Assessing Social Sustainability Performance in Textile Industry using Integrated Fuzzy Best-Worst Method and Fuzzy Inference System

T. G. Fadara[1,2], K. Y. Wong[1]

[1]School of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 Skudai, Malaysia

[2]Department of Mechanical Engineering Technology, Federal Polytechnic Ede, P.M.B. 231, Ede, Nigeria

ABSTRACT: The main purpose of the research primarily focused on the development of sustainable social indicators and to test their usefulness and applicability in the Nigerian textile sector in terms of social performance. The integrated Fuzzy Best-Worst method (FBWM) and Fuzzy inference system (FIS) was presented to aid in the evaluation of these indicators. The outcomes demonstrate that employee rights received the highest score of 0.206 in the study. Employee rights are regarded as the most crucial and critical factor. Furthermore, among the indicators, fair salary has the highest global weight. The case company's sustainability performance index was 0.248, which was in the "poor" performance category. A case study was conducted in a Nigerian textile industry to demonstrate the effectiveness and efficiency of the proposed method. These findings will assist managers and policymakers in the textile manufacturing industry, particularly in emerging economies such as Nigeria, in developing strategies to lay the groundwork for social sustainability and transition to truly sustainable textile manufacturing industry.

KEYWORDS: Sustainable indicators, Textile industry, Social performance, Fuzzy best-worst method, Fuzzy inference system

[Received Jul. 25, 2022; Revised Sep. 22, 2022; Accepted Sep. 27, 2022] Print ISSN: 0189-9546 | Online ISSN: 2437-2110

I. INTRODUCTION

Globally, sustainability has been a promising trend in production without affecting the well-being of mankind. Though the textile manufacturing industry is one of the most hazardous industries on the planet (Boström and Micheletti, 2016), representing 10% of total greenhouse gas emissions (Islam, 2016). Social sustainability challenges in the textile manufacturing industry have received less attention than environmental and economic factors. As a result of rapid urbanisation and population growth, the demand for textiles has increased. The textile industry has long wrestled with social sustainability difficulties in addition to environmental and economic concerns. Abuse of migrant workers, product safety, labour rights, safe housing, product service life, and community engagement are all critical issues in the textile industry, particularly in developing countries where labor-intensive garment manufacturing operations are common. Human difficulties include discrimination, human rights violations, long working hours and child labour (O'Rourke, 2003). In the textile industry, low-paid semi-skilled employees, blue-collar workers with fragmented jobs are mostly women (Loo, 2002).

Mani et al. (2015) reported significant social difficulties in India's manufacturing supply chain. The investigation showed that child labour, bonded work, education, and pay are among the most prominent social issues. In addition, child labour and long working hours are common instances of social risks in the textile and apparel industry, which can be minimised by implementing social risk management procedures (Freise and Seuring, 2015, Giannakis and Papadopoulos, 2016). Unsatisfactory work conditions, such as low pay, forced labour, factory safety issues, and the usage of dangerous chemicals, on the other hand, are a few of the societal issues in developing countries (Perry and Towers, 2013; Ashby et al., 2017). The assessment conducted by Roos et al. (2019), observed that the textile sector employs roughly 15,000 chemicals in various operations. Some of these substances have the potential to harm the environment, personnel, and even customers (De Smet et al., 2015). Furthermore, excessive contact with formaldehyde in the textile by the employee increased the risk of developing leukaemia and brain tumours (IARC, 2012). Because of the risks to human and environmental health, some rules govern the use of chemicals in this field (Kemi, 2014). Butnariu and Avasilcai (2015) examined the impact of work-related injuries and illnesses, employee training programmes, and non-profit programmes as social sustainability criteria.

Currently, there is no uniform or universal standard to assess the textile manufacturing industry social sustainability, which makes it difficult due to a lack of conceptual clarity in the sector. To date, only a few studies have incorporated social factors in their sustainability frameworks to achieve sustainable development. Most social efforts performed by companies to address corporate sustainability are going towards more sustainable textile products. Workers' rights and environmental management, in addition to economic factors, are two effective features, according to observation in the

*Corresponding author: tgfadara@graduate.utm.my

doi: http://dx.doi.org/10.4314/njtd.v19i4.7

previous research (Fallahpour and Moghassem, 2012). In the presentation by Taçoğlu *et al.* (2019) open-mindedness is the most essential variable in determining SME competitiveness in the textile industry, followed by staff skill and other critical social parameters.

The work carried out by Guarnieri and Trojan (2019) reported the influence of social, socio-environmental, and economic sustainability criteria, as well as other environmental and economic parameters, to choose sustainable suppliers. The most highly ranked indicators in this survey were those connected to the social issue of sustainability, as well as how the company treats its employees, community. Lenzo et al. (2017) assessed the social life cycle evaluation in the textile industry, emphasized on five stakeholder categories as social sustainability criteria: workers, local community, consumers, value chain actors, and society. Several studies have made the first step in evaluating and defining some significant social sustainability traits and criteria in the textile manufacturing industry yet lack insight to combine them in a cohesive and far more comprehensive framework, which this study aimed to explore.

When dealing with a high number of sustainability criteria, it is obvious that fuzzy logic integrated multi criteria decision-making method (MCDM) procedures fall short, and greater mathematical calculations are required. As a result, a fuzzy inference system (FIS) was used in this work to overcome these restrictions and capture the inherited vagueness in decision makers' responses. Furthermore, FIS uses expert knowledge in the development of the fuzzy rules set, which improves performance evaluation and provides more exact and accurate outcomes. To address the limitation, this paper proposes a standardized evaluation method for analysing social sustainability in the Nigerian textile manufacturing industry. In this study, the combined innovative FBWM developed by Xu et al. (2021), and FIS were utilized to analyse and test the performance of social sustainability criteria. The following are the structure took in actualizing the objective of this work: Section II, lays out the research methodology and case study. The result is presented in Section III, while the study draws its conclusion in section IV.

II. METHODOLOGY

To achieve the objectives of this study, a thorough methodological research technique was employed. At the initial stage a literature analysis was undertaken on social sustainability indicators applicable in the textile manufacturing industry, with formulation of useful indicators as generated from aforementioned relevant literatures on sustainability assessments. The extracted suitable indicators were used to develop the questionnaire and sent to Nigerian textile manufacturing industry experts and decision-makers for refinement, inclusion, removal, and validation. Thereafter, the modified and validated list of sustainable social indicators was further used to develop a questionnaire and resubmit it to a group of experts for data collection, thus, further analysed by employing the integrated FBWM-FIS. The FBWM according to Xu et al. (2021) approach was used to calculate the weights of the criteria, the scores and to prioritise the most influential and impacted indicators. While FIS was utilized to determine the case company's total social performance.

Finally, the research findings and outcomes are debated, and a conclusion is offered. We apply the integrated fuzzy inference system and Fuzzy Best-Worst Method (FBWM-FIS), to calculate the sustainability performance index of the textile industry. The utility of FBWM-FIS in textile manufacturing industry is still limited. Although this framework is currently unavailable, we believed it was worth investigating. In this study 24 social sustainability indicators were used based on literature review and experts' input and validation as shown in Table 1. Table 1 showed the description of each indicator, and they were explained in detail in Appendix B.

A. Fuzzy Best-Worst Method

Best-Worst Method (BWM) is a pairwise comparison technique that was developed Rezaei et al. (2015) as an improvement on the previous analytic hierarchy process (AHP) methodology. In two subsequent steps, the decision-maker compares the fuzzy preferences of the best and worst criteria with the other criteria. The pairwise comparison strength is determined using a preference scale with points ranging from 0.5 to 0.9. The fuzzy preference pairwise comparison of the best and worst indicators is then used to develop an optimization problem. As a result of this optimization problem, the optimal weights of criteria are determined.

To address the features of vagueness and intangibility, the method uses fuzzy set theory, which has the following advantages: Only the better preference values (i.e., 0.5-0.9) are employed in the FBWM calculation, making it easier to use and lessening computational complexity. In addition, when compared to FAHP, which is extensively utilized (Shen *et al.*, 2015), in decision-making problem. The FBWM's complexity increases linearly or slowly as the number of criteria or alternatives increases, but the FAHP curve grows exponentially, resulting in computing complexity. Moreover, when there are two or three criteria or alternatives, the comparisons are the same (Xu *et al.*, 2021). All of these advantages are the primary reasons for employing this novel FBWM in this investigation.

B. Fuzzy Logic

Lotfi Zadeh (1965) came up with the concept of fuzzy set theory around as a means of dealing with human decision-making reasoning, five decades ago (Zadeh, 1965). Fuzzy is a mathematical paradigm that allows for the use of quantitative numbers to reflect ambiguity as well as vagueness in decision-making

.

C. FIS for Decision Making

The fuzzy rules were developed based on the case company's expert judgments. According to Amindoust *et al.* (2012), experts might create rules using just two inputs (the total number of rules is 25 if C = 2 and M = 5). The historical data set is not required by FIS, unlike other decision-making approaches. In the following subsections, the basic ideas of the

Table 1: Criteria for social sustainability based on literature and expert opinion.

Main criteria	Indicators	References
Employee right	Fair salary	(Lenzo et al., 2017, Ahmad and Wong, 2019, Steen and Palander, 2016, Sutherland et al., 2016)
	Standard working hours	(Fallahpour et al., 2017)
	Child and forced labour	(Lenzo et al., 2017, Baskaran et al., 2012, Hauschild et al., 2008, Steen and Palander, 2016, Sutherland et al., 2016, GRI, 2002, Osiro et al., 2018, Nikolaou et al., 2019)
	Non-discrimination	(GRI (Global Reporting Initiative), 2010, Ahmad and Wong, 2019, Sutherland et al., 2016, GRI, 2002)
	Freedom of Association and collective bargaining	(Lenzo et al., 2017, Steen and Palander, 2016, Sutherland et al., 2016, GRI, 2002)
Employee satisfaction	Training and Education	(GRI (Global Reporting Initiative), 2010, Hauschild et al., 2008, GRI, 2002, Pham and Kim, 2019)
	Occupational health and safety	(GRI (Global Reporting Initiative), 2010, Ahmad and Wong, 2019)
	Work accident	(Butnariu and Avasilcai, 2015)
	Rewards	(Osiro *et al.*, 2018)
	Work illness	(Butnariu and Avasilcai, 2015)
Consumer right	Health and safety	(Lenzo et al., 2017, Steen and Palander, 2016, Lehmann et al., 2011, Sutherland et al., 2016, GRI, 2002, Nikolaou et al., 2019)
	The service life of the product	Expert
	On-time delivery of the product	Expert
	Transparency on the label	(Lenzo et al., 2017, Peruzzini et al., 2017, Steen and Palander, 2016, Sutherland et al., 2016)
Consumer satisfaction	Trendiness	Expert
	Animal skin product	Expert
	Complaint rate	Expert
	Low patronage	Expert
Community right	Employment opportunity	(GRI, 2002, Osiro et al., 2018, Nikolaou et al., 2019)
	Access to a health facility	Expert
	Community Engagement/ involvement	(Lenzo et al., 2017, Ahmad and Wong, 2019, Steen and Palander, 2016, Sutherland et al., 2016)
Community satisfaction	Community complaints	(Ahmad and Wong, 2019)
	Secure living condition	(Lenzo et al., 2017, Steen and Palander, 2016)
	Contribution to economic development	(Lenzo et al., 2017, Peruzzini et al., 2017, Steen and Palander, 2016, Sutherland et al., 2016)

FIS considered in this study were described in three stages shown in Figure 1. In this study, five fuzzy membership functions are employed for both output and inputs throughout the phases of the FIS. Experts employed fuzzy preference scale as seen in Table 2, to provide the fuzzy best vector (FBV) preference and fuzzy worst vector (FWV) preference for the assessment. A fuzzy set of linguistic variables includes "very poor," "poor," "moderate," "good," and "very good". The five scale linguistic variables were used to lessen expert bias and also account for the ambiguities of human qualitative judgement, which is consistent with the findings of (Jain and Singh, 2020). These variables are analogous to fuzzy numbers on a numeric range of 0–1. Also, Table 3 reveals the fuzzy membership function of both input and output variables. Whereas Table 4 showed the overall sustainability performance index range. The fuzzy rule base was developed using able 5 based on five input and output membership functions shown in Table 2.

Table 2: Fuzzy preference scale.

PBW	0.5	0.6	0.7	0.8	0.9
Consistency index (max ξ)	0	0.20	0.62	1.63	5.23

D. Calculate the Local and Global Weights of Main Criteria and Indicators

The following steps are used to put the model into action:

Step 1. Choose a set of criteria as seen in Table1.

$$C = \{c_1, c_2, \dots\dots, c_n\} \quad (1)$$

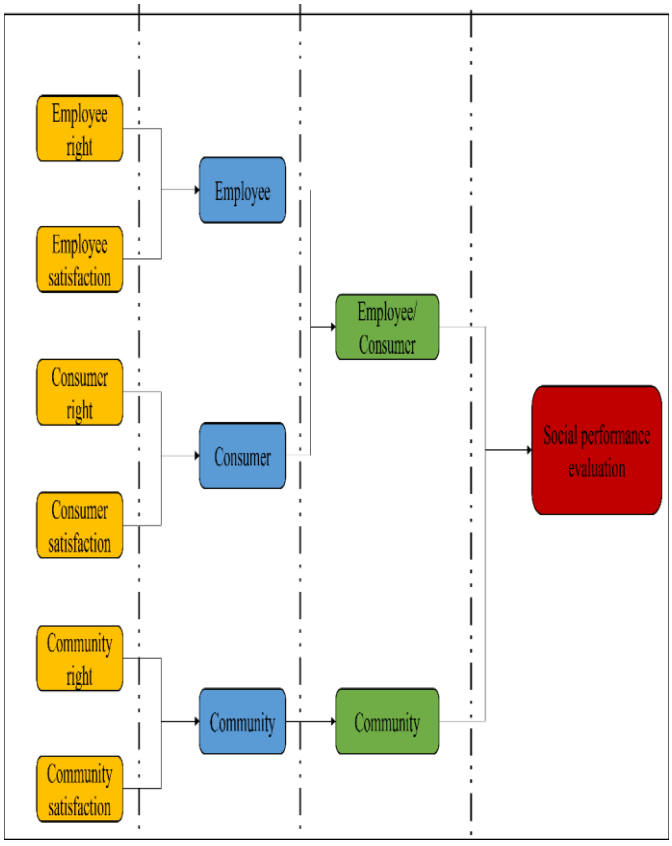

Figure 1: The assessment model for an illustrative example.

Step 2. Determine the most crucial (FBV) and least crucial (FWV) criteria.
Step 3. For the best criterion, perform fuzzy preference comparisons.

$$P_B = (p_{B1}, p_{B2}, \ldots., p_{Bn}) \quad (2)$$

where p_{Bj} is the best criterion B fuzzy preference over criterion j. Clearly, $p_{BB} = 0.5$
Step 4. For the worst criterion, make fuzzy preference comparisons.

$$P_W = (p_{1W}, p_{2W}, \ldots., p_{nW})^T \quad (3)$$

where p_{jW} denotes criterion j fuzzy preference over the worst criterion W. Clearly, $p_{WW} = 0.5$.
Step 5. Determine the optimal fuzzy weights $(\omega_1^*, \omega_2^*, \ldots., \omega_n^*)$.

$$\omega_s^* = \frac{\sum_{k=1}^{m} \omega_s^k}{m},\ s = 1, 2, \ldots., n \quad (4)$$

Step 6. Determine the global weights

$$\omega_s^* \times \left(\omega_{s1}^*, \omega_{s2}^*, .., \omega_{sr_s}^*\right)^T,\ s = 1, 2, .., n \quad (5)$$

Step 7. Determine the consistency ratio

$$Consistency\ Ratio = \frac{\xi^*}{Consistency\ index} \quad (6)$$

The consistency ratio is a statistic used to assess the consistency of comparisons. The lower the consistency ratios, the more trustworthy the comparisons. Figure 1 showed the three multi-stage FISs of the entire assessment model.
Eqn. (7) is used to calculate the single estimated value using the graded mean integration representation(GMIR) method (Chen and Hsieh, 1999).

$$S = \frac{1}{6}(l + 4m + u) \quad (7)$$

Table 3: Fuzzy membership function for input and output variables.

Number	Membership Function			Description
1	0.0	0.0	0.25	Very poor
2	0.00	0.25	0.50	Poor
3	0.25	0.50	0.75	Moderate
4	0.50	0.75	1.0	Good
5	0.75	1.0	1.0	Very good

Table 4: Overall social sustainability performance levels.

Number	Index Range	Description
1	0.0-0.19	Very poor
2	0.2-0.39	Poor
3	0.4-0.59	Moderate
4	0.6-0.79	Good
5	0.8-1.00	Very good

E. The Developed FBWM-FIS Model

The suggested methodology necessitates textile industry performance ratings in terms of indicators relevant to sustainability assessment as well as importance weights for these indicators. After computing the global weight of each criterion (from FBWM) and determining the single value of the case company estimated data. The indicator scores are then calculated by multiplying the single value with the corresponding global weights of the indicators. Hence, the aspect scores are determined with the consideration of the direction of impacts of the indicators which is then used as input performance data to FIS. The values were lowered following multiplication. The following are the steps for the established FBWM-FIS model:

i. Identifying the evaluated sustainability criteria.
ii. Collecting data sets for each indicators local weights and establishing their global weights.
iii. Collecting data sets for each indicators performance value for sustainable textile industry and calculate their precise single estimated values.
iv. Taking the global weights and multiplying them by the corresponding single estimated values.

Using the FIS to calculate the social performance rating of the case company.

Table 5: Fuzzy rules base for the analysis.

RULES	Input 1	Input 2	Output
	IF	AND	THEN
1	Very poor	Very poor	Very Poor
2	Very poor	Poor	Very poor
3	Very poor	Moderate	Poor
4	Very poor	Good	Poor
5	Very poor	Very good	Moderate
6	Poor	Very poor	Very poor
7	Poor	Poor	Poor
8	Poor	Moderate	Poor
9	Poor	Good	Moderate
10	Poor	Very good	Moderate
11	Moderate	Very poor	Poor
12	Moderate	Poor	Poor
13	Moderate	Moderate	Moderate
14	Moderate	Good	Moderate
15	Moderate	Very good	Good
16	Good	Very poor	Poor
17	Good	Poor	Moderate
18	Good	Moderate	Moderate
19	Good	Good	Good
20	Good	Very good	Good
21	Very good	Very poor	Moderate
22	Very good	Poor	Moderate
23	Very good	Moderate	Good
24	Very good	Good	Good
25	Very good	Very good	Very good

F. Steps Involved in Relative Weights of Indicators, Aspects, and Dimensions Calculation

i) Select a set of applicable criteria.
ii) Determine the most and least important criteria.
iii) Compute the best criterion fuzzy preference over all other criteria.
iv) Compute the fuzzy preference of others across the worst criterion.
v) Calculate the fuzzy weights.

G.

The FBWM method used to calculate the weights was developed by (Xu *et al*., 2021), the MATLAB software programmes was used to solve the optimization problems. The ideal fuzzy weights and consistency ratio are determined by solving the FBV and FWV as seen in Table 6 since consistency ratio is a metric for determining whether comparisons are able. By solving the FBWM optimization model for each of the 6 main criteria and 24 indicators provided by four experts, the optimal weights of the criteria are derived in this step.

Table 6: The FBV and FWV of the sustainability dimension.

Best criterion S1							**Worst criterion S4**						
Experts	S1	S2	S3	S4	S5	S6	Experts	S1	S2	S3	S4	S5	S6
Expert 1	0.5	0.6	0.8	0.9	0.7	0.7	Expert 1	0.9	0.8	0.6	0.5	0.7	0.7
Expert 2	0.5	0.6	0.6	0.7	0.6	0.6	Expert 2	0.7	0.6	0.6	0.5	0.6	0.6
Expert 3	0.5	0.6	0.7	0.8	0.7	0.7	Expert 3	0.8	0.7	0.6	0.5	0.7	0.7
Expert 4	0.5	0.6	0.7	0.8	0.6	0.7	Expert 4	0.8	0.7	0.7	0.5	0.7	0.7

The weight vector for the main criteria and $\xi^{(1)}: \left(\omega_1^{(1)}, \omega_2^{(1)}, \ldots, \omega_6^{(1)}\right) = (0.3620, 0.2304, 0.0815, 0.0519, 0.1371, 0.1771)$ and $\xi^{*(1)} = 0.0254$ by solving the given model.

The other three experts can provide the preference scale to calculate the weight of each main criterion using same procedure. The average weight values for each main criterion are then calculated and the results are shown in Table 7, which revealed the criteria weights of the assessment. All the estimated consistency ratios (ξ^*) are near to zero, indicating that the comparisons are very reliable and consistent.

Case Study

The indicators developed were examined for use in a case study of the Nigerian textile industry. For confidentiality purposes, the company's name was not disclosed; hence, it is simply referred to as CFD Textile Company in Nigeria. The company began as 13 of the main boa small textile unit in 1970, with the goal of producing fabrics for the Nigerian market. With a production capacity of 450,000 metres each month, with roughly 220 employees. Three members of upper management and production staff were tasked with gathering information.

Table 7: The main criteria local weight.

Experts	1	2	3	4	Averages
S1	0.3620	0.2457	0.3153	0.2947	0.304
S2	0.2304	0.1619	0.1900	0.1776	0.190
S3	0.0815	0.1619	0.1202	0.1412	0.126
S4	0.0519	0.1067	0.0724	0.0677	0.075
S5	0.1371	0.1619	0.1511	0.1776	0.157
S6	0.1371	0.1619	0.1511	0.1412	0.148
ξ*	0.0254	0.0028	0.0240	0.0240	-
Consistency ratio	0.0049	0.0045	0.0147	0.0147	-

G. Calculation of Local and Global Weights of Indicator

The local weights of the indicator was obtained the same way as reported by Xu et al. (2021), then multiplying the indicator weights with the corresponding aspect weights to obtained the global weights of the indicators. Tables A.1 to A.6 showed the best and worst indicators at each aspect level and their FBVs and FWVs. Table 8 consists of the weights of criteria and the indicators as well as the global weights used for the assessment.

For comparability and ease of use, daily, weekly, and monthly data were transformed to 'per product' statistics. As a result, we analyse social dimensions, as well as 6 criteria and 24 social sustainable indicators based on literature and expert opinions. Quantitative data were collected using measuring units, whereas qualitative data was collected using linguistic scales ranging from (1 Very poor to 5 Very good).

Table 8: Local and global weights of sustainable indicators.

Main criteria	**Main weight**	**Indicator**	**Indicator local weight**	**Global weight**
	0.304	Fair salary	0.437	0.133
		Standard working hour	0.244	0.074
Employee right (S1)		Child and forced labour	0.073	0.022
		Non discrimination	0.131	0.040
		Freedom of Association and collective bargaining	0.115	0.035
	0.190	Training and Education	0.211	0.040
Employee		Occupational health and safety	0.197	0.037
satisfaction (S2)		Work accident	0.132	0.025
		Rewards	0.375	0.072
		Work illness	0.085	0.016
	0.126	Health and safety	0.252	0.032
Consumer right (S3)		The service life of the products	0.455	0.057
		On-time delivery of the products	0.189	0.024
		Transparency on the label	0.104	0.013
Consumer	0.075	Trendiness	0.229	0.017
satisfaction (S4)		Animal skin product	0.497	0.037
		Complaint rate	0.098	0.008
		Low patronage	0.176	0.013
	0.157	Employment opportunity	0.610	0.096
Community right		Access to health facility	0.263	0.041
(S5)		Community Engagement/ involvement	0.127	0.020
	0.148	Community complaints	0.121	0.018
Community		Secure living condition	0.309	0.046
satisfaction (S6)		Contribution to economic development	0.570	0.084

Due to a lack of publicly available data, each indicator's data was collected as three-point estimates (least possible, most likely, and maximum possible). Because different indicators use various measuring units, they can't be summed up directly. To tackle this problem, the gathered data were normalised from 0 to 1. The graded mean integration representation (GMIR) approach (Chen and Hsieh, 1999) was utilized as seen in Equation (7) to calculate the single value from three point estimates. While, Equation (8) was used to normalise indicators with a positive (+) sign while Equation (9) was used to normalize indicators with a negative (-) sign. The weighted score of each indicator was calculated by multiplying each indicator's solitary value by its associated weight to determine the associated aspect category's score. The scores of the indicators were subtracted or added based on their influence direction at the aspect category level. The score at the dimension level was calculated using the same method.

$$X = \left(\frac{P^1}{C^+}, \frac{P^2}{C^+}, \frac{P^3}{C^+}\right) \quad (8)$$

$$X = \left(\frac{C^-}{P^3}, \frac{C^-}{P^2}, \frac{C^-}{P^1}\right) \quad (9)$$

where $p1, p2\ and\ p3$ are the three-point estimates, whereas $C^+\ and\ C^-$ are the maximum and minimum values respectively among the three-point estimates, while X represent three-point estimates' normalised values. Based on the expert consensus, 24 social sustainability indicators were finalized for the Nigerian textile manufacturing industry as seen in Table 1. Table 9 showed the evaluation of social indicators performance of CFD textile manufacturing industry. Table 9 revealed the indicators, their impact directions of each indicators, and the weights of social dimension. Each indicator is given a positive (+) or negative (-) sign based on its sustainability effect. Positive sign denotes a beneficial or contributing attribute to sustainability, whereas negative signs denote a detrimental or hindering attribute. Moreover, based on the experts' preferences, the weights of the indicators were determined using FBWM and the CFD textile manufacturing industry performance evaluation data (three-point data estimates) were used to calculate the indicator score, aspect score and dimension score. In this study, the incorporation weightages and the influence directions of indicators yielded intriguing results.

III. RESULTS AND DISCUSSION

Table 8 revealed the study local and global weights. The study observations can assist managers in making strategic management decisions. As it can be seen from Table 7 which revealed the main criteria weights, and showed that employee rights with a weight of 0.304 is the most crucial and important criterion. Employee satisfaction and community rights are the second and third most important factors, with criteria weights of 0.190 and 0.157, respectively.

Consumer satisfaction is the least important factor, with a local weight of 0.075. It was hardly unexpected that this criterion was deemed the least important, whereas employee rights were rated as the most important criteria by the experts in the textile manufacturing industry because of the difficulties most workers in the textile manufacturing industry in developing countries faced during coronavirus disease (Covid-19), which clearly resulted in a decline in their living standards (Antonopoulos, 2009).

Employee rights were violated since majority of textile manufacturing industry ceased production. The crisis has compelled textile entrepreneurs to make difficult decisions such as layoffs, wage reduction, and requiring employees to take unpaid leaves (Kaur, 2021). There have also been complaints of human rights violations against textile manufacturing workers who opposed being laid off without pay (Campaign, 2020). As a result, dealing with an outbreak such as Covid-19 is an uncommon issue in today's globalized society. Though, consumer satisfaction is critical to the improvement and competitiveness of the company (Ramlawati, 2018). In addition, the primary emphasis of textile manufacturers is customer satisfaction (Winchester, 1994), because they must understand their customers' requirements, tastes, and demands (Roach, 1994).

Furthermore, maintaining consumer satisfaction will improve corporate success, resulting in a lower complaint rate. Whereas the most significant factor among the indicators is fair salary, which has a global weight of 0.133, preceded by employment opportunity and contribution to economic development, with a global weight of 0.096 and 0.084, respectively. The consistency ratio derived from simulation suggests that the weights of main criteria and indicators could help to provide more precise and reliable evaluation conclusions, as shown in Table 7. Meanwhile, the consistency ratio is a statistic used to assess the consistency of comparisons, the results revealed that the fuzzy preference comparison were more consistent since the consistency ratio ξ^* is smaller.

The validated indicators were put to test in CFD textile manufacturing company in Nigeria to determine their usefulness and applicability. The result revealed that employee right has the highest score of 0.206 as seen in Table 9. Employee right is the most critical and important criterion. Community right and consumer right came in second and third, with aspect scores of 0.150 and 0.113, respectively. The conclusion for the Nigerian textile manufacturing industry is that employee rights demand the highest and most immediate managerial attention to ensure social sustainability. Once employee rights have been defined and applied, it will serve as a baseline for the establishment of other criterion, resulting in the industry improvement. Employee rights include fair salary, standard working hour, child and forced labour, non-discrimination, and freedom of association and collective bargaining. While the least is employee satisfaction with the score of 0.034 as seen in Table 9. This is surprising because experts assigned more weight to this criterion. The cause could be that the CFD textile manufacturing industry has a poor overall employee wellbeing. In practise, this could imply that employee satisfaction is more appropriate for Nigeria textile manufacturing industry, which is facing sustainability challenges. This also shows that the Nigerian textile manufacturing industry is still lagging behind in terms of social sustainability implementation.

Table 9 also showed that community satisfaction with a score of 0.108 is the fourth most critical factor for social

Table 9: Evaluation of social indicators performance of CFD textile manufacturing industry.

Aspect	Indicator	Estimated values			Normalized data			Single value P (m)	Indicator's weight	Indicator's score	Aspect's score	Dimension's score
		Least possible	Most likely	Max possible	Least possible	Most likely	Max possible					
Employee right	Fair salary (+)	2	2	3	0.667	0.667	1.000	0.723	0.133	0.096	0.206	0.557
	Standard working hour (+)	3	4	4	0.750	0.750	1.000	0.792	0.074	0.059		
	Child and forced labour (-)	1	1	2	0.500	1.000	1.000	0.917	0.022	0.020		
	Non-discrimination (+)	2	3	3	0.667	1.000	1.000	0.945	0.040	0.038		
	Freedom of Association and collective bargaining (+)	2	3	3	0.667	1.000	1.000	0.945	0.035	0.033		
Employee satisfaction	Training and Education (+)	20	26	30	0.667	0.867	1.000	0.856	0.040	0.034	0.034	
	Occupational health and safety (-)	13	16	20	0.650	0.813	1.000	0.817	0.037	0.030		
	Work accident (-)	25	31	35	0.714	0.806	1.000	0.823	0.025	0.021		
	Rewards (+)	20	22	25	0.800	0.880	1.000	0.887	0.072	0.064		
	Work illness (-)	10	13	15	0.667	0.769	1.000	0.791	0.016	0.013		
Consumer right	Safe and healthy products (+)	3	4	4	0.750	1.000	1.000	0.958	0.032	0.031	0.113	
	The service life of the product (+)	4	4	5	0.800	0.800	1.000	0.833	0.057	0.047		
	On-time delivery of products (+)	4	5	5	0.800	1.000	1.000	0.967	0.024	0.023		
	Transparency on the label (+)	3	4	4	0.750	1.000	1.000	0.958	0.013	0.012		
Consumer satisfaction	Trendiness (-)	3	4	4	0.750	1.000	1.000	0.958	0.017	0.016	0.054	
	Animal skin product (-)	1	1	2	0.500	0.500	1.000	0.583	0.037	0.022		
	Complaint rate (-)	1	1	2	0.500	1.000	1.000	0.917	0.008	0.007		
	Low patronage (-)	2	2	3	0.667	0.667	1.000	0.723	0.013	0.009		
Community right	Employment opportunity (+)	3	4	4	0.750	1.000	1.000	0.958	0.096	0.092	0.150	
	Access to health facility (+)	3	4	4	0.750	1.000	1.000	0.958	0.041	0.039		
	Community Engagement/ involvement (+)	2	3	3	0.667	1.000	1.000	0.945	0.020	0.019		
Community satisfaction	Community complaints (-)	1	1	2	0.500	1.000	1.000	0.917	0.018	0.016	0.108	
	Secure living condition (+)	2	3	3	0.667	1.000	1.000	0.945	0.046	0.043		
	Contribution to economic development (+)	4	5	5	0.800	1.000	1.000	0.967	0.084	0.081		

sustainability. The conclusion of this finding is that, to achieve social sustainability, Nigerian textile industries must be focused on community satisfaction after evaluating and developing the more critical criterion listed above. Consumer satisfaction indicators are critical criteria for measuring customer satisfaction and well-being, as these are critical criteria for the survival of an organization (Joung *et al*., 2013). Our study findings contradict earlier research, for example Ocampo *et al.* (2016) discovered that employee satisfaction and consumer satisfaction, which were the two least rank in our study, were considered as intermediate and third most important in their study. The prior study's findings are unsurprising, given that the well-being of employees, who are crucial asset in any firm is critical to attaining sustainability development.

Another study, conducted by Ahmad and Wong (2019) looked at the sustainability assessment of the Malaysian food manufacturing industry and found that labour rights, which was ranked first in our study, were ranked third among the social factors. Furthermore, Ahmad and Wong (2019) ranked consumer and community satisfaction as the least important criterion, scoring 0.004 and 0.005 respectively, although they were ranked fifth and fourth in our analysis respectively. As mentioned in the previous section, the scores of both quantitative and qualitative indicators were used to test the social performance of the case company by employing fuzzy logic technique. The linguistic information given in Table 3 were used to produce the input and output fuzzy membership function.

Table 10: The main criteria weights sensitivity analysis.

Main criteria	Present	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Employee right	0.304	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Employee satisfaction	0.190	0.246	0.218	0.191	0.164	0.137	0.109	0.082	0.055	0.027
Consumer right	0.126	0.163	0.145	0.127	0.109	0.091	0.072	0.054	0.036	0.018
Consumer satisfaction	0.075	0.097	0.086	0.076	0.065	0.054	0.043	0.032	0.022	0.011
Community right	0.157	0.203	0.181	0.158	0.136	0.113	0.090	0.068	0.045	0.023
Community satisfaction	0.148	0.191	0.170	0.148	0.127	0.106	0.085	0.064	0.042	0.021

The total social sustainability performance index was calculated using the aspect scores of all the indicators (quantitative and qualitative) as input variables. As shown in Table 9 the aspects scores of 0.206, 0.034, 0.113, 0.054, 0.150, and 0.108 were employed. The total social sustainability performance index for the case company was 0.248, putting it in the "Poor" category. Given the absence of scientific investigations to back up the findings of this study, as well as the fact that research into social sustainability performance assessment in the Nigerian textile manufacturing industry is obviously within the initial phases, varied results are not unexpected at this point. These findings will assist managers and practitioners in the Nigeria textile manufacturing industry to determine which criteria are more relevant and suitable for the textile manufacturing industry.

By altering the weights of the employee right, the results were investigated for bias and robustness using sensitivity analysis. Table 10 showed the weights of all-important criteria. The weights of the other key criteria are changed as the weight of the employee right fluctuates from 0.1 to 0.9. Table 11 shows the various outcomes for all aspects scores based on the fluctuated weights, while Figure 2 depicts the results of the aspects scores. Employee right scores always rank first, and employee satisfaction ratings always rank last when the weight of the employee right aspects spans from 0.1 to 0.9. This conclusion suggests that most important issue to consider in a sustainable textile sector is currently employee rights. The ranking of choices is always in the following order, employee right>community right>consumer right> community satisfaction> consumer satisfaction> employee satisfaction according to the results of the sensitivity analysis as shown in Table 11. Figure 3 depicted the rule viewer of the FIS associated with social performance rating of the case company.

Table 11: The scores of alternatives by varying main criterion weights.

	S1	S2	S3	S4	S5	S6
Present	0.206	0.034	0.113	0.054	0.150	0.108
Run 0.1	0.068	0.045	0.147	0.069	0.195	0.182
Run 0.2	0.135	0.039	0.130	0.062	0.173	0.124
Run 0.3	0.203	0.033	0.114	0.053	0.151	0.107
Run 0.4	0.270	0.030	0.082	0.047	0.130	0.098
Run 0.5	0.338	0.024	0.081	0.040	0.108	0.077
Run 0.6	0.405	0.020	0.064	0.031	0.086	0.062
Run 0.7	0.473	0.015	0.050	0.024	0.065	0.047
Run 0.8	0.540	0.010	0.033	0.016	0.042	0.030
Run 0.9	0.607	0.005	0.017	0.008	0.022	0.015

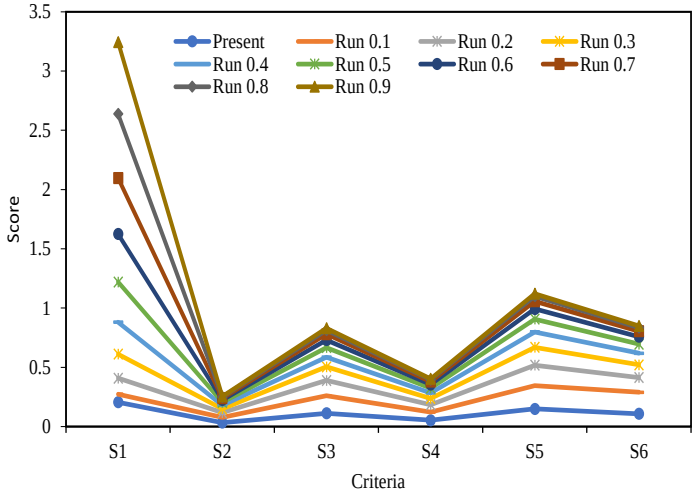

Figure 2: The scores of alternatives by varying main criterion weights.

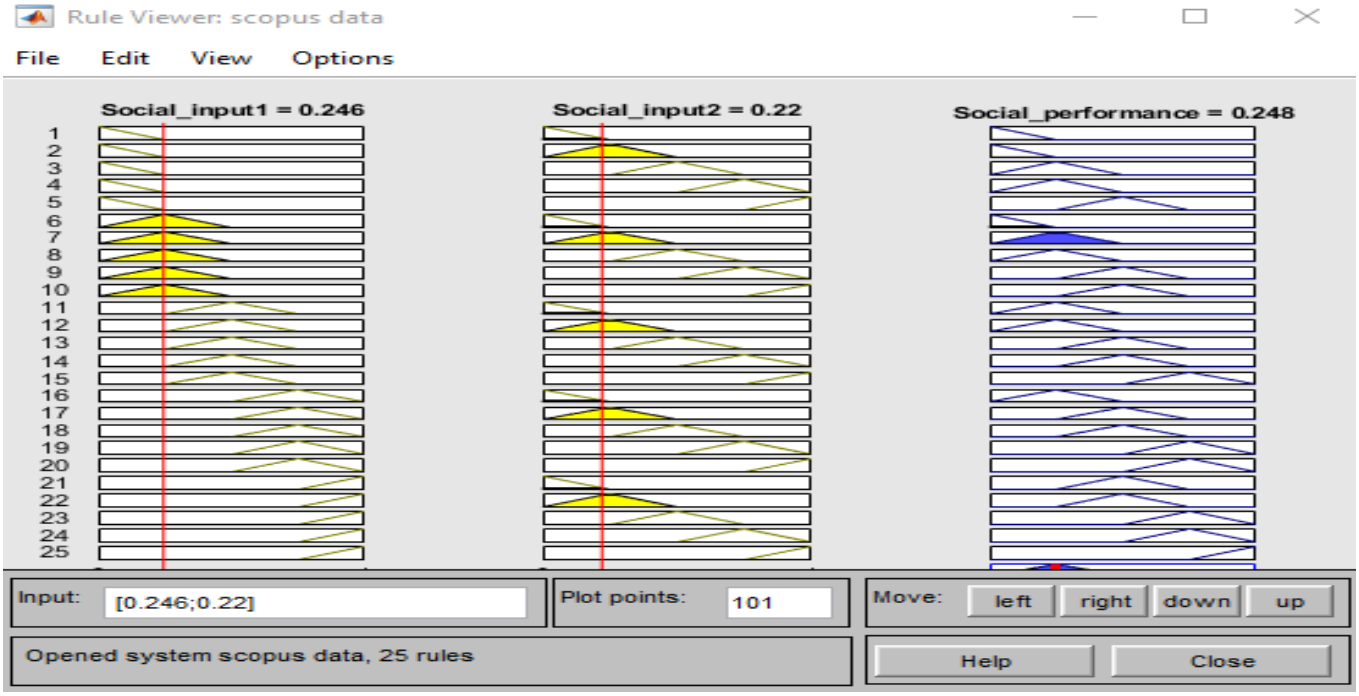

Figure 3: Rule viewer of the FIS associated with social performance rating of the case company.

IV. CONCLUSION

The social sustainability issues in textile manufacturing industry in the Nigeria were investigated in this research. Several textile manufacturing industries have launched a number of sustainability initiatives to address these challenges. Consequently, a few studies have attempted to address the issue of textile manufacturing industry sustainable practices, however, these early efforts and programmes tended to focus on environmental aspects of sustainability. This research provides a complete assessment to help the Nigerian textile industry towards social sustainability in their manufacturing operations, which is currently lacking. To address these multiple issues of social sustainability, this paper began by reviewing previous sustainability studies to discover potential criteria in the textile manufacturing industry and other industrial contexts. The operations are subjected to multiple stages of assessment by the industry experts in order to present a complete and all-encompassing assessment. The research established and used the integrated FBWM-FIS to measure and prioritised 24 criteria, utilising a sample of 4 experts to validate the criteria and indicators.

The FBWM-FIS results reveal that the case company's social performance is poor with yielded value of 0.248. According to the findings, managers and practitioners should place a greater emphasis on employee satisfaction, consumer satisfaction, and community satisfaction. The study observed that the most important factor is employee rights. Notwithstanding, the research made use of certain limitations and constraints which provides good starting place for further investigation into this subject area. The results reported here solely apply to a textile industry in Nigeria, making the findings extrapolating challenging. Due to the uniqueness of the experts, industry specialist was given the opportunity to validate or change the selected criteria based on the Nigerian context.

As a result of the confronted challenges in the Nigeria textile industry over a decade, the experts could be knowledgeable on certain actions connected to social sustainability in the Nigeria textile industry. Future researchers should employ different MCDM models to establish the weights, as well as our social sustainability criteria assessment, then compare the results of these models to our FBWM-FIS findings. This study, in our opinion, serves as groundwork for a proposed model that will only become more prominent in the coming years.

AUTHOR CONTRIBUTIONS

T. G. Fadara: Conceptualization, Methodology, Software, Validation, Writing – original draft, Writing – review & editing. **K. Y. Wong:** Supervision, Writing – review and editing.

ACKNOWLEDGEMENT

The authors are grateful to Universiti Teknologi Malaysia (UTM) (Vote Number: 20H69).

REFERENCES

Ahmad, S. and Wong, K. Y. (2019). Development of weighted triple-bottom line sustainability indicators for the Malaysian food manufacturing industry using the Delphi method. Journal of Cleaner Production, 229**,** 1167-1182.

Amindoust, A.; S. Ahmed.; A. Saghafinia and A. Bahreininejad. (2012). Sustainable supplier selection: A ranking model based on fuzzy inference system. Applied soft computing, 12 (6)**:** 1668-1677.

Antonopoulos, R. (2009). The current economic and financial crisis: a gender perspective. Levy Economics Institute, Working Papers Series.

Ashby, A.; M. H. Smith and R. Shand. (2017). Embedding sustainability in clothing supply chain strategies. Sustainability in fashion and textiles: values, design, production and consumption**,** 61-81.

Baskaran, V.; S. Nachiappan and S. Rahman. (2012). Indian textile suppliers' sustainability evaluation using the grey approach. International Journal of Production Economics, 135 (2): 647-658.

Boström, M. and Micheletti, M. (2016). Introducing the sustainability challenge of textiles and clothing. Journal of Consumer Policy, 39 (4)**:** 367-375.

Butnariu, A. and Avasilcai, S. (2015). The assessment of the companies' sustainable development performance. Procedia economics and finance, 23**,** 1233-1238.

Campaign, C. C. (2020). COVID-19 Demands in defence of Garment Workers in Global Supply Chains.

Chen, S. H. and Hsieh, C. H. (1999). Graded mean integration representation of generalized fuzzy number.

De Smet, D.; D. Weydts and M. Vanneste. (2015). Environmentally friendly fabric finishes. Sustainable Apparel, 3-33, Elsevier.

Fallahpour, A. and Moghassem, A. (2012). Evaluating applicability of VIKOR method of multi-criteria decision making for parameters selection problem in rotor spinning. Fibers and polymers, 13 (6): 802-808.

Fallahpour, A.; E. U. Olugu; S. N. Musa; K. Y. Wong and S. Noori. (2017). A decision support model for sustainable supplier selection in sustainable supply chain management. Computers & Industrial Engineering, 105**,** 391-410.

Freise, M. and Seuring, S. (2015). Social and environmental risk management in supply chains: a survey in the clothing industry. Logistics Research, 8 (1): 1-12.

Giannakis, M. and Papadopoulos, S. T. (2016). Supply chain sustainability: A risk management approach. International Journal of Production Economics, 171**,** 455-470.

Gri (Global reporting initiative). (2010). G3 Sustainable reporting guidelines [Online]. Available: /http://www.globalreporting.org/AboutGRI/WhatIsGRI/S [Accessed (accessed on 27/01/2021) 2021].

Gri, (2002). Sustainability reporting guidelines. GRI: Boston, MA.

Guarnieri, P. and Trojan, F. (2019). Decision making on supplier selection based on social, ethical, and environmental criteria: A study in the textile industry. Resources, Conservation and Recycling, 141**,** 347-361.

Hauschild, M. Z.; L. C. Dreyer and A. Jørgensen. (2008). Assessing social impacts in a life cycle perspective—Lessons learned. CIRP annals, 57 (1): 21-24.

Iarc (2012). Chemical Agents and Related Occupations—A Review of Human Carcinogens; IARC. Lyon, France.

Islam, M. I. (2016). Energy consumption determinants for apparel sewing operations: An approachto environmental sustainability, Kansas State University.

Jain, N. and Singh, A. (2020). Sustainable supplier selection under must-be criteria through Fuzzy inference system. Journal of Cleaner Production, 248**,** 119275.

Joung, C. B.; J. Carrell; P. Sarkar and S. C. Feng. (2013). Categorization of indicators for sustainable manufacturing. Ecological indicators, 24**,** 148-157.

Kaur, K. (2021). The early impact of COVID-19 on textile industry: an empirical analysis. Management and Labour Studies, 46 (3): 235-247.

Kemi (2014). Chemicals in Textiles. In Risks to Human Health and the Environment; Swedish Chemicals Agency: Stockholm, Sweden.

Lehmann, A.; D. Russi; A. Bala; M. Finkbeiner and P. Fullana-i-Palmer. (2011). Integration of social aspects in decision support, based on life cycle thinking. Sustainability, 3 (4): 562-577.

Lenzo, P.; M. Traverso; R. Salomone and G. Ioppolo. (2017). Social life cycle assessment in the textile sector: an Italian case study. Sustainability, 9 (11): 2092.

Loo, B. P. (2002). The textile and clothing industries under the fifth Kondratieff wave: some insights from the case of Hong Kong. World Development, 30 (5): 847-872.

Mani, V.; R. Agrawal and V. Sharma. (2015). Supply chain social sustainability: A comparative case analysis in indian manufacturing industries. Procedia-Social and Behavioral Sciences, 189**,** 234-251.

Nikolaou, I. E.; T. A. Tsalis and K. I. Evangelinos. (2019). A framework to measure corporate sustainability performance: A strong sustainability-based view of firm. Sustainable Production and Consumption, 18**,** 1-18.

O'Rourke, D. (2003). Outsourcing regulation: Analyzing nongovernmental systems of labor standards and monitoring. Policy Studies Journal, 31 (1): 1-29.

Ocampo, L. A.; E. E. Clark and M. A. B. Promentilla. (2016). Computing sustainable manufacturing index with fuzzy analytic hierarchy process. International Journal of Sustainable Engineering, 9 (5): 305-314.

Osiro, L.; F. R. Lima-Junior and L. C. R. Carpinetti. (2018). A group decision model based on quality function deployment and hesitant fuzzy for selecting supply chain sustainability metrics. Journal of Cleaner Production, 183**,** 964-978.

Perry, P. and Towers, N. (2013). Conceptual framework development: CSR implementation in fashion supply chains. International Journal of Physical Distribution & Logistics Management.

Peruzzini, M.; F. Gregori; A. Luzi; M. Mengarelli and M. Germani. (2017). A social life cycle assessment methodology for smart manufacturing: The case of study of a kitchen sink. Journal of Industrial Information Integration, 7**,** 24-32.

Pham, H. and Kim, S. Y. (2019). The effects of sustainable practices and managers' leadership competences on sustainability performance of construction firms. Sustainable Production and Consumption, 20**,** 1-14.

Ramlawati, R. (2018). Total Quality Management as the Key of the Company to Gain the Comrtitiveness, Performance Achievement and Consumer Satisfaction. International Review of Management and Marketing, 8 (4): 60-69.

Rezaei, J.; J. Wang and L. Tavasszy. (2015). Linking supplier development to supplier segmentation using Best

Worst Method. Expert Systems with Applications, 42 (23): 9152-9164.

Roach, A. (1994). Meeting consumer needs for textiles and clothing. Journal of the Textile Institute, 85 (4): 484-495.

Roos, S.; C. Jönsson; S. Posner; R. Arvidsson and M. Svanström. (2019). An inventory framework for inclusion of textile chemicals in life cycle assessment. The International Journal of Life Cycle Assessment, 24 (5): 838-847.

Shen, L.; K. Govindan and M. Shankar. (2015). Evaluation of barriers of corporate social responsibility using an analytical hierarchy process under a fuzzy environment—A textile case. Sustainability, 7 (3): 3493-3514.

Steen, B. and Palander, S. (2016). A selection of safeguard subjects and state indicators for sustainability assessments. The International Journal of Life Cycle Assessment, 21 (6): 861-874.

Sutherland, J. W.; J. S. Richter; M.J. Hutchins; D. Dornfeld; R. Dzombak; J. Mangold; S. Robinson; M. Z. Hauschild; A. Bonou; P. Schönsleben and F. Friemann. (2016). The role of manufacturing in affecting the social dimension of sustainability. CIRP Annals, 65 (2): 689-712.

Taçoğlu, C.; C. Ceylan and Y. Kazançoğlu (2019). Analysis of variables affecting competitiveness of SMEs in the textile industry. Journal of Business Economics and Management, 20 (4): 648-673.

Winchester, S. (1994). Total Management in quality. Journal of the Textile Institute, 84**,** 445-459.

Xu, Y.; X. Zhu; X. Wen and E. Herrera-Viedma. (2021). Fuzzy best-worst method and its application in initial water rights allocation. Applied Soft Computing, 101**,** 107007.

Zadeh, L. A. (1965). Fuzzy sets. Information and control, 8**,** 338-353.

APPENDIX A

Table A.1: The *FBV* and *FWV* of the employee right.

Best criterion S11						**Worst criterion S13**					
Experts	S11	S12	S13	S14	S15	Experts	S11	S12	S13	S14	S15
Expert 1	0.5	0.6	0.9	0.8	0.8	Expert 1	0.9	0.8	0.5	0.6	0.6
Expert 2	0.5	0.6	0.8	0.7	0.7	Expert 2	0.8	0.7	0.5	0.6	0.6
Expert 3	0.5	0.6	0.9	0.7	0.8	Expert 3	0.9	0.8	0.5	0.7	0.6
Expert 4	0.5	0.6	0.9	0.8	0.8	Expert 4	0.9	0.7	0.5	0.6	0.6

Table A.2: The *FBV* and *FWV* of the employee satisfaction.

Best criterion S24						**Worst criterion S25**					
Experts	S21	S22	S23	S24	S25	Experts	S21	S22	S23	S24	S25
Expert 1	0.6	0.7	0.8	0.5	0.9	Expert 1	0.8	0.7	0.6	0.9	0.5
Expert 2	0.7	0.7	0.8	0.5	0.9	Expert 2	0.7	0.8	0.6	0.9	0.5
Expert 3	0.6	0.6	0.7	0.5	0.8	Expert 3	0.7	0.7	0.6	0.8	0.5
Expert 4	0.6	0.6	0.6	0.5	0.7	Expert 4	0.6	0.6	0.6	0.7	0.5

Table A.3: The *FBV* and *FWV* of the consumer right.

Best criterion S32					**Worst criterion S34**				
Experts	S31	S32	S33	S34	Experts	S31	S32	S33	S34
Expert 1	0.7	0.5	0.8	0.9	Expert 1	0.7	0.9	0.6	0.5
Expert 2	0.6	0.5	0.7	0.9	Expert 2	0.8	0.9	0.8	0.5
Expert 3	0.6	0.5	0.7	0.8	Expert 3	0.7	0.8	0.6	0.5
Expert 4	0.6	0.5	0.6	0.7	Expert 4	0.6	0.7	0.6	0.5

Table A.4: The *FBV* and *FWV* of the consumer satisfaction.

Best criterion S42					**Worst criterion S43**				
Experts	S41	S42	S43	S44	Experts	S41	S42	S43	S44
Expert 1	0.6	0.5	0.9	0.8	Expert 1	0.8	0.9	0.5	0.6
Expert 2	0.6	0.5	0.8	0.7	Expert 2	0.7	0.8	0.5	0.6
Expert 3	0.7	0.5	0.8	0.7	Expert 3	0.6	0.8	0.5	0.6
Expert 4	0.8	0.5	0.9	0.7	Expert 4	0.6	0.9	0.5	0.7

Table A.5: The *FBV* and *FWV* of the community right.

Best criterion S51				**Worst criterion S53**			
Experts	S51	S52	S53	Experts	S51	S52	S53
Expert 1	0.5	0.7	0.9	Expert 1	0.9	0.6	0.5
Expert 2	0.5	0.6	0.8	Expert 2	0.8	0.7	0.5
Expert 3	0.5	0.7	0.8	Expert 3	0.8	0.6	0.5
Expert 4	0.5	0.7	0.9	Expert 4	0.9	0.7	0.5

Table A.6: The *FBV* and *FWV* of the community satisfaction.

Best criterion S63				**Worst criterion S61**			
Experts	S61	S62	S63	Experts	S61	S62	S63
Expert 1	0.9	0.7	0.5	Expert 1	0.5	0.6	0.9
Expert 2	0.9	0.6	0.5	Expert 2	0.5	0.8	0.9
Expert 3	0.7	0.6	0.5	Expert 3	0.5	0.6	0.7
Expert 4	0.9	0.6	0.5	Expert 4	0.5	0.8	0.9

Appendix B: Social sustainability indicators selected for the evaluation.

Criteria	Indicators	Description
Employee right	Fair salary	This is reasonable amount being paid by the company for the specific type of work done to the workers.
	Standard working hour	The industry must sustain reasonable working hours in compliance with applicable laws and country standards of the jurisdiction in which the factory is located
	Child and forced labour	No one shall be engaged at a younger age than the legal minimum age and made to work in the textile industry or jurisdiction through deception, force, or coercion.
	Non-discrimination	Merit and individual capability to do the job should be the condition of employment. Any form of Nepotism should be ignored, such as gender, sexual orientation, complexion, national origin, disability, religion and any other similar factors.
	Freedom of Association and collective bargaining	Every employee in the organization must have complete freedom of association. E.g. employee union association.
Employee satisfaction	Training and Education	The number of education and training programs put in place to assist employees
	Occupational health and safety	It is concerned with workplace safety, health, and welfare issues, which include legislation, initiatives, and standards aimed at making the workplace a better environment for workers, as well as customer, co-workers, and other stakeholders.
	Work accident	Rate of work-related accidents per year such as injuries at workplace
	Rewards	The sum of money spent on employees in appreciation of their services, efforts, and accomplishments.
	Work illness	Rate of long-term health effect of work illness per year due to human contact with several harmful chemicals and environment
Consumer right	Safe and healthy	The product must be safe to wear and use for the consumer
	The service life of the products	The amount of time the consumer uses the product before it fades away
	On-time delivery of product	The ability to adhere to a set delivery schedule in order to maximise customer satisfaction.
	Transparency on the label	There must be honesty and openness in all the transactions with the customer
Consumer satisfaction	Trendiness	The product must be up to date and very fashionable
	Animal skin product	The product must be generally accepted irrespective of the tribe and religion
	Complaint rate	This is the rate at which customer expressed their dissatisfaction about the service or product of the industry
	Low patronage	The effect of low patronage of the products on the textile industry
Community right	Employment opportunity	The industry must make adequate employment provision ratio for the immediate communities where the industry is situated in other to enhanced them socially, economically and physically to promote equity and fairness
	Access to health facility	The industry must provide a functional health care to the immediate community
	Community Engagement/ involvement	The number of programs carried out to communicate the impacts of operations on the communities such as community-company partnership
Community satisfaction	Community complaints	There must be honesty and openness in all the transactions with the indigene of the community where the company is situated
	Secure living condition	The community must be free from any form of danger or harm and must be safe from all the industry effluents
	Contribution to economic development	The industry must contribute to the economic development of the immediate community by patronizing the local market, address environmental challenges and investing in product and services people need