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Applying MCDM Technique in analyzing the effect of promotion items based on online shopping factors: A case study

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Developing technology causes companies in a market to compete with each other in challenging ways. In addition to a holistic marketing concept which focuses on the needs of target markets and delivering superior value, marketing should be adapted with new technology to fulfill consumer needs. Although many strategies have been introduced for marketing, digital marketing or marketing 4.0 is a new generation of marketing that engages with the audience through digital tools. These days, online shopping is only too popular among consumers. Many factors which affect customer decision during online shopping have been explored. In this paper, the effect of promotion items in online shopping will be explained. The main aim of this paper is to apply a multi-criteria decision-making technique in prioritizing eleven promotion items by considering five online customer shopping criteria. The novelty of this paper is to apply PROMETHEE II (Preference Ranking Organization METHod for Enrichment of Evaluations) in analyzing the effect of promotion items based on online shopping criteria. PROMETHEE II completely prioritizes discrete alternatives. A case study is conducted in a home appliance company in Iran.

Keywords: digital marketing, decision making, PROMETHEE, online shopping, promotion

1. Introduction

Due to an increase in customer computer knowledge and access to the internet, the traditional way of purchasing is coming to be replaced with online shopping. It follows that conventional types of advertising and its modes of operation in businesses should be changed. These changes naturally must occur in the digital environment. To succeed in the digital environment, each business should be able to adopt a completely different perspective besides implementing new strategies in digital marketing. Big data, machine learning, live video marketing, and conversation user interface are some of the new digital marketing strategies. These strategies could be applied to different businesses.

As a result of developing digital marketing, an important decision-making process for top managers especially marketing managers in a company is to choose the correct digital marketing strategies to attract, engage, and motivate customers to conduct online shopping. Hence marketing managers, are always seeking to find different ways (promotion items) to motivate and persuade customers to purchase products.

In this paper, I will try to answer the question of what the priority of promotion items is based on online shopping criteria in a home appliance company. To make the main question clear, it can be paraphrased as "ranking different promotion items based on online shopping criteria in a home appliances company".

The literature review, methodology, results, discussion, and conclusion are the next sections, respectively.

2. Literature review

2.1. Digital marketing

Electronic commerce has appeared as a main sector in the international economy. In 1999, U.S. firms sold approximately 109 billion dollars worth of goods over the internet, and by the end of 2000, it reached $251 billion. It is estimated that over 93% of U.S. companies conducted some part of their business trade over the internet in 2002 (Chiu et al. 2004, p. 13). Besides company trades over the internet, customers have trusted the internet to fulfill their daily requirements and even customize their needs with the aid of digital technology. Changing patterns in consumer behavior pose considerable challenges for online service providers. Online retailers should discover the strategies regarding the criteria for further improvements in maintaining consumer trust. They have to gauge consumer expectation (Kumar et al. 2018, p. 675).

2.2. MCDM in digital marketing

Multi-criteria decision making is a discipline which deals with decisions involving the choice of a proper alternative among several potential alternatives based on some common criteria. Multi-Criteria Decision Making (MCDM) methods are divided into two general categories: Multi-Attribute Decision Making (MADM), and Multi-Objective Decision Making (MODM). In Multi-Attribute Decision Making, several alternatives are analyzed and prioritized. The Alternatives will be examined based on the criteria that are identified by decision-makers or researchers. In Multi-Objective Decision Making, several goals are considered for optimization simultaneously. In my research, the problem is to be solved by MADM methods. There are some alternative "promotion items" which will be analyzed and prioritized based on some common criteria. There are different types of MADM methods such as AHP (Analytic Hierarchy Process), ANP (Analytic Network Process), ELECTRE (ELimination Et Choix Traduisant la REalité), TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), and PROMETHEE to solve such a problem. In the following, I will provide a summary of the models.

AHP was developed by Saaty in 1980. This technique is one of the most powerful and flexible methods of MADM. It can be used to solve complex problems. It is called a hierarchical model since its structure is like a tree and hierarchy. The AHP method combines both objective and subjective assessment in an integrated structure based on pairwise comparisons. The hierarchical analytical process emphasizes the importance of decision-makers' intuitive judgments as well as the stability of comparing alternatives in the decision-making process. Decision makers make their judgments based on their knowledge and experience. In AHP, a decision problem is divided into different levels: aim, criteria, sub-criteria and alternatives. Different alternatives are involved in decision making. The alternative must be compared based on the given criteria. It is possible to analyze sensitivity on the criteria and sub-criteria. To summarize, AHP provides a structure of decision-making processes where there are limited numbers of choices, but each has several attributes (Byun 2001, p. 1).

ANP method is one of the MADM methods which is similar to the AHP, but in which the criteria, sub-criteria, or alternatives may have dependency. The AHP method can be considered as a specific form of ANP technique. ANP provides a comprehensive and powerful way for accurate decision-making using decision makers' experimental information or personal judgments. It also provides a structure for organizing different criteria and evaluating the importance and preference of each criterion over alternatives (Saaty 1999).

ELECTRE is another MADM method which is introduced by Roy. Instead of prioritizing alternatives, this method only shows the superiority of an alternative in comparison to other alternatives. In ELECTRE method, Ap→ Aq means decision maker(s) prefer the risk of selecting alternative p to the risk of choosing alternative q. So, in this technique, alternatives should first be compared in pairs. Then, strong and dominant alternatives will be identified. Finally, weak alternatives will be eliminated (Roy 1968, Roy–Bouyssou 1993).

TOPSIS is one of the MADM methods which is based on a clear logic. This technique determines an ideal alternative and an anti-ideal alternative first. Then, it prioritizes alternatives based on the minimum distance from the ideal alternative and the maximum distance from the anti-ideal alternative. The ideal alternative maximizes profitability measures and minimizes cost criteria, while the anti-ideal alternative maximizes the cost criteria and minimizes the profitability measures (Ajripour et al. 2019).

In the next section, the PROMETHEE technique is thoroughly explained. In comparison to the other techniques such as AHP, ANP, TOPSIS, and ELECTRE, this method is too simple. It facilitates matching outputs and assumptions. Moreover, there is no need to change and normalize the decision matrix.

As an MCDM subject, if managers tend to assess and prioritize some strategies in digital marketing, they can apply different decision-making techniques. Recently Singh et al. (2016), Kumar et al. (2018), Lin et al. (2009) have applied different MCDM techniques such as AHP, ANP, TOPSIS, Fuzzy MCDM to solve some complicated decision-making problems in marketing, especially digital marketing. Fuzzy MCDM method was used by Tang et al. (1999) to prioritize electronic marketing strategies. For assessing an e-commerce strategy Chiu et al. (2004) applied fuzzy MCDM and AHP. To evaluate and improve strategies for decreasing the gap in customer satisfaction and aspiration level in e-stores, Chiu et al. (2013) used the combination of DEMATEL-based Analytic Network Process and VIKOR (ViseKriterijumsa Optimizacija I Kompromisno Resenje). Kang and Park (2012) applied TOPSIS, VIKOR, and GRA (Grey Relational Analysis) to analyze customer service satisfaction. Chern and Tzeng (2012) evaluated the problem of business to customer service e-loyalty construct, by using fuzzy ANP.

2.3. PROMETHEE

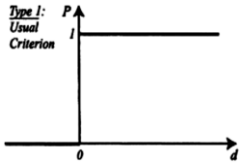
Although many studies have been done to find digital marketing strategies, what is rarely discussed are the strategies (promotion items) which may affect online shopping criteria. Doing a literature review, a considerable amount of literature in digital marketing subjects have applied different MCDM techniques to solve such problems. However, PROMETHEE as a MADM technique has not been employed to find proper strategies in digital marketing. This provides further opportunity for researchers to survey more of this subject.

PROMETHEE is one of the MCDM methods, which was presented by Brans (1982) and developed by Brans and Vincke (1985). It is used for a finite set of alternatives that compare, rank, and select them concerning the commonly conflicting criteria. This method is quite simple and smooth compared to other multi-criteria decision-making methods (Behzadian et al. 2010). Many scholars have applied PROMETHEE methods as practical methods in their researches. For example, Peng and Xiao (2013) selected materials in automotive industrial production. Albadvi et al. (2007) applied PROMETHEE in stock market decisions and Alencar and Almeida (2011) used it for supplier selection. Silva et al. (2015) used PROMETHEE II in organizational management. Social resilience to a disaster was measured by Carone et al. (2018) by Appling PROMETHEE. Antanasijević et al. (2017) have used PROMETHEE to measure the rate of progress in sustainable development. Araz et al. (2007) evaluated the outsourcing of a textile company by linking to PROMETHEE. To increase the efficiency and response time in incident management, Zhao et al. (2013) suggested a modified PROMETHEE II.

Put simply, PROMETHEE is a Non-Compensatory model in MCDM. In Non-Compensatory models, an exchange between criteria is allowed. That is, one criterion's weakness may be offset by another criterion's advantage. The PROMETHEE method simply creates several permutations at the first step, and then calculates the score of each permutation. The higher the score of each permutation, the greater the superiority of the permutation and ranking of the alternatives. The number of permutations in research is always m!, "m" is the number of alternatives. Besides that, PROMETHEE is an outranking method in Multi-criteria analysis. Its main features are simplicity, clearness, and stability. The notion of a generalized criterion is used to construct a valued outranking relation (Brans et al. 1986).

A necessary concept in PROMETHEE is the Preference function (PF). There are six pre-defined functions (Usual, U-shape, Linear, Level, V-shape, Gaussian preference) which are used to implement a pair-wise comparison between all alternatives, and thus calculate the preference degree of one alternative over another for all criteria (Nassereddine et al. 2019). Ishizaka and Nemery (2013) believed PROMETHEE is based on the computation of preference degrees that applies several PFs with pre-defined shapes mapped into a zero-one interval. Different studies have applied different preference functions. For example, to evaluate the public transportation systems in Tehran, Iran, Nassereddine, and Eskandari (2017) applied seven specific PF.

In determining the PROMETHEE II order in current research, the usual (Type I) preference function (1) is applied because decision-makers could not allocate values for the differences between alternatives based on each criterion. Moreover, the selected criteria are qualitative.



$$P(d) = \begin{cases} 0 & d \leq 0 \\ 1 & d > 0 \end{cases} \quad (1)$$

where *d* values are the differences of alternative values for each criterion. (Brans et al. 1986, p. 170)

Because of local market competitiveness, decision-makers in a home appliances company in Iran must find the best ways to attract potential customers besides motivating real customers (customers: those who prefer online shopping). The decision-makers decided to improve the performance of the online sales process.

To improve the performance of the online sales process, marketing managers in the home appliances company tried to find the promotion items which had the most effective impact on customer online shopping criteria. So this paper tries to assess different promotion items based on online shopping criteria by applying "PROMETHEE II" technique.

The suggested technique not only allowed me to cope with the nature of human judgments but also provides a general and rational framework for structuring a decision problem, for recognizing and quantifying its conflicts and synergies, and clusters of actions.

3. Methodology

My research starts with the literature review on digital marketing, and PROMETHEE. After the selection of the decision-makers' team, the evaluation criteria are selected based on the literature review and alternatives are chosen based on the expert's ideas. The data are gathered by distributing a questionnaire (decision matrix) among decision-makers. Then, the geometric mean is applied to obtain a collective decision matrix. After that, the weights of the criteria are determined by Shannon entropy. Finally, PROMTHEE is run to determine the ranks of alternatives by employing the usual preference function.

3.1. Geometric mean

The geometric mean is defined as the n^{th} root of the products of values where n is the count of values. The geometric average, G_A of a data set $\{x_1, x_2, ..., x_n\}$ is given by (2) (Yousefi–Carranza 2015).

$$G_A(x_1, x_2, ..., x_n) = \left(\prod_{i=1}^{n} x_i\right)^{1/n} = \sqrt[n]{x_1}, x_2, \dots, x_n \quad (2)$$

Geometric mean has been applied in various research like a study entitled "Consensus models for AHP group decision making under row geometric mean prioritization method", in which decision-makers applied the weighted geometric mean technique to aggregate individual judgment matrices to reach a collective judgment matrix (Dong et.al 2010). The geometric mean is also used to obtain the values in consensus matrix in FAHP (Fuzzy Analytical Hierarchy Process) computations process (Anojkumar et al. 2014). In another study in 2019, the geometric mean is applied to integrate a comparison matrix of criteria for all decision-makers under a fuzzy environment (Gupta et.al 2019). In the study of Nassereddine and his colleagues (2019), after the constitution of the decision hierarchy, a pairwise comparison of criteria was performed by the experts. Then, the geometric mean of the values obtained from the evaluations was calculated.

The geometric mean was used in the study of Wu et al. (2010) to sum up the evaluators' values of pairwise comparison in response to the relative importance of market innovation capabilities when compared to human resources assets. The authors in another marketing study utilize geometric mean for combining individuals' judgments to reach group judgment for integrating answers coming from the decision-making group (Liu et al. 2019).

3.2. Shannon entropy

To calculate the weights of criteria in current research, Shannon entropy is applied. Shannon entropy is based on decision-making matrix i.e. if the data in the decision matrix are completely available, the Shannon entropy can be used to calculate the weights of criteria (Momeni 2010). Since all the required data in the decision matrix was available in this study, Shannon is selected to calculate the criteria weights. Shannon entropy is a rather abstract mathematical concept. It is firstly introduced by Shannon in 1948, after which many fields such as engineering, management, etc. widely applied this method. Zeleny (1996) believes Shannon's entropy concept is well suited for measuring the relative contrast intensities of criteria to show the average intrinsic information shifted to the decision-makers.

According to the idea of information entropy, one of the determinants of accuracy and reliability of the decision-making problem is the number or quality of information acquired from a decision-making setting. Entropy is, therefore, a very good method when it is applied to different cases of evaluation in the different decision-making process, and similarly, entropy can also be deployed to measure the quantity of useful information provided by data itself (Wang–Lee 2009, Wu et al. 2011).

The entropy method has been applied in different MCDM studies to compute the relative weights of ranking methods, weights of criteria, and relative weights of performance measures (Barak–Javanmard 2020, Zandieh–Aslani 2019, Çalı–Balaman 2019, Wu et al. 2011).

The steps of calculating criteria weights by entropy measure are as follows (Wang–Lee 2009):

1. The decision matrix must to be normalized for each criterion C_j(j = 1,2,…,n) to obtain the estimated value of each criterion: P_{ij}.

$$p_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \tag{3}$$

2. Calculate the entropy value: e_j.

$$e_j = -k \sum_{j=1}^{n} p_{ij} \ln p_{ij} \tag{4}$$

k is a constant value, $k = (\ln(m))^{-1}$.

3. The degree of divergence d_j of the intrinsic information of each criterion $C_j(j = 1, \dots, n)$ can be computed as d_j.

$$d_j = 1 - e_j \tag{5}$$

The value d_j shows the inherent contrast intensity of C_j. The higher d_j is, the more important the criterion C_j is in the issue.

4. The weights of criteria can be obtained by equation 6.

$$w_j = \frac{d_j}{\sum_{k=1}^{n} d_k} \tag{6}$$

3.3. PROMETHEE method

PROMETHEE can analyze multiple criteria project on an objective mathematical foundation (Chou et al. 2007). This technique has attracted much attention from the side of academics and practitioners (Behzadian et al. 2010). This method is a user-friendly outranking method. Completeness of ranking and high level of flexibility when defining preference/indifference thresholds for criteria are the other advantages of this technique (Ishizaka–Nemery 2011). PROMETHEE considers the deviation between the evaluations of two alternatives on a particular criterion. The relative importance of the criteria and the decision-maker's preference function are the two types of information that are required in the PROMETHEE technique (Nassereddine et al. 2019).

The main steps of the PROMETHEE II method are (Amaral–Costa 2014, Palczewski–Sałabun 2019, Bagherikahvarin–De Smet 2016):

1. Compute the preference function and the difference between the evaluations of two alternatives.
2. Compute marginal preference index considering the criteria weights.

$$\Pi(a,b) = \sum w_j \; F_j \; (a,b) \tag{7}$$

Where, π (a, b) is the marginal preference index ranging from 0 to 1 based on pre-defined preference functions, and W_j is the weight of the j_{th} criterion.

3. Calculate the positive and negative outranking flows.
4. Compute the net outranking flow. The higher the flow, the better the alternatives.

$$\emptyset(a) = \emptyset^{+}(a) - \emptyset^{-}(a) \tag{8}$$

5. Complete the ranking of alternatives based on Ø(i).

The decision-makers (DMs) in a company in Iran decided to analyze the effect of promotion items on online shopping. The company is a home appliances company that produces various home appliances. There are different production lines with different variety of products. The company has been active in the production of four home appliances products (refrigerators, gas cookers, washing machines, and dishwashers) for about 14 years. This company included five departments: planning, sales, marketing, research and development, and finance. The members of the marketing department are responsible for a wide variety of tasks such as maintaining a relationship (correspondence, interviews, face-to-face or telephone calls) with customers, key decision-makers on procurement, financial department, and managers, measuring customer satisfaction, besides identifying opportunities to increase customer satisfaction. Besides that, they identify current customers and classify them with regard to age, sex, income, geographic location, color sensitivity, price, and service.

Based on the literature, consensus decision-making on the criteria is employed among DMs. Five criteria are considered to analyze alternatives (Table 1). The main decision-makers have been working in the company's marketing department for at least 12 years (Table 2).

An interview was done with ten marketing experts to determine alternatives (promotion items). After the interview, eleven promotion items are selected based on expert opinion (Table 3). The interviewees have had 2-year experiences in home appliances marketing.

Then the five main DMs are asked to fill in the decision matrix (see Appendix 1) to evaluate alternatives based on each criterion. The performances of alternatives based on criteria were quantified based on a 9-item scale in which 1 means effective and 9 means "incredibly high effective".

Table 1 Decision-making criteria

Criteria	Description
C_1. Personal Innovativeness on Information Technology (PITT)	This criterion explains consumers who are conscious of personal innovativeness and updating of information technology i.e. experiment with new information technologies, adoption of new technology, try out new information technologies.
C_2. Web quality dimension	This criterion shows the degree of consumer consideration about web quality dimensions provided by the internet malls i.e. web quality, web design, easy navigation, and responsiveness.
C_3. Information and e-service dimension	This criterion determines consumers who are conscious about their privacy, security, sensitivity about price, third party seal, and trustworthiness of online service providers.
C_4. Online reputation	The degree of consumer consideration about good corporate reputation established by the internet malls i.e. centralized reputation, trust value, seller's rating, customer relationship, and social responsibility.
C_5. Incentives and post-purchase service	The degree of consciousness of consumer consideration about motivations and post-purchase services provided by the internet malls i.e. discount coupons, cash-back, free home delivery, cash on delivery, and return policy

Source: Singh et al. (2016)

Table 2 List of decision-makers and their expertise

No.	Designation	Experience	Expertise
1	Digital Marketing Manager	15	Online Reputation, Digital Marketing
2	Washing Machine Marketing Manager	12	Management and Marketing
3	Gas cooker Marketing Manager	13	Management and Marketing
4	Refrigerator Marketing Manager	15	Management and Marketing
5	Dish Washer Marketing Manager	10	Industrial Engineering

Source: own construction

Table 3 Alternatives

Alternatives	Description
A_1. Social advertising	Facebook, Twitter, Instagram, Telegram are excellent platforms for advertising to a switched-on, digital generation.
A_2. Tell the press	New products, should always start with a well-written press release to get the word out to the media.
A_3. Use email	Customers will be interested in seeing the latest products of the company or the latest news on product research and development.
A_4. Create an affiliates scheme	Affiliates are great because they do all the hard marketing for companies for a small amount of commission.
A_5. Referral reward	Satisfied customers will always be happy to recommend the company's brand or products to others, so create referral schemes to reward those who have spread the word about the business.
A_6. Loyalty reward	Firms love customers who come back to them again and again. Promise loyal customers reward repeat purchases with special offers or exclusive discounts.
A7. Use video	Having a video on the company website can increase conversions considerably.
A8. Use images	Customers love visuals while they do online shopping. Using plenty of high-quality images will show off the full potential of the product.
A_9. Create guides	Guides make great resources for customers while carefully directing them toward company products.
A_{10}. Easy sharing	Social shares are important for marketing a product. Companies should make it easy for people to share product information with plenty of handy, instant-share buttons on company product web pages.
A_{11}. Make affordable shipping	Companies should recommend free or cheapest shipping costs for online shopping.

Source: own construction

To combine all the expert comparison matrices and achieve the unit pairwise comparison, the geometric mean is applied. Although arithmetic means can be calculated, the geometric mean is more appropriate because its weights have ratio properties, meaning that ratio comparisons are valid (Aragon et al. 2012, p.8, Dong et al. 2010, Xu 2000). Due to the calculation of the marginal preference index in PROMETHEE II, criteria weights are computed by Shannon entropy (Wang–Lee 2009).

4. Results

The decision matrix of all decision-makers is shown in Table 4–8. Table 9 represents the final decision-making matrix after applying the geometric mean. The matrix of preference indices (average of $P(d)$ preference values for each criterion) is shown in Table 10. The last row (Φ^-) and last column (Φ^+) of the matrix are the sums of columns and sums of rows, respectively. They describe the relative dominance of alternatives. The Φ values of alternatives are the differences of Φ^- and Φ^+ values. The reducing order of Φ values is considered as the order of alternatives. In Table 11 the final orders calculated by PROMETHEE II are summarized. The final order is A8≻A9≻A6≻A1≻A5≻A7≻A2≻A4≻A3≻A10≻A11. Based on the results of final priorities, the three most important promotion items which may influence customers' online shopping would be using images, creating guides, and rewarding loyalty. When a customer tries to do online shopping, the first thing which attracts his/her attention is the picture or the image of a product. The more beautiful a picture of a product with high resolution, the more a customer might be attracted to the product. After checking the image, customers concentrate on the features of the product. Creating guides would provide information regarding the features of a specific product for customers. Giving precise information in the guideline section will help customers to easily choose their desired product. Special offers or exclusive discounts mostly stimulate customers to stay loyal to a special brand. Determining a considerable reward for loyal customers especially in online shopping, motivates customers to constantly purchase the specific brand. For example, reward loyalty in a home-appliances company sometimes motivates customers to purchase not only a required home appliance (like refrigerator) but it also stimulates them to buy unnecessary products (like gas cooker). A customer may not need or use the gas cooker currently but the special offer and discount as a reward of loyalty make him/her purchase the product.

The limitation of my study is the number of experts that determined the alternatives. The chosen alternative might change if more experts were involved in the interview. Also, the results might change if managers' evaluations of alternatives based on the criteria differ in decision matrices.

The calculated criteria weights in Table 9 indicate that the criteria (information and e-service dimension, online reputation, incentives, and post-purchase service, web quality dimension, personal innovativeness on information technology) weights are almost the same while in the literature review the criteria weights are different. It means information and the e-service dimension received the highest weight followed by online reputation, incentives and post-purchase service web quality dimension, and personal innovativeness on information technology (Singh et al. 2016). The main reasons that the criteria weights in my study differ from the literature review are the number of decision-makers and the decision-makers' judgment in pairwise comparisons. So, the weights of criteria might be varied if the number of decision-makers were to increase or decrease. It can affect the final results of ranking alternatives in the MCDM problem.

Table 4 Decision Matrix 1

Criteria / Alternatives	C1	C2	C3	C4	C5
A1	3	3	1	9	5
A2	1	3	3	9	3
A3	1	1	1	3	1
A4	9	9	3	7	7
A5	1	1	1	9	1
A6	1	1	1	9	5
A7	3	9	1	9	1
A8	3	9	1	9	1
A9	3	9	1	9	3
A10	5	9	1	9	3
A11	5	9	1	9	9

Source: own construction

Table 5 Decision Matrix 2

Criteria / Alternatives	C1	C2	C3	C4	C5
A1	5	7	9	3	5
A2	9	1	1	3	1
A3	1	3	3	3	1
A4	5	5	9	7	1
A5	5	3	1	7	5
A6	3	3	1	5	5
A7	3	3	1	7	1
A8	3	3	1	7	1
A9	7	7	1	5	3
A10	7	5	5	5	5
A11	3	3	7	7	9

Source: own construction

Table 6 Decision Matrix 3

Criteria / Alternatives	C1	C2	C3	C4	C5
A1	7	5	5	3	3
A2	5	7	3	3	3
A3	3	1	1	1	3
A4	5	7	3	5	3
A5	7	7	3	3	3
A6	7	7	5	3	3
A7	5	3	1	3	3
A8	7	7	1	3	3
A9	7	7	1	3	3
A10	5	5	3	3	5
A11	3	1	1	1	7

Source: own construction

Table 7 Decision Matrix 4

Criteria / Alternatives	C1	C2	C3	C4	C5
A1	5	6	3	5	5
A2	1	9	1	7	7
A3	1	9	1	9	7
A4	5	1	1	9	9
A5	1	1	1	9	1
A6	1	1	1	9	1
A7	1	9	1	9	1
A8	1	9	1	9	1
A9	1	9	1	9	1
A10	3	9	7	9	3
A11	5	9	1	9	3

Source: own construction

Table 8 Decision Matrix 5

Criteria / Alternatives	C1	C2	C3	C4	C5
A1	7	9	3	9	7
A2	3	3	1	5	7
A3	3	3	3	3	7
A4	5	9	7	7	7
A5	1	9	3	7	7
A6	1	9	3	7	7
A7	3	5	5	5	5
A8	1	9	1	7	7
A9	5	9	3	7	5
A10	7	9	1	9	7
A11	1	5	1	3	7

Source: own construction

Table 9 Final Decision Matrix

W_i	0.2	0.2	0.2	0.2	0.2
Criteria / Alternatives	C1	C2	C3	C4	C5
A1	5	6	3	5	5
A2	3	4	2	5	3
A3	2	2	2	3	3
A4	6	5	4	7	4
A5	2	3	2	7	3
A6	2	3	2	6	3
A7	3	5	1	6	2
A8	2	7	1	7	2
A9	4	8	1	6	3
A10	5	7	3	6	4
A11	3	4	1	4	7

Source: own construction

Table 10 Matrix of preference indices

$\pi(d_i)$	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	Φ^+
A1	–	1	0.8	0.6	0.4	0.2	0	0.8	1	1	0	0.58
A2	0	–	0.8	0.6	0.4	0	0	0	0	1	1	0.42
A3	0	0	–	0.4	0.4	0	0	0	0	0	1	0.24
A4	0.4	0.4	0.6	–	0.2	0.2	0	0	0	0	1	0.40
A5	0.4	0.6	0.6	0.8	–	0.2	0	0	0	1	1	0.52
A6	0.4	1	1	0.8	0.8	–	0.8	0	0	1	1	0.68
A7	0.20	0.6	0.8	0.6	0.4	0.2	–	0	0	1	1	0.48
A8	1	1	1	1	1	1	1	–	1	1	1	1.00
A9	1	1	1	1	0.8	1	0.8	0	–	1	1	0.86
A10	0	0	0	0	0	0	0	0	0	–	1	0.10
A11	0	0	0	0	0	0	0	0	0.00	0	–	0
Φ^-	0.34	0.56	0.66	0.58	0.44	0.28	0.42	0.08	0.20	0.82	0.90	

Source: own construction

Table 11 Alternative ranking

Alternatives	φ_+	φ_-	$\varphi(i)$	**Ranking**
A1	0.58	0.34	0.24	**4**
A2	0.42	0.56	–0.14	**7**
A3	0.24	0.66	–0.42	**9**
A4	0.40	0.58	–0.18	**8**
A5	0.52	0.44	0.08	**5**
A6	0.68	0.28	0.40	**3**
A7	0.48	0.42	0.06	**6**
A8	1.00	0.08	0.92	**1**
A9	0.86	0.20	0.66	**2**
A10	0.10	0.82	–0.72	**10**
A11	0.00	0.90	–0.90	**11**

Source: own construction

5. Conclusion

Recently, digital marketing, which is a new science in marketing theory, has resulted in some businesses earning lots of money. Each company should select proper digital marketing strategies to be a success in the competitive market. Strategies must be selected by top managers according to certain digital marketing factors. There are lots of factors which influence online shoppers' decisions. The present study has tried to prioritize the eleven promotion items based on five online shopping criteria by applying PROMETHEE II. This method is all too simple. It facilitates matching outputs and assumptions. It does not require changing and normalizing the decision matrix. PROMETHEE provides a general and rational framework for structuring a decision problem, recognizing and quantifying its conflicts and synergies, and clusters of actions.

By Applying PROMETHEE II, the most important promotion items which can affect online shopping and motivate the consumer to purchase online goods have been determined. The results, as shown in Table 11, indicate that the three most important promotion items which can influence customers in online shopping would be using images, create guides, and rewarding loyalty. The first important item which can affect customers' online shopping is applying an attractive image. Customers love visuals, especially 3-D moving images, while purchasing online since it helps them to get a feel for a product. Creating a guide not only assists customers in conducting online shopping, but it can also provide information required for using a product. A loyalty reward is a feature for the company to motivate real customers to repeat their shopping.

In summary, this study used PROMETHEE II as a practical MCDM technique that completely prioritizes alternatives based on different criteria. It is recommended that managers in different home appliance companies apply PROMETHEE II to solve certain decision-making problems, specifically in digital marketing.

Besides changing the weights of criteria in the model which may change the alternative ranks, the number of experts and managers with digital marketing experiences was the limitation of this study. The results, therefore, need to be interpreted with caution. However, more research on this topic needs to be undertaken before the association between alternatives and criteria is more clearly understood. Further research should be done to investigate the results when applying different kinds of MCDM techniques.

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Appendix 1: Decision matrix

Effectiveness	Effective	Relatively effective	Too effective	Too much effective	Incredibly high effective	Effective	Relatively effective	Too effective	Too much effective	Incredibly high effective	Effective	Relatively effective	Too effective	Too much effective	Incredibly high effective	Effective	Relatively effective	Too effective	Too much effective	Incredibly high effective	Effective	Relatively effective	Too effective	Too much effective	Incredibly high effective
Scale	1	3	5	7	9	1	3	5	7	9	1	3	5	7	9	1	3	5	7	9	1	3	5	7	9
Criteria / Alternatives	Personal Innovativeness					Web quality dimension					Information and e-service dimension					Online reputation					Incentives and post-purchase service				
Embrace social advertising																									
Tell the press																									
Use email marketing																									
Create an affiliates scheme																									
Create an affiliates scheme																									
Referral reward																									
Loyalty reward																									
Use video																									
Create guides																									
Make sharing easy																									
Make affordable shipping a USP																									

Notes: To fill in the questionnaire (decision matrix), decision-makers must use the score in the scale row. For example, if one according to his/her experience finds creating guides is too much effective in online reputation, then he/she will give 7.