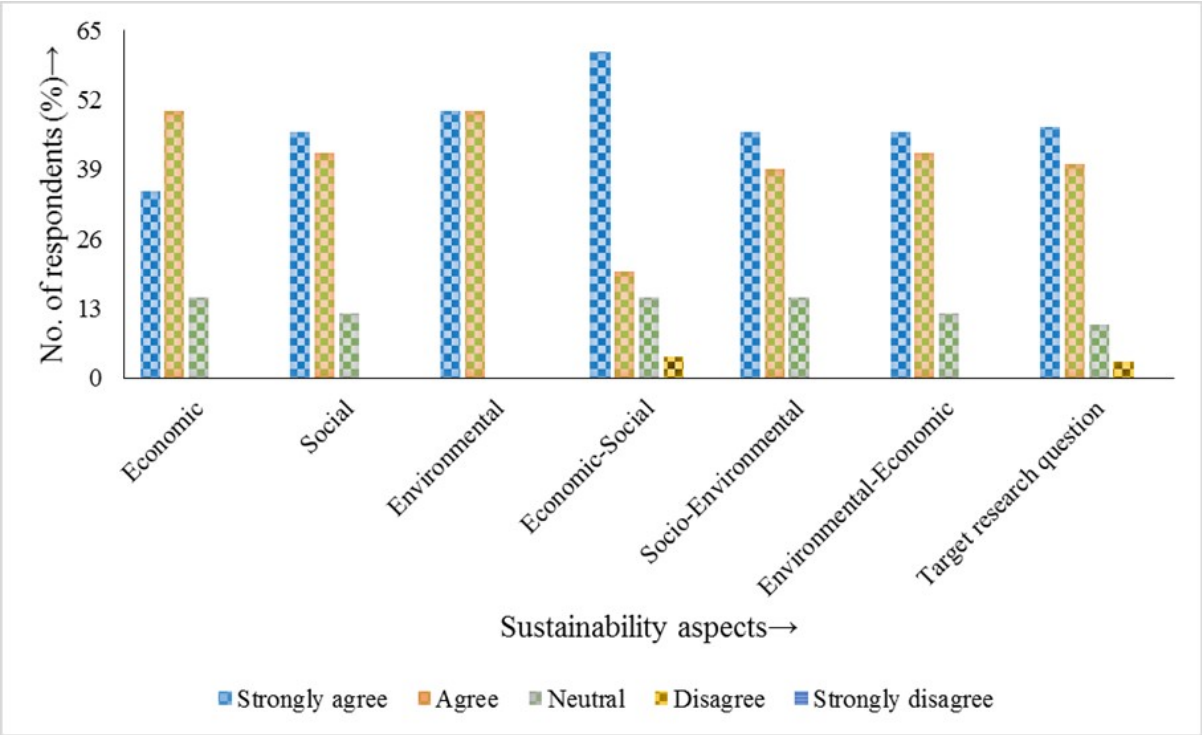


Figure 5. Graphical representation of different sustainability aspects of the respondents

Comparative Profile of Success and Barriers

Figure 6 explains the barriers and success factors of sustainability at the producer level. It shows that success factors are greater than barriers. The main barriers in respect of the Bangladeshi textile industry are a lack of proper knowledge on the sustainability issue and reuse, recycling, and the reduction process not available in each factory. The factory owners and management are not concerned about the sustainability issue and its effect on society and the environment. The textile industry does not pay attention to the waste and hazards it creates. This waste has a severe impact on the environment and human beings. For the betterment of all, we should be aware of the impact of

these wastes. The law should be strict for the industry administration so that they can not do any harm to the environment by their negligent, and nonchalant attitude.

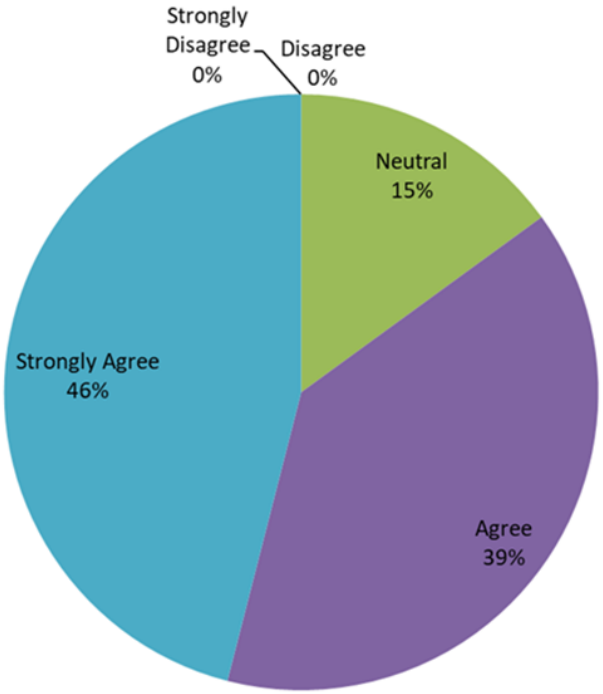


Figure 6. The comparative scenario of success and barriers

CONCLUSION

The depletion of natural resources and increasing pollution has led to the need for sustainability. In the world of modernization and industrialization, sustainability is mandatory for every sector. The Bangladeshi textile industries use a large number of natural resources and also generate a massive quantity of waste. Changing all the underlying barriers into successes and ensuring sustainability in Bangladeshi textile sectors is a very tough task. A strong background study is needed. The task at the producer level for the managers in the Bangladeshi textile sector was made. The statistical data were surveyed and analyzed. It was concluded that there are more success factors than barriers. The textile industries are one step ahead of sustainability implementation. Despite that, awareness must be increased among owners, officers, executives, and workers to minimize the gap between barriers and successes. Some of our findings about the barriers to implementing sustainability are that many industries do not reveal their views in terms of sustainability, owners are too busy to look after the issues, and owners are negligent at some point. This article could be very useful to the textile industry management bodies to update the sustainability status of the industry. The industry could use the

method to identify the barriers to sustainability existing in the industry and ways of converting barriers into success. The article theoretically shows the method of surveying through questionnaires and practically analyzing the data using software and drawing a conclusion from the data. The necessary steps should be taken by both government and industry to minimize barriers and ensure sustainability in the textile industry.

Author Contributions

Conceptualization – Akter N and Baral LM; methodology – Akter N, Baral LM and Rashed MFR; formal analysis – Akter N, Auntu SK and Alim MA; investigation – Akter N, Baral LM, Auntu SK and Rashed MFR; resources – Akter N, Baral LM and Rashed MFR; writing-original draft preparation – Akter N, Auntu SK and Alim MA; writing-review and editing – Akter N, Baral LM, Auntu SK and Alim MA; visualization – Akter N, Auntu SK and Rashed MFR; supervision – Akter N and Auntu SK. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Funding

This research received no external funding.

Acknowledgements

Technical supports from the “ZR Research Institute for Advanced Materials (ZRRIAM)”, Sherpur-2100, Bangladesh are gratefully acknowledged.

REFERENCES

[1] Goyal S, Garg D, Luthra S. Analyzing critical success factors to adopt sustainable consumption and production linked with circular economy. Environment, Development and Sustainability. 2022; 24:5195-5224. https://doi.org/10.1007/s10668-021-01655-y

[2] Haque MS, Nahar N, Sayem SM. Industrial water management and sustainability: development of SIWP tool for textile industries of Bangladesh. Water Resources and Industry. 2021; 25:100145. https://doi.org/10.1016/j.wri.2021.100145

[3] Bhakar V, Digalwar AK, Sangwan KS. Sustainability Assessment Framework for Manufacturing Sector - A Conceptual Model. In: Laurent A, Leclerc AS, Niero M, Dong Y, Olsen SI, Owsianiak M, Bey N, Ryberg M, Hauschild MZ, editors. 25th CIRP Life Cycle Engineering (LCE) Conference; 30

April – 2 May 2018, Copenhagen, Denmark; 2018. p. 248–253. https://doi.org/10.1016/j.procir.2017.11.101

[4] Luthra S, Garg D, Haleem A. An analysis of interactions among critical success factors to implement green supply chain management towards sustainability: An Indian perspective. Resources Policy. 2015; 46(1):37-50. http://dx.doi.org/10.1016/j.resourpol.2014.12.006

[5] Acar E, Kiliç M, Güner M. Measurement of sustainability performance in textile industry by using a multi-criteria decision making method. Tekstil ve konfeksiyon. 2015; 25(1):3-9. Available from: https://dergipark.org.tr/en/download/article-file/218280

[6] Söderholm P. The green economy transition: the challenges of technological change for sustainability. Sustainable Earth. 2020; 3(6):1-11. https://doi.org/10.1186/s42055-020-00029-y

[7] Muthu SS, editor. Sustainability in the Textile Industry. Singapore: Springer; 2017. 150 p. https://doi.org/10.1007/978-981-10-2639-3

[8] Ahmed Z, Mahmud S, Acet H. Circular economy model for developing countries: evidence from Bangladesh. Heliyon. 2022; 8(5):e09530. https://doi.org/10.1016/j.heliyon.2022.e09530

[9] Chen WK, Nalluri V, Ma S, Lin MM, Lin CT. An exploration of the critical risk factors in sustainable telecom services: An analysis of indian telecom industries. Sustainability. 2021; 13(2):445. https://doi.org/10.3390/su13020445

[10] Connell KYH. Internal and external barriers to eco-conscious. International Journal of Consumer Studies. 2010; 34(3):279-286. https://doi.org/10.1111/j.1470-6431.2010.00865.x

[11] Dongerkery KS. The Romance of Indian Embroidery. Bombay, India: Thacker & Co; 1951. Harris F, Roby H, Dibb S. Sustainable clothing : challenges, barriers and interventions for encouraging more sustainable consumer behaviour. International Journal of Consumer Studies. 2016; 40(3):309-318. https://doi.org/10.1111/ijcs.12257

[12] Ertekin ZO, Atik D. Sustainable Markets : Motivating Factors , Barriers , and Remedies for Mobilization of Slow Fashion. Journal of Macromarketing. 2015; 35(1):53-69. https://doi.org/10.1177%2F0276146714535932

[13] Kazancoglu I, Kazancoglu Y, Yarimoglu E, Kahraman A. A conceptual framework for barriers of circular supply chains for sustainability in the textile industry. Sustainable development. 2020; 28(5):1477-1492. https://doi.org/10.1002/sd.2100

[14] Islam MM, Khan MMR. Environmental Sustainability Evaluation of Apparel Product: A Case Study on Knitted T-Shirt. Journal of Textiles. 2014. http://dx.doi.org/10.1155/2014/643080

[15] Morgan GA, Leech NL, Gloeckner GW, Barrett KC. SPSS for introductory statistics: Use and interpretation. London: Psychology Press; 2004. 224 p. https://doi.org/10.4324/9781410610539

[16] Christmann A, Van Aelst S. Robust estimation of Cronbach's alpha. Journal of Multivariate Analysis. 2006; 97(7):1660-1674. https://doi.org/10.1016/j.jmva.2005.05.012

[17] Cho E, Kim S. Cronbach's coefficient alpha: Well known but poorly understood. Organizational Research Methods. 2015; 18(2):207-230. https://doi.org/10.1177%2F1094428114555994

[18] Helms JE, Henze KT, Sass TL, Mifsud VA. Treating Cronbach's alpha reliability coefficients as data in counseling research. The counseling Psychologist. 2006; 34(5):630-660. https://doi.org/10.1177%2F0011000006288308

[19] Revelle W, Zinbarg RE. Coefficients alpha, beta, omega, and the glb: Comments on Sijtsma. Psychometrika. 2009; 74:145. https://doi.org/10.1007/s11336-008-9102-z

[20] Gülden Kaya Uyanıka NG. A study on multiple linear regression analysis. Procedia-Social and Behavioral Sciences. 2013; 106:234-240. https://doi.org/10.1016/j.sbspro.2013.12.027

[21] Chicco D, Warrens MJ, Jurman G. The coefficient of determination R-squared is more informative than SMAPE, MAE, MAPE, MSE and RMSE in regression analysis evaluation. PeerJ Computer Science. 2021; 7:e623. https://doi.org/10.7717/peerj-cs.623

[22] McHugh ML. Multiple comparison analysis testing in ANOVA. Biochemia medica. 2011; 21(3):203-209. https://doi.org/10.11613/BM.2011.029

[23] King BM. Analysis of Variance. In: Peterson P, Baker E, McGaw B, editors. International Encyclopedia of Education. Netherlands: Elsevier; 2010. p. 32-36. https://doi.org/10.1016/B978-0-08-044894-7.01306-3

[24] Zwanenburg G, Hoefsloot HCJ, Westerhuis JA, Jansen JJ, Smilde AK. ANOVA–principal component analysis and ANOVA–simultaneous component analysis: A comparison. Journal of Chemometrics. 2011; 25(10):561-567. https://doi.org/10.1002/cem.1400

[25] Ellison SL, Barwick VJ, Farrant TJ. Practical statistics for the analytical scientist: a bench guide. Cambridge: Royal Society of Chemistry; 2009. Chapter 6, Analysis of Variance; p. 59 – 91. https://doi.org/10.1039/9781847559555-00059

[26] Schneider BA, Avivi-Reich M, Mozuraitis M. A cautionary note on the use of the Analysis of Covariance (ANCOVA) in classification designs with and without within-subject factors. Frontiers in Psychology. 2015; 6:474. https://doi.org/10.3389/fpsyg.2015.00474

[27] Liu J, Li Q, Dong J, Chen J, Gu G. Multivariate modeling of aging in bottled lager beer by principal component analysis and multiple regression methods. Journal of Agricultural and Food Chemistry. 2008; 56(16):7106-7112. https://doi.org/10.1021/jf800879v

[28] Daoud JI. Multicollinearity and Regression Analysis. In: Rakhimov A, Ural B, Daoud JI, Saburov K, Chowdhury MSH, editors. ICMAE 2017. 4th International Conference on Mathematical

Applications in Engineering; 8–9 August 2017, International Islamic University Malaysia, Kuala Lumpur, Malaysia; 2017. p. 1-6. https://doi.org/10.1088/1742-6596/949/1/012009

[29] Smith RL, Ager Jr JW, Williams DL. Suppressor variables in multiple regression/correlation. Educational and Psychological Measurement. 1992; 52(1):17-29. https://doi.org/10.1177%2F0013164492052001O2

[30] Schober P, Boer C, Schwarte LA. Correlation Coefficients: Appropriate Use and Interpretation. Anesthesia & Analgesia. 2018; 126(5):1763-1768. https://doi.org/10.1213/ANE.0000000000002864