Assessing Furniture Brands in Marketing 4.0 for Green Supply Chain Management (GSCM) using Multi-Criteria Decision-Making (MCDM)

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Abstract

The world is moving towards sustainability through environmentally friendly practices. Green marketing practices also contribute toward sustainability by controlling and managing green products. The present study aims to provide an assessment of furniture brands in marketing 4.0 for successful green supply chain management (GSCM). Three famous furniture brands are evaluated by considering the various green marketing criteria. The Analytic hierarchy process-Group decision-making (AHP-GDM) is employed to evaluate and assess the criteria and furniture brand. The present study finds that green marketing practices can contribute toward successful GSCM 4.0 in Industry 4.0. It is found that brand performance evaluation criteria of product pricing, product value, and product quality are the three most important criteria which are compatible with marketing 4.0 and industry 4.0. The present study helps the practicing managers in the area of marketing 4.0, green manufacturing, green supplier selection for industry 4.0 for accomplishing successful GSCM for establishing "green" products as well as.

Keywords

Green marketing practices, Marketing 4.0, Supply chain management 4.0, Industry 4.0, Analytic hierarchy process-Group decision-making (AHP-GDM)

1. Introduction

Marketing 4.0, is a novel marketing approach updated from marketing 3.0 involving internet-based technology which may be used in product brand assessment. Marketing 4.0 also encourages internet-based green production and consumption. Further, more and more businesses are more inclined in adopting "green" as a marketing strategy. The adoption of such a strategy not only helps in sustainability but also enhances loyalty and satisfaction. The organization adopting the strategies of practicing green, clean, and sustainable production and consumption are in a position to capture more market share. Apart from many businesses, the furniture industries are also keen on practicing "green" for the most required sustainability. The "green" practices in the business of furniture production and consumption have helped in reducing carbon emissions which ultimately helped in a sustainable environment by preventing serious effects. The importance of implementing green marketing techniques has increased for businesses seeking triple-bottom-line performance evaluation. The involvement of People, Planet and Profit helps in accomplishing the most needed sustainability which is shown in Figure 1.
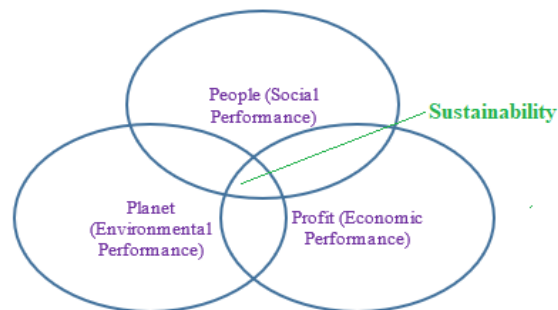

Figure 1 Triple Bottom Line

As business organizations are moving towards Industry 4.0, the role of marketing has also changed. In marketing 4.0 the internet plays a vital role in marketing the product in the market. Marketing 4.0 may be successfully used in boosting loyalty and satisfaction and thus can drive customers' buying intentions. Since brands influence the market share and related manufacturing processes the performance evaluation of the brand has become an important task in marketing 4.0.

1.1 Objectives

Looking at marketing 4.0, the performance evaluation is required to decide in favor of sustainability. Based on the role of marketing 4.0 in managing brand value and customer satisfaction, the following research objectives are considered.

- (i) Evaluating the green furniture brands' performance emulation criteria in marketing 4.0
- (ii) Performance ranking of green furniture brands in Saudi Arabia

2. Literature Review

The product's acceptance in the market is identified by its brand value. The strength of a brand can be judged by its market performance. Brand values decide the sale of a product and related market share. The sale of furniture is also influenced by its brand values, hence the furniture industry is looking for the performance evaluation of its brand. There are several studies investigating the role of marketing 4.0 looking for accomplishing loyalty and satisfaction influenced by brand values (Mudanganyi et al. 2020).

An empirical study involving was carried out to investigate the influence of marketing 4.0 on customer satisfaction and purchase intention in home buying (Dash et al. 2021). The study concluded that the marketing 4.0 approach helps in the brand building thus helping in loyalty and satisfaction that may drive buying intentions. The need of customers is changing rapidly and they are looking for not only products to satisfy them but also look for needs, wants, desires, and anxieties, hence several new technologies including the internet of things (IoT) may be employed (Jara et al. 2012). A study was initiated to imbibe agility in marketing 4.0 (Kartajaya et al. 2019). A study was carried out to investigate the role of marketing 4.0 in enhancing consumer-brand engagement through big data analysis (Jiménez-Zarco et al. 2019). The study also explored the use of various technologies to form various goals based on consumer engagement, loyalty, retention, and the building of strong brand-consumer relationships. The internet-based technology has helped marketing 4.0 to achieve an organization's objectives by knowing human behavior, needs, and expectations. Thus marketing 4.0 can help better customer engagement. A study investigating the role of online personalized marketing and big data analytics tools involvement to investigate the relationship between marketing and big data analytics (Kotler 2017; Confetto et al. 2020).

The selection of green suppliers boosting green supply chain management (GSCM) has an application in the furniture industry. The green supplier selection demands the criteria on which the supplier's performance may be evaluated.
A study was carried out to find green suppliers for the furniture industry in Brazil (dos Santos, Godoy, and Campos 2019). The study further identified green supplier selection criteria as "Pollution Production, Resource consumption, Eco-design, Green image, Environmental management system, Commitment of managers from GSCM, Use of environmentally friendly materials". A study was undertaken to promote green manufacturing for sustainability in the Chinese furniture industry (Xiong et al. 2020). A study proposes to promote green public procurement (GPP) that gives eco-friendly design and helps green manufacturing operations (Parikka-Alhola 2008). The criteria like the product, price, place, promotion, people, physical evidence, and process '7Ps' representing the services marketing were tested on Indian customers (Kushwaha and Agrawal 2015). The green furniture brands' evaluation criteria may be used for testing the performance of the brand value. The criteria that could be considered are the use of the Internet of things (IoT), use of the internet in product payment, product promotional activities, product distributing channel, product variety, after-sales service of the product, product quality, product pricing, product value, loyalty towards the product brand, green manufacturing practices etc. The criteria may be used in brand evaluation to check the performance of the brand value.

3. Analytic Hierarchy Process-Group Decision Making (AHP-GDM)

The AHP is a systematic decision-support model (Saaty 1987). AHP has wide application in different decision areas (Qureshi, et al.2007). In the AHP, the expertise and understanding of the experts are used to formulate the final opinion. Experts help in building opinions through their feedback. It has been well accepted that a single decision maker (DM) is used in decision-making, the opinion provided by such DM may be biased. The biased decision in

AHP may lead to an inaccurate result and inaccurate selection of the alternative. Whereas, group decision-making (GDM) on other hand may be used to eliminate this bias in decision-making. Several decision-makers (DMs) may be asked to provide their judgment which can lead to unbias decision-making. The geometric mean (GM) may be employed to synthesize the final decision-making. Thus more reliability in the decision-making may be accomplished as compared to a single DM. Table 1 shows nine-point scale that may be used for the pairwise comparison matrix.

Table 1 Nine-point scale

The intensity of Relative Importance	Definition
1	Equally preferred
3	Moderately preferred
5	Essentially preferred
7	Very strongly preferred
9	Extremely preferred
2, 4, 6, 8	Intermediate importance between two adjacent judgments

AHP's basic steps are shown below:

Step 1:

All brand performance factors are grouped to form decision comparison matrix 'D'. Every element of the matrix 'D' will be linked on Saaty's scale. Each component of the matrix 'D', d_{pq}, compares the importance level of the pth technical requirement with that of the qth.

$$D = \begin{bmatrix} d_{11} & d_{12} & \dots & d_{1k} \\ d_{21} & d_{12} & \dots & d_{2k} \\ \vdots & \vdots & \vdots & \vdots \\ d_{k1} & d_{k2} & \dots & d_{kk} \end{bmatrix}$$

(1)

Step 2:

The geometric means (GM) may be calculated for each of the rows for both the decision matrix. Pairwise comparison of the matrices may be carried out. The weight or priority vector values are computed for each GM value.

Step 3:

A principal eigenvalue (λ_{max}), may be obtained by summing the product of each vector column for both the decision matrix and pairwise comparison matrices.

$$\lambda_{max} = \sum_{i,j=1}^{k} C_j PV_i$$

(2)

where c_j is the sum of each column vector.

Step 4:

The consistency index may be the final rule to accept or reject the decision matrix. The inconsistency index of decision and pairwise comparison matrices may be checked using Equation (3):

$$\text{Inconsistency Index} = \frac{\lambda_{max} - n}{n - 1}$$

(3)

Here the number of matrix elements is denoted by n.

Step 5:

The random index (R.I.) values are important in calculating the Consistency Ration (C.R.). The R.I. value may be obtained using Equation (4).

$$\text{Random Inconsistency Indices} = \frac{1.98 \, (n-2)}{n}$$

(4)

Step 6:

The Inconsistency Ration (I.R.) for each of the square matrices may be obtained by dividing Inconsistency Index (I.I) values by I.R. values. In case, if the inconsistency ratio is >10%, a further revision of matrix elements is required.

Step 7:
Synthesizing of feedback of DMs using the GM method

Step 8:
Pairwise comparison matrices ($A_i, i = 1,2, ..., n$). The P.V. values, principal eigenvalues, I.I., and I.R. are calculated using the steps described in in steps 2–7.

4. Case Study

Three prevailing popular brands for furniture were selected for the case study in Saudi Arabia. The selected three brands X, Y, and Z (disguised) were evaluated based on the performance evaluation criteria. There are several criteria employed in the performance evaluation of furniture brands. In the present case study, eight criteria were selected to carry out the performance evaluation of furniture brands. Out of five decision makers (DMs), three belong to the furniture industry and have more than five years of working experience. The other two DMs were selected from marketing companies knowing digital marketing and GSCM. All five DMs were briefed on the AHP process and later on asked for the pairwise comparison to ascertain the weightage of performance evaluation criteria.

5. Results and Discussion

Based on the AHP-GDM analysis, eight criteria were included in the performance evaluation of the furniture brand. Using the AHP-GDM methodology and considering the feedback of five DMs, the performance evaluation of the furniture brand was carried out. Table 1 provides the main criteria weights for brand performance evaluation of DM1. Table 2 provides synthesizing weights using the feedback of all five DMs. Table 3 shows the performance evaluation of three brands X, Y, and Z. it is seen from Figure 2 that brand X, Y, and Z has weights of 0.3380, 0.3282, and 0.3337. Thus, brands X, Y, and Z follow the brand ranking of 1,3, and 2.

Table 1 Pairwise comparison by DM1 of main criteria for performance evaluation of brands

Sr.No.	Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Weights
1	Product promotional activities (C1)	1	2	3	3	1/3	1/5	1/4	1/2	0.071
2	Product distributing channel (C2)	1/2	1	2	3	1/4	1/6	1/5	1/3	0.050
3	Product variety (C3)	1/3	1/2	1	1	1/5	1/7	1/6	1/4	0.031
4	After-sales service of the product (C4)	1/3	1/3	1	1	1/6	1/8	1/7	1/5	0.027
5	Product quality (C5)	3	4	5	6	1	1/3	1/2	1/2	0.139
6	Product pricing (C6)	5	6	7	8	3	1	2	3	0.316
7	Product value (C7)	4	5	6	7	2	1/2	1	3	0.231
8	Loyalty toward the product brand (C8)	2	3	4	5	2	1/3	1/3	1	0.134

CI=0.040, RI=1.410, λ_{max}=8.315, CR=0.0319

Table 2 Synthesizing of pairwise comparison by DMs 1-5 of main criteria for performance evaluation of brands

Sr.No.	Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Weights
1	Product promotional activities (C1)	1.00	1.26	2.08	2.29	0.33	0.20	0.23	0.50	0.063
2	Product distributing channel (C2)	0.79	1.00	1.10	2.08	0.25	0.17	0.20	0.33	0.048
3	Product variety (C3)	0.48	0.91	1.00	1.82	0.24	0.22	0.24	0.25	0.045
4	After-sales service of the product (C4)	0.44	0.48	0.55	1.00	0.17	0.15	0.22	0.27	0.032
5	Product quality (C5)	3.00	4.00	4.22	6.00	1.00	0.33	0.63	0.87	0.155
6	Product pricing (C6)	5.00	6.00	4.61	6.84	3.00	1.00	1.59	3.78	0.310
7	Product value (C7)	4.31	5.00	4.16	4.61	1.59	0.63	1.00	3.30	0.226
8	Loyalty toward the product brand (C8)	2.00	3.00	4.00	3.68	1.14	0.26	0.30	1.00	0.122

CI=0.037, RI=1.410, λ_{max}=8.2633, CR=0.0267

Table 3 Synthesizing of pairwise comparison by DMs 1-5 of main criteria for three brands X, Y, and Z

| Sr. No.	Criteria	Local Weight	Local weight			Global weight		
		Weight	Product X	Product Y	Product Z	Product X	Product Y	Product Z
1	Product promotional activities (C1)	0.057	0.058	0.064	0.062	0.003	0.004	0.004
2	Product distributing channel (C2)	0.045	0.058	0.048	0.051	0.003	0.002	0.002
3	Product variety (C3)	0.047	0.050	0.045	0.044	0.002	0.002	0.002
4	After-sales service of the product (C4)	0.029	0.032	0.032	0.032	0.001	0.001	0.001
5	Product quality (C5)	0.135	0.147	0.153	0.152	0.020	0.021	0.021
6	Product pricing (C6)	0.335	0.336	0.298	0.318	0.113	0.100	0.106
7	Product value (C7)	0.218	0.219	0.229	0.222	0.048	0.050	0.048
8	Loyalty toward the product brand (C8)	0.134	0.100	0.131	0.120	0.013	0.018	0.016
					Normalized weights	0.3380	0.3282	0.3337
					Brand Rank	1	3	2
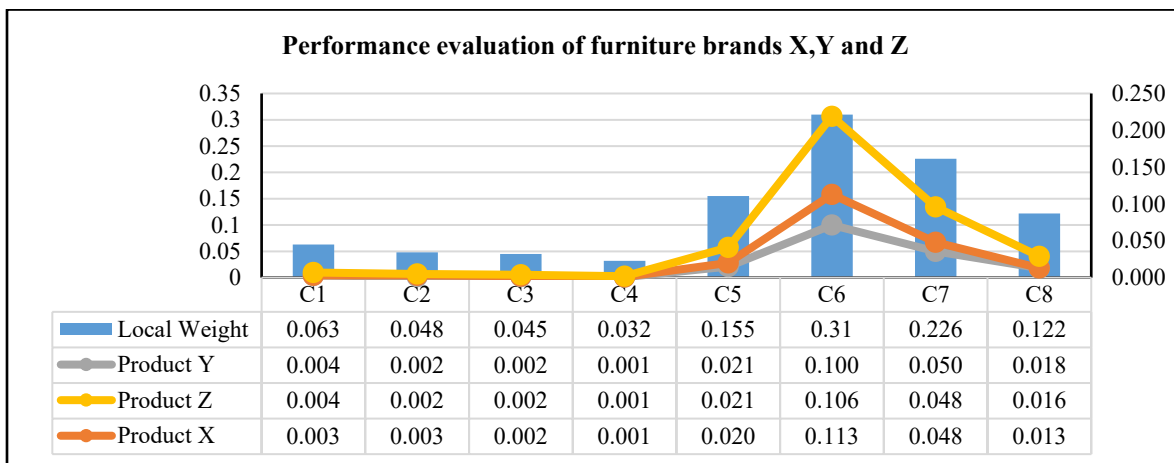
Figure 2 Performance evaluation of furniture brands X, Y, and Z

6. Conclusion

In the present study, the performance evaluation of a furniture brand is carried out using the multi-criteria decision-making-based approaches of AHP-GDM for GSCM. Eight performance evaluation criteria that are compatible with industry 4.0 and marketing 4.0 are selected for the evaluation of three popular furniture brands X, Y, and Z (disguised). It is found that brand performance evaluation criteria of product pricing (C6), product value (C7), and product quality (C5) are the three most important criteria. Further, the brands X, Y, and Z are ranked 1, 3, and 2. The furniture industries may use these performance evaluation criteria for ranking their product brands and regularly assessing their products for their performance evaluation concerning the triple-bottom-line.

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Biography

Saleh Yahya Al Ghamdi is an assistant professor and chair of the industrial engineering department, college of engineering, King Khalid University. His research interest is Supply chain management, Risk management, Safety engineering, etc. He has earned his Master's and Ph.D. from the Wichita State University, USA. He published several papers.