Performance Modelling Of Sambalpuri BastralayaHandloom Cooperative Society: A DEA Approach

Rajib Kumar Sahu[1] , Rohita Kumar Mishra[2]

[1]Doctoral Scholar, Department of Business Administration, Sambalpur University, Odisha,India.

[2]Assistant Professor, Department of Business Administration, Sambalpur University,Odisha, India.

ABSTRACT

India's design industry is one of the world's most promising manufacturing sectors. It has been seen that both within and outside the cooperative sector, there is growth and innovation, which offers us a good indication of the Handloom industry's potential in the twenty-first century. In terms of job prospects and revenue creation, it is essential to our rural economy. Handlooms are well-known in Odisha. The handloom sector is extremely important to the state's economy. One of the country's largest handloom cooperative societies, the Sambalpuri Bastralaya handloom cooperative society, has a distinguished reputation. The primary goal of this research is to determine the significance of Sambalpuri Bastralaya in managerial decision-making. For the performance modelling of Sambalpuri Bastralya Handloom Cooperative Society Ltd, data was explored using DEA. Sambalpuri Bastralaya can use the DEA approach to determine their position in comparison to their peers and build improvement strategies based on a combination of inputs and outputs.

Key Words: Sambalpuri Bastralaya, Handloom, DEA, Handloom Sector

INTRODUCTION

Sambalpuri Bastralaya Handloom cooperative society holds a unique position in India as a cooperative organisation in terms of both its existence and the quality of its Handloom. Odisha's handloom items are in high demand, thanks to the Sambalpuri Handloom business, which is independent of agriculture and employs weavers both domestically and abroad. Apart from the fact that Odisha is known throughout the country for its handcrafted goods, the Sambalpuri Saree stands out owing to its distinct weaving techniques, style, and fabric quality. Hand loomed is of exceptional quality in terms of colour, design, and aesthetics. The colour of the

Handloom is long-lasting and does not fade over time. Ginning, spinning, dying, bleaching, weaving, selling, and marketing of handloom items are the main activities of the Handloom sector. In terms of design, texture, and weaving level, Sambalpuri sarees are exceptional. The tie-and-dye method is known as ikat. Sambalpuri sarees come in a variety of styles, including bomkai, khandua, Bichitrapuri, Saktapar, posapalli, tarapali, rupashree, and others, and are made of cotton, silk, and tussar. The artisans create the design concept, then sketch the relevant drawings, which are subsequently coloured to match the picture's theme.

Padmashree Krutartha Acharya created the Sambalpuri Bastralaya Handloom Cooperative Society(SBHLCS) Ltd., Bargarh, Odisha on June 22, 1954 to conserve and nurture weavers. In terms of both its existence and the quality of its Handloom, the Sambalpuri Bastralaya Handloom cooperative society holds a unique position in India as a landing cooperative society. Weavers work in the Sambalpuri Handloom sector, which is separate from agriculture. Odisha's handloom goods are in high demand both domestically and globally. Apart from the fact that Odisha is known throughout the country for its handcrafted goods, the Sambalpuri Saree stands out owing to its distinct weaving techniques, style, and fabric quality. Hand loomed is of exceptional quality in terms of colour, design, and aesthetics. The colour of the Handloom is long-lasting and does not fade over time. Ginning, spinning, dying, bleaching, weaving, selling, and marketing of handloom items are the main activities of the Handloom sector. In terms of design, texture, and weaving level, Sambalpuri sarees are exceptional. The tie-and-dye method is known as ikat. Sambalpuri sarees come in a variety of styles, including bomkai, khandua, Bichitrapuri, Saktapar, posapalli, tarapali, rupashree, and others, and are made of cotton, silk, and tussar. The artisans create the design concept, then sketch the relevant drawings, which are subsequently coloured to match the picture's theme. On June 22, 1954, Padmashree Krutartha Acharya established the Sambalpuri Bastralaya Handloom Cooperative Society(SBHLCS) Ltd. in Bargarh, Odisha, in acknowledgment of the value of sambalpuri handlooms.

LITERATURE REVIEW

The demand for handloom products, as well as their production and distribution in the mass market, are all intertwined. A few market rules are related to the Handloom production function by standardising production. The links could be placed in various areas to assist, optimise, and channelize the manufacturing process in a variety of ways (Syamasundari and Niranjana, 2006). Handloom products have lost value in the local market due to a multitude of issues. Market trends and preferences have no effect on a wide range of opinions. This separates the market's preferences for handloom products and converts them into design in order to make production viable. Handloom marketing is a major undertaking that necessitates the development of a strategic plan. Handloom has an impact on markets and alters the nature of marketplaces. This industry's sole purpose is to pursue a sales-driven strategy. Weavers have observed an increase in inventories, underemployment, and unemployment as a result of insufficient marketing services and facilities(Satyanarayana, M, 2016).Handloom products confront obstacles such as a scarcity of raw materials, a lack of funding, and competition from power loom manufacturers (Bhadouria, 2012). Online promotion, such as the use of social

media, benefits handloom merchandise since it lowers market costs and extends possibilities. In order to gain from digital marketing, the handloom industry must be informed of the facts. By taking a major position in social media, it will be possible to eliminate the lack of advertising and promotional activities for these handloom products (Humbe, 2014). The traditional selling tactics, as well as social media marketing, are used by businesses to boost sales and revenue. In the Handloom business, however, significant promotion operations connected to brand recognition, brand image, and delivering brand equity to Handloom items are necessary. Women weavers have a unique opportunity to sell their products by engaging directly with their clients thanks to social media. Women weavers gain from the use of social media to boost the value of their firm and brand because they learn new design in the process of communicating via social media and because it is naturally less expensive (Humbe and Bhalerao, 2018). The handloom sector clearly dominates the niche market, as indicated by the weavers' conversation. Mass manufacturing has a problem, and current marketing tactics can't keep up with demand. Because of their traditional (conservative) worldview, weavers are hesitant and unable to innovate (Seemanthini et al., 2016).Weavers are too naive to marketing management talents to rely on middlemen. Because they rely on middlemen, they have marketing challenges and are exploited by them. The weavers are fully unaware of the state and federal governments' initiatives. The infrastructure isn't especially mature or well- developed. Raw material shortages are also a major issue, with increased cotton exports accounting for half of the problem, as well as false shortages produced by commission brokers (Chaudhary, (2015). The education of weavers must be prioritised, and public awareness of the value of higher education must be promoted. Increased education and a reduction in the amount of loans supplied by the weaver's government can help speed things up. The majority of houses are not illiterate as a result of educational institutions, but rather because the waving are uninformed of the advantages of education. As a result, the author suggests that in order to attain maximum success, the wavers obtain a high level of education (Parvin & Haque, 2017). The wages, education, and access to modern technologies are all factors that influence one's career choice. In this case, yearly earnings are mostly utilised to boost capital expenditures for a vital manufacturing process, allowing the company to overcome the challenges of high raw material costs (Bortamuly, Goswami, and Hazarika, 2013).The question of whether master weavers' switch from saree to dress material affects their marketing strategy for attracting new customers remains unsolved. A new market product was created and exported for outside markets, with a focus on the export component, because moving a product from a known market to an unfamiliar market is usually risky(Niranjana.S.et.al., 2006).

Mathiraj and Rajkumar (2008) did studies on handloom weavers' production and available marketing facilities in Tirunelveli district. The weavers' community, according to the research, has been subjected to a wide range of yarn price changes. The manufacturing pattern, design, and selling price of the products, on the other hand, are all modestly priced. According to the report, proper marketing facilities with a consistent selling price and the availability of reasonably priced yarn can help alleviate the problems. Boruah Rickey Rani and Kaur Satvinder (2015) done research on Assam's weavers' cooperative community and focus on the business transactions of a few Assamese handloom weaving companies and identify the many challenges that the Assamese handloom sector faces. The bottlenecks of the handloom sector

in Assam are the use of obsolete technology, which leads to low productivity, a lack of marketing facilities, a lack of innovative design, overall stagnation in the production and selling system, and, most importantly, competition with the power loom and spinning mill sectors. Varghese and Salim (2015) investigated the importance of the handloom industry in India, conducted a detailed analysis of the handloom industry's major problems and challenges in Kerala, and recommended appropriate remedial measures and policy choices for the handloom sector's healthy growth. Rao and Roa (2015) Based on information gathered from both primary and secondary sources examines the current state and federal government systems. Despite the government's institutional support and direct financial assistance, the handloom weavers continue to suffer tremendously as a result of the numerous issues and continue to lose money.

Patra and Dey (2015) conducted a study to investigate the profitability of Odisha handloom products, and give recommendations for enhancing the profitability of Odisha's handloom weavers. Jain and Gera (2017) found out that the lack of weavers' expertise of current production, packaging, design, and promotion strategies create problem in marketing of handloom. As a result, substantial study in this subject is required for the development and promotion of the handloom business. Kar and Bhuyan (2012) emphasised the various and uncoordinated developmental initiatives, depletion of the knowledge worker base, poor protection for traditional arts and crafts, insufficient identification of training needs, and industrial fragmentation as important concerns for the cluster's planning, executing, and monitoring the agencies. Tripathy (2009) investigated the problems and potential of Odisha handloom, concluding that at this level, all types of generalists and specialists are needed to fill key positions in productive firms, research, and planning.

MAJOR APPLICATION OF DEA

Several studies have used Data Envelopment Analysis (DEA) technique to analyse efficiency in the education sector in recent years. The scope, meaning, and definition of DMUs vary by study. The following are a few notable works. Taner and Sizen (2009) used DEA for medical purposes. They used a sequential application of sensitivity analysis, specificity, and efficiency score to reflect the diversity of inputs and outcomes in their study. Madu and Kuei (1998) used Data Envelopment Analysis for benchmarking in their study. They conducted an empirical poll to determine which company or companies should be benchmarked on quality instruments where they may be inefficient at the moment. In his investigation, Seydel (2006) used DEA, which had been updated to include Weber (1996) remarked that when it comes to vendor selection, there are many things to consider. He demonstrated how to use the DEA technique in the case of a baby food factory, where he demonstrated how to use the DEA technique to save money and other measurable terms. He then explains how a baby food maker used the DEA technique in a just-in-time context by developing a DEA formulation for monitoring vendor efficiency. He demonstrates how the DEA technique can result in monetary and other quantifiable savings. Garfamy (2006) evaluates hospital performance in a fictional corporation using numerous criteria related to total cost ownership and arranged data. He then used the model to lower the total cost of ownership. Simulated data in a hypothetical company with the strategy goal of lowering total cost of ownership concept and simulated data in a hypothetical

company. In the field of service quality, Seth, Deshmukh, and Vrat (2006) developed a conceptual model. It includes both inter- and intra-organizational service quality transactions. Wong and Wong (2008) focused on emerging trends in service quality benchmarking information. It gives managers insight into how to apply DEA in strategic decision-making. Park et al. (2010) investigated an integrative perspective on the Supply Relationship Management (SRM) system, highlighting the importance of adopting an integrative concept in improving the efficiency and effectiveness of SRM. The use of cross-sectional data and Data Envelopment Analysis, described the relative efficiency of US merchants and food consumer outlets Mostafa (2009). He has emphasised the need of supporting better efficiency in the retailing industry in the United States from an economic standpoint.

Percin (2010) evaluated third-party logistics (3PL) providers using a two-phase AHP and TOPSIS methodology using a simple, scalable, and easy-to-use approach. Chen and Chen (2009) used DEA to evaluate the efficiency of Taiwanese wafer manufacturing. They also looked at efficiency performance over time using the Malmquist Productive Index. DEA is a good technique for analysing a restaurant menu by evaluating specific menu items based on labour and profitability characteristics, according to Taylor et al. (2009). They've shown that by combining DEA with traditional menu analysis methods, a more efficient menu analysis tool may be utilised to analyse menu items without having to allocate arbitrary non-food costs. Our research's primary purpose is to identify and analyse the problem. The literature clearly emphasizes on lost sales, handloom sector instability, lack of livelihood sustainability, and system inefficiency, but it is rather silent on the reasons for retail store inefficiency, as well as performance modelling relating to store quality and store features. As a result, we attempt to estimate the performance of SBHLCS.

OBJECTIVES OF THE STUDY

- To measure efficiency of Sambalpuri Bastralaya through Data Envelopment Analysis(DEA)
- To assess the importance of Sambalpuri Bastralaya for managerial decision making.

RESEARCH METHODOLOGY

The study employs both primary and secondary data. A structured questionnaire was used to collect the original data from the weavers and cooperative organisations. In our study we have considered 23 Sambalpuri Bastralaya are considered when determining relative efficiency. Secondary data was acquired from a variety of sources, including journals, newspapers, magazines, relevant web sources, and NABARD. DEA was used to analyze data for the SBHLCS Performance Modelling. The CCR DEA model is used in this study. In the CCR model, efficiency is measured by the largest ratio of weighted output to weighted input. One stipulation is that each decision-making unit's ratio be less than or equal to one.

DEA MODEL

The relative efficiency score of j_0 DMU is given by Maximize the efficiency of unit $j0$, Subject to the efficiency (output / input) of all units being ≤ 1.

Or, output - input ≤ 0 Algebraically the model can be written as

In the above problems weight mostfavourable to unit and also produces a measure of efficiency. The decision variables $u = (u_1, u_2, ..., u_r, ..., u_s)$ and

Are the s outputs and m inputs given the same weights? The weighted sum of the output is the numerator of the objective function in (3.4), and the weighted sum of the input is the denominator for DMU. In the constraint section, we write the difference between the weighted sum of output and the weighted sum of input for each of the n DMUs one by one. The model is solved n times, one unit at a time, to determine the relative efficiency of all the units. The fractional program (3.4) can be reduced to Linear Programming Problem (LPP) as follows:

$$\max h_{j_0}(u, v) = \frac{\sum_{r=1}^{s} u_r y_{rj_0}}{\sum_{i=1}^{m} v_i x_{ij_0}}$$

$$subject \quad to \quad \sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \leq 0 \quad j = 1, 2, ..., n$$

$$u_r, v_i \geq 0 \; \forall \; r, i$$

$$(1.1)$$

In the above problem the variables are the weight most favourable to unit and also produce a measure of efficiency. The decision variables an u and v having the s outputs and m inputs.

The weighted sum of the output is the numerator of the objective function in (3.4), and the weighted sum of the input is the denominator for DMU. In the constraint section, we write the difference between the weighted sum of output and the weighted sum of input for each of the n DMUs one by one. The model is solved n times, one unit at a time, to determine the relative efficiency of all the units. The fractional program (3.4) can be reduced to Linear Programming Problem (LPP) as follows:

$$\max h_{j_0} = \sum_{r=1}^{s} u_r y_{rj_0}$$

4621 $$subject \quad to \quad \sum_{i=1}^{m} v_i x_{ij_0} = 1$$ http://www.webology.org

$$\sum_{}^{s} u_r y_{rj} - \sum_{}^{m} v_i x_{ij} \leq 0 \quad j = 1, 2, ..., n$$

This above model is Called CCR output maximization DEA model
For illustration - say we have four DMUs with two inputs and three outputs as shown below.

DMU	Input 1	Input 2	Output 1	Output 2	Output 3
DMU1	5	7	3	6	8
DMU2	3	8	4	7	8
DMU3	4	5	6	3	5
DMU4	4	6	9	8	7

The efficiency score of DMU1 can be calculated using (1.1) and the LP model can be written as:

$$\max h_1 = 3u_1 + 6u_2 + 8u_3 \qquad (1.3)$$
$$\text{subject to} \; 5v_1 + 7v_2 = 1 \qquad (1.4)$$
$$3u_1 + \rightleftarrows 6u_2 + 8u_3 - 5v_1 - 7v_2 \leq 0 (\text{for} DMU_1) \; (1.5)$$
$$4u_1 + 7u_2 + 8u_3 - 3v_1 - 8v_2 \leq 0 (\text{for} DMU_2) \qquad (1.6)$$
$$6u_1 + 3u_2 + 5u_3 - 4v_1 - 5v_2 \leq 0 (\text{for} DMU_3) \qquad (1.7)$$
$$9u_1 + 8u_2 + 7u_3 - 4v_1 - 6v_2 \leq 0 (\text{for} DMU_4) (1.8) u_1,$$
$$u_2, u_3, v_1, v_2 \geq 0 \qquad (1.9)$$

DMU1's weighted output is maximised by the objective function (1.3), whilst DMU1's weighted inputs are unitized by the objective function (1.4). According to equations (1.5) to (1.8), the efficiency of DMU1 to DMU4 are between 0 and 1. The non-negativity restriction on weights of both inputs and outputs is defined by equation (1.9). Similarly, a second programme can be built to determine DMU2's efficiency, and so on for all four DMUs. The number of LPPs that must be developed is the same as the number of DMUs that must be considered. LP software or DEA software can be used to do typical DEA computations.

ADVANTAGES OF DEA

The DEA model may handle multiple inputs and outputs.

Multiple inputs and outputs can be used to make decisions in DEA.

DEA finds potential role models who have an efficiency score of 1 and assigns them improvement goals.

The DEA is assisting in the identification of Benchmarking Units, which is an important tool for Benchmarking.

Different DMUs' inefficiencies can also be discovered using DEA. DEA can be used to identify potential sources of inefficiency.

Table 1: Classification of input and output

Inputs	Outputs
X1: Inventory (in Lakhs) X2: No. Of Staff X3: Store Area (Sq.ft)	Y1:Customer Satisfaction Y2: Sales (in Lakh)

Table 2: Explanation of input and output parameters

SL NO	Parameter	Explanation
1	Inventory	Total stock in the retail outlet
	Number of staff in shop	No of staff on the outlet Total
2.	Area inside the shop	area of the retail outlet
	Satisfaction Sales	Number of customer having repeat
3.	in lakh	purchase from the store
4.		Total yearly sales
5.		

Table -3: Comparison between various Rankings

DMU	DEA -CRS TE	DEA – VRS TE	Scale Efficiency
1	0.991	1	0.991
2	0.986	1	0.986
3	1	1	1
4	1	1	1
5	0.930	0.991	0.938
6	0.880	0.821	1.071
7	0.770	0.731	1.053
8	0.812	0.886	0.916
9	0.992	0.991	1.001
10	1	0.770	1.298
11	0.962	1	0.962
12	1	1	1
13	1	1	1

14	1	1	1
15	0.581	0.714	0.813
16	0.726	0.913	0.795
17	0.761	0.882	0.862
18	0.782	0.752	1.039
19	0.792	0.750	1.056
20	0.661	0.606	1.090
21	0.623	0.687	0.906
22	1	1	1
23	1	1	1
24	0.881	1	0.881
25	0.982	1	0.982
26	1	1	1
27	0.710	1	0.710
28	1	1	1
29	1	1	1
Mean	0.892	0.913	0.977

We employ a "paired sample t test" to see if there is a difference between the ranks obtained by different models.

The hypothesis is as follows:

H01: DEA-CRS efficiency score = DEA-VRS efficiency score H11:
DEA-CRS efficiency score DEA-VRS efficiency score

The efficiency score produced by DEA-CRS and DEAVRS has a p value of 0.003 in a paired sample t test, which is exceedingly low. As a result, the null hypothesis is discovered to be incorrect (Type-1 error). As a result, support for the alternative idea has grown. As a result, the DEA-CRS and DEA-VRS rankings are incompatible. It's also worth noting that there are multiple numbers of DMUs with the same efficiency score in both the CCR and BCC ratings, suggesting that this is the case. Because it appears the most in the chart below, this sales branch can be considered the best. Efficiency DMUs with an unusual input/output combination are likely to be rare in the peer set of other inefficient DMUs.

FINDINGS AND DISCUSSION

The CCR DEA model used in this work is based on the constant return to scale concept. The CCR model, which is based on the CRS assumption, overlooks the size of the sales branch when determining efficiency. However, the size of a sales branch has a greater impact on a company's quality and efficiency in many cases. The VRS model was also used in this investigation. It's worth noting that the (BCC) model only calculates TE for each DMU without taking variable RTS into account. If a DMU is both scale and technical efficient, it is referred

to as CCR efficient. Table-3 examines and reports the sales unit's relative efficiency score. The BCC scale measures pure TE and is based on the variable return to scale (VRS) assumption. The CCR score is a non-additive combination of pure TE and scale efficiency based on the constant return to scale (CRS) assumption. The inefficient sales unit's peer group and peer weight are also shown in the table above. This might assist you in determining which DMUs are inefficient. They have the ability to see where they are lacking and make the required improvements. The scale efficiency is the ratio of the CSR model's technical efficiency to the VRS model's technical efficiency. Using the output-oriented CSR model, DMUs had an average technical efficiency of 0.892. When employing the Output oriented VRS paradigm, the average technical efficiency of DMUs is 0.913. The efficiency of the scale is 0.977.

CONCLUSION:

The DEA solve5.0 programme is used to assess the efficiency of SBHLCS retail shops. The DEA solver 5.0 is used to perform the calculations. The technical efficiency score was calculated using the constant return to scale (CRS) and variable return to scale (VRS) assumptions. The CRS model produced a technical efficiency score of 0.892 on average. In the CCR model, the constant return to scale assumption was applied. The BCC model makes use of a variable return to scale assumption. The VRS model yielded an average efficiency score of 0.0.913, which is higher than the CRS score. Each Sambalpuri Bastralaya performs differently depending on its resources and capabilities. It could be owing to a lack of modern Bastralaya management strategies. The DEA technique is beneficial for Sambalpuri Bastralaya in identifying their position in comparison to their peers and developing strategies for improvement through the proper balance of inputs and outputs. Benchmarking has the potential to improve individual unit performance, but data transparency and reliability will have a greater impact on its accuracy. As a result, in the future, more Sambalpuri Bastralaya may be considered in order to gain a better knowledge of the issue throughout time.

REFERENCES

Bhadouria, P. S. (2012). Handloom industry on the way of distress: an empirical study over the major problems. Asian Journal of Research in Social Sciences and Humanities, 2(6), 71-83.

Bortamuly, A. B., Goswami, K., & Hazarika, B. (2013). Determinants of occupational choice of workers in the handloom industry in Assam. International Journal of Social Economics, 6(2),93-98

Charnes, A., & Cooper, W. W. (1957). Management models and industrial applications of linear programming. Management science, 4(1), 38-91.

Charnes, A.et al. (1978). Measuring the efficiency of decision-making unit. European Journal of Operational Research, 2 (4), 429-444.

Chaudhary, M., Saini, A., & Solanki, R. (2015). Problems faced by handloom & power loom industries in Uttar Pradesh. International Journal. of Trade and Commerce IIARTC, 4(1), 92- 105.

Chen, Y. S., & Chen, B. Y. (2009). Using data envelopment analysis (DEA) to evaluate the operational performance of the wafer fabrication industry in Taiwan. Journal of Manufacturing Technology Management, 4 (20), 475-488.

Garfamy, R. M. (2006). A data envelopment analysis approach based on total cost of ownership for supplier selection. Journal of enterprise information management,19(6),662-678

Goswami, R., & Jain, R. (2014). Strategy for sustainable development of handloom industry. Global Journal of Finance and Management, 6(2), 93-98.

Humbe, V. R. (2012). Role of social media in Marketing of Handloom Products. International Journal of Science and Research 3(7),136-139

Humbe,R.& Bhalerao.p.(2018).Social Media - A Tool for Empowering Women Working in Handloom Industry. International journal for innovative research in multidisciplinary field4(5), 260-265

Jain. D. C. and Gera. R. (2017), An Analytical Study of Handloom Industry of India, International Journal of Science Technology and Management, ISSN: 2394-1537(O) 2394- 1529(P), Vol. 6(01)

Kar. S.K. and Bhuyan. B. (2012), Intergrated Handloom Cluster Development in Odisha: A case analysis of Bargarh Cluster, Parikalpana : KIIT Journal of Management, ISSN: 0974- 2808, Vol 8, pp.26-44.

Khatoon, S. (2016). Make in India: A platform to Indian handloom market. IOSR Journal of Business and Management, 18(9), 36-40.

Madu, C. N., & Kuei, C. H. (1998). Application of data envelop analysis in benchmarking. International Journal of Quality Science.3(4),320-327

Min, H., & Perçin, S. (2009). Evaluation of third- party logistics (3PL) providers by using a two- phase AHP and TOPSIS methodology. Benchmarking: An International Journal.16(5),588-604

Mostafa, M. M. (2009). Benchmarking the US specialty retailers and food consumer stores using data envelopment analysis. International Journal of Retail & Distribution Management, 37(8),661-679

Patra. S. and Dey. S.K. (2015), Profitability Analysis of Handloom Weavers: A Case Study of Cuttack District of Odisha, Abhinav National Monthly Referred Journal of Research in Commerce and Management, ISSN: 2277-1166, Vol. 4(8)

Park, J., Shin, K., Chang, T. W., & Park, J. (2010). An integrative framework for supplier relationship management. Industrial Management & Data Systems.110(4),495-515

Parvin, Tania & Haque, Sadika (2017). An Analysis of Socioeconomic Indicators of Rural Non-agricultural Households in Bangladesh: A Case of Handloom Weaving, Journal of Economics and Sustainable Development, 8(12), 170 -222

Rao. K.S.N. and Rao, T.U.M. (2015), An Analysis of Handloom Industry in Andhra Pradesh-Challenges vs Government Schemes, International Journal of Engineering Technology Science and Research (IJETSR), ISSN: 2394-3386, Vol. 2(9)

Rickey Rani, B. and K. Satvirendra. 2015. "A study on the analysis of the economics of weavers co-operative societies in Assam", International Journal of Scientific and Research Publications, 5 (1):1-2.

Satyanarayana, M. (2016). Operational Problems of Handloom Weavers in Andhra Pradesh State – A Study of SPSR Nellore District. International Journal of Engineering Technology Science and Research. 3(10), 61–67.

Seemanthini Niranjana, Annapurna M., B. Syamasundari, LathaTummuru and Uzramma, Economic and Political Weekly, 41(31), 3361-3365

Seth, N., Deshmukh, S. G., &Vrat, P. (2006). A framework for measurement of quality of service in supply chains. Supply Chain Management: An International Journal1(1),82-94

Seydel, J. (2006). Data envelopment analysis for decision support. Industrial Management & Data Systems.106(1),81-95

Subramanian, Sp Mathiraj& Rajkumar, P.. (2008). Analytical Study on Handloom Products - Production and Marketing. 8. 69-73.

Takamura, Y., & Tone, K. (2003). A comparative site evaluation study for relocating Japanese government agencies out of Tokyo. Socio-Economic Planning Sciences, 37(2), 85-102.

Taner, M. T., &Sezen, B. (2009). An assessment of diagnostic efficiency by Taguchi/DEA methods. International Journal of Health Care Quality Assurance.22(1),93-98

Taylor, J., Reynolds, D., & Brown, D. M. (2009). Multi- factor menu analysis using data envelopment analysis. International Journal of Contemporary Hospitality Management.21(2),213-225

Tripathy, G. (2009). Odisha handlooms: problems and perspectives. Orissa Review 2009 No. December pp.54-56

Varghese. A. and Salim. M.H. (2015), Handloom Industry in Kerala: A Study of the Problems and Challenges, International Journal of Management and Social Science Research Review, Vol 1(14), pp 347

Weber, C. A. (1996). A data envelopment analysis approach to measuring vendorperformance. Supply Chain Management: An International Journal.1(1),28-39

Wong, W. P., & Wong, K. Y. (2008). A review on benchmarking of supply chain performance measures. Benchmarking: An international journal.15(1),25-51

Zhu, J. (2000). Multi-factor performance measure model with an application to Fortune 500 companies. European journal of operational research, 123(1), 105-124.A