International Journal of Information, Control and Computer Sciences
ISSN: 2517-9942
Vol:12, No:7, 2018

Multidimensional Compromise Programming Evaluation of Digital Commerce Websites

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Abstract—Multidimensional compromise programming evaluation of digital commerce websites is essential not only to have recommendations for improvement, but also to make comparisons with global business competitors. This research provides a multidimensional decision making model that prioritizes the objective criteria weights of various commerce websites using multidimensional compromise solution. Evaluation of digital commerce website quality can be considered as a complex information system structure including qualitative and quantitative factors for a multicriteria decision making problem. The proposed multicriteria decision making approach mainly consists of three sequential steps for the selection problem. In the first step, three major different evaluation criteria are characterized for website ranking problem. In the second step, identified critical criteria are weighted using the standard deviation procedure. In the third step, the multidimensional compromise programming is applied to rank the digital commerce websites.

Keywords—Standard deviation, commerce website, website evaluation, multicriteria decision making, multicriteria compromise programming, website quality, multidimensional decision analysis.

I. Introduction

DIGITAL commerce is the buying and selling of products and services, or the transmitting of funds or data, over a digital network, primarily the Internet. Thus, digital commerce enables transacting or facilitating business on the Internet. Digital commerce business transactions occur either as business-to-business, business-to-consumer, consumer-to-consumer or consumer-to-business. Business-to-consumer digital commerce deals with both web information systems and marketing activities.The increasing use of the Internet affects consumers' attitudes, behaviors, and intentions to obtain products and services from various digital commerce enterprises.

Digital enterprises focus on having digital portals and websites to serve their customers' needs and to simplify procedures for purchasing their products and services. Digital commerce is trendily gaining the hot attention of customers as it helps in achieving better a price, improved quality and customer satisfaction with lower costs in online business.

On the other hand, digital enterprises develop their business strategies to obtain competitive advantages over their competitors by responding to five primary forces: the threat of new entrants, competitive rivalry among existing firms within an industry, the threat of substitute products and services, the bargaining power of suppliers, and the bargaining power of buyers. Digital commerce, as compared to the traditional method of selling products and services, can have a much stronger influence on the five forces, especially to rivalry among existing enterprises within an industry and the bargaining power of buyers in the digital market [1]-[3]. Developing an evaluation framework for a digital commerce website is an essential requirement of a feedback loop for continuous improvement. An enterprise website represents a digital connection media between customers and the enterprise, and this affects their attitude, behavior, and intentions for business purposes. Various website characteristics influencing customers' impression of the enterprises' portals are considered for multidimensional digital commerce website evaluation.

The quality of the digital commerce website is an important concept in digital commerce information systems because the customers' perception of the quality of the digital commerce website directly affects their intentions to use a website [4], and further drives their purchase intentions [5]. The customer's perception of the quality of the website refers to users' assessments of the characteristics of a website meeting the needs of users and reflecting the overall excellence of the website [6]. Therefore, when evaluating a company's website offerings, understanding which aspect the site user considers most important has become a priority for companies wishing to use a successful digital strategy [7]. In other words, in order to attract and retain customers, especially online retailers need to have a clear knowledge of what website qualities online customers expect on shopping websites [8]. The impact of website quality on customer satisfaction and purchase intention is examined to assess perceived playfulness and perceived flow as mediators. Online shopping is a usage of digital commerce related convergence between the offline and online environments [9]. Online environments are viewed as a source of information about companies, brands, products and services, even consumers can further share products and services in both online and offline marketplaces [10]. The customers attitude toward digital commerce can be an effective method to enhance satisfaction [11]. Therefore, it is very important to know consumer perception about website quality in order to achieve quality management practices for their digital commerce enterprises. Digital commerce enterprises are also much aware of the power of digital reputation, which has a great impact on their digital commerce transactions especially with the current increased usage of social networking portals. Digital commerce website quality is a multidimensional construct comprising of information quality, system quality and service quality.The multidimensional measure of website quality evaluates the principal factors that affect users' expectations and perceptions of website quality [5], [12]-[14].

This measure confirms the findings that the quality of the information, of the system, and of the service provided by the enterprise through its website are the principal factors of digital commerce website design [7]. The multidimensional determinants having significant effects on digital business information systems are characterized as information quality, system quality and service quality. Information quality and system quality are evaluated from a technical perspective, while service quality from a customer perspective. Specifically, information quality is a measure of value perceived by a customer of the output produced by a website. System quality is manifested in a digital commerce website system's overall performance, and it can be measured by the customer's perceived degree of user friendliness when shopping at an online retailer. Service quality is defined as the overall customer evaluation and judgment of the quality of online service delivery. These three factors play a key role in the satisfaction of online customers, helping to improve their purchase intentions [12]-[14]. Website quality evaluation is performed with aspects of preference modelling and evaluation aggregation used in multicriteria decision analysis (MCDA) [15]-[17]. Digital commerce website evaluation is recognized as a complex multicriteria decision making (MCDM) problem involving vast amounts of imprecise and inconsistent evaluation data. Amongst those MCDM methods, multidimensional compromise optimization method lies in defining the positive and the negative ideal points in the solution space [13]. It focuses on ranking and selecting from a finite set of feasible alternatives in presence of conflicting and non commensurable (attributes with different units) criteria. It evaluates a multicriteria ranking index based on the 'closeness' to the 'ideal' solution [28]. When each alternative is evaluated with respect to each criterion, the compromise ranking can be obtained while comparing the relative closeness measure to the ideal alternative. Thus, the derived multicriteria compromise solution is a feasible solution, which is the closest to the positive ideal solution and farthest from the negative ideal solution, and a compromise means an agreement established by mutual concessions made between the alternatives.

Consequently, this study proposes a model that hybridizes the standard deviation, and the multidimensional compromise programming in order to provide an evaluation model that prioritizes the objective weights of digital commerce websites.

The intended research contributions are: (i) to determine and evaluate the most relevant criteria for digital commerce websites; (ii) to apply a hybrid multidimensional decision model based on standard deviation, and compromise programming methodology; (iii) to present results of analyses that capture the effects of different criteria quantitative characteristics on the ranking of the best digital commerce website.

The remainder of the paper is organized as follows. In Section II, dimensions considered for website evaluation are provided. In Section III, multidimensional compromise programming methods is presented. In Section IV, evaluation of digital commerce websites is given to demonstrate the applicability of the proposed model. In Section V, concluding remarks and future directions are given finally.

II. Digital Commerce Website Evaluation

Quality concept is considered as a pervasive complex set of attributes and its measurement multidimensional in nature. Quality dimensions are influenced by culture, participators and even time. Quality dimensions are informed by constructs that enable influences of any evaluation plan to be considered.The information systems quality has three major dimensions; information quality, systems quality and service quality. The information systems success model is presented for digital commerce website success metrics on Fig. 1. [12].

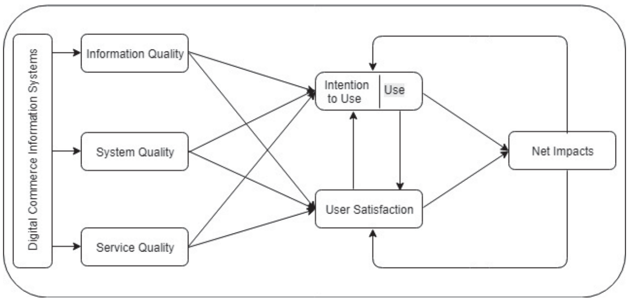

Fig. 1. Information Systems Success Model [12]

Effective digital commerce websites are usually dynamic, subject to constant update, innovation and management. A variety of criteria and computational methods are used in digital commerce website evaluation. Computational evaluation of website criteria is developed to capture information quality, systems quality, and service quality factors. The advantages of evaluating multiple commerce websites regularly are significant when assessing these website quality features. The two stakeholders users and designers may have significant influence on evaluations of website. The stakeholders vary according to the reason for the website evaluation. Users hold a central stake when user satisfaction is under consideration, but developers may have a greater influence on evaluations of digital commerce website design. User satisfaction in the evaluations is a significant measure of information systems success. The website quality dimensions are used to develop an evaluation instrument that can be used to support decision makers gain a comprehensive understanding of digital commerce website quality constitutes [18]-[27]. The three quality dimensions affect use and user satisfaction. The information systems quality constructs are founded as critical success factors in digital commerce website evaluation together with information system use as follows [12], [13].

System quality measures the desirable characteristics of an information system. This is the elements of a system that affect the end user in the way they interact and use a digital commerce system. System quality constructs are accessibility, responsiveness, usability, learnability, functionality, reliability, flexibility, security, intuitiveness, sophistication, and communication.

Information quality measures the desirable characteristics of the system outputs. To encourage repeat visits, visitors need to be provided with appropriate, complete and clear information. Information quality constructs are responsiveness, relevance, accuracy, reliability, competency, conciseness, understandability, completeness, currency, timeliness, security, dynamicity, and customization.

Service quality measures the quality of the support that system users receive from the information systems organization and IT support personnel. The service quality dimension allows for examination of the role of service provider within organisations, particularly in the context of digital commerce where the end user is the customer and not the employee. Digital consumers demand more service quality in the online environment. Service quality constructs are tangibles, assurance, perception of service, empathy, responsiveness, competency, and customization.

Use measures the degree and manner in which employees and customers utilize the capabilities of an information system. It is amount of use, frequency of use, nature of use, appropriateness of use, extent of use, and purpose of use.

User satisfaction measures users' level of satisfaction with reports, websites, and support services. It covers the entire customer experience cycle from information retrieval through repeat purchases, repeat visits, and user surveys.

Net impacts measure the extent to which information systems are contributing (or not contributing) to the success of individuals, groups, organizations, industries, and nations. Net impacts are improved decision making, improved productivity, increased sales, cost reductions, improved profits, market efficiency, consumer welfare, creation of jobs, and economic development.

The consideration of the website quality must precede any measurement of use. The arguments for use or user satisfaction are not addressed as to the process or causal nature of use as a success variable. Evaluation of a website using the three quality dimensions contributes to understanding where the website can be improved as a prerequisite for any assessment of use to be made. This in turn affects assessment of the net benefits of the website that constitute the final success variable. Thus, a comprehensive evaluation of digital commerce website success can be developed using exhaustive quality metrics grounded in the quantitative methods of objective evaluations that result in a judgement of success or failure. The structure of the evaluation instrument is developed using the main constructs of the model within the three quality dimensions. It takes advantage of the flexibility of the information systems success model to avoid definitive metrics and to develop more qualitative questions from the identified constructs that are further supported by the website evaluation research to both test and expand the existing constructs [16].

III. Multidimensional Compromise Programming

The compromise programming belongs to a class of multicriterion analytical methods called distance-based methods. The compromise programming is a multiple criteria decision making method. The basic idea in compromise programming is to identify an ideal solution which is only a point of reference for the decision maker. The compromise programming is an approach which identifies solutions closest to the ideal one by distance measure L_p. The compromise programming assumes, quite realistically, that any decision maker seeks a solution as close as possible to the ideal point, possibly the only assumption made by decision maker about human preferences. To achieve this closeness, a distance function is introduced into the compromise programming analysis. In the L_p metrics, L_1^j is the longest distance and L_∞^j is the shortest distance. Therefore, all possible distances are bounded by L_1^j and L_∞^j. The important point to emphasise here is that the concept of distance is not used in its geometric sense, but the distance measure is used as a proxy for human preferences.

The idea of a distance metric or a family of distance functions is essential for the compromise programming method to work. The compromise programming method is developed for multicriteria optimization of complex systems. The compromise programming method determines the compromise ranking, the compromise solution, and the weight stability intervals for preference stability of the compromise solution obtained with the given weights. The compromise programming method focuses on ranking and selecting from a set of alternatives in the presence of conflicting criteria. The compromise programming method considers the multicriteria ranking index based on the particular measure of ''closeness'' to the ''ideal'' solution [28]-[31]. The compromise solution obtained by L_1^j is with a maximum group utility (''majority'' rule), and the solution obtained by L_∞^j is with a minimum individual regret of the ''opponent''.

In compromise programming procedure the closeness between a solution and the ideal point is measured by a distance function L_p. The ideal point is not achievable, but is used as a reference point for the identification of the best compromize solution .

The compromise programming method starts with the development of decision matrix which shows the performance of the alternatives with respect to various criteria. Let, x_{ij} represents the performance measure of i^{th} alternative with respect to j^{th} criterion. The multicriteria measure for compromise ranking is then developed from the

L_p - metric used as an aggregating function in a compromise programming method [32]-[37].

$$\min L_p^i = \left\{ \sum_{j=1}^{n} \left[\omega_j r_{ij} \right]^p \right\}^{1/p}$$

$$\min L_p^i = \left\{ \sum_{j=1}^{n} \left[\omega_j \left(1 - \frac{|x_{ij} - T_j|}{Max\left\{x_j^{\max}, T_j\right\} - Min\left\{x_j^{\min}, T_j\right\}} \right) \right]^p \right\}^{1/p} \quad (1)$$

$$i \in \{1,2,...,m\} \;\; j \in \{1,2,...,n\} \quad 1 \le p \le \infty$$

where p is the metric defining the L_p family of distance functions. The value chosen for $p = 1,2,\ldots,\infty$ reflects the way of achieving a multidimensional compromise solution by minimizing the weighted sum of the deviations of criteria from their respective reference points. n is the number of criteria, m is the number of alternatives and ω_j is the relative importance (weight) of j^{th} criterion. The procedures for evaluating the best solution to a multicriteria decison making problem includes computing the utilities of alternatives and ranking these alternatives. The alternative compromise solution with the highest utility is considered to be the optimal solution. In compromise programming method, L_1^i and L_∞^i are used to formulate the ranking measure. The compromise programming ranking algorithm involves the following procedural steps [38]-[40]:

a) Determine the most favorable values for all criteria. From the given decision matrix, identify the best, $x_{ij}^{\max}$ and the worst, $x_{ij}^{\min}$ values of all thecriteria.

$T_j = \{T_1, T_2, ..., T_n\}$ {most desirable element (r_{ij}) or target value for j^{th} criterion}

where r_{ij} (i = 1,2,…,m and j = 1,2,…,n) are elements of the decision matrix (performance of i^{th} alternative with respect to j^{th} criterion).

b) Normalize the decision matrix

$$r_{ij} = \left(1 - \frac{|x_{ij} - T_j|}{Max\left\{x_j^{\max}, T_j\right\} - Min\left\{x_j^{\min}, T_j\right\}} \right) \quad (2)$$

where x_{ij} is the rating of alternative i (A_i or website $i = 1,2,...,m$) with respect to criterion j (c_j or website qualities $j = 1,2,...,n$) in decision matrix. T_j is either the most favorable element (x_{ij}) or the target value in criteria j, $x_{ij}^{\max}$ is maximum element in criterion j, $x_{ij}^{\min}$ is minimum element in criterion j.

c) The three different classes of selection attributes are; attributes that need a maximum value optimization (larger-the-better,LTB); attributes that need a minimum value optimization (smaller-the-better,STB); attributes that require a target value (Target (T)). The objective weights of the criteria are determined using various weighting methods categorized into three different groups: subjective, objective or integrated methods. The standard deviation method is used to determine the objective weights of the criteria.

$$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m} (r_{ij} - \overline{r}_j)^2}{m}} \quad (3)$$

$$\overline{r}_j = \frac{\sum_{i=1}^{m} r_{ij}}{m}$$

$$\omega_j = \frac{\sigma_j}{\sum_{j=1}^{n} \sigma_j}$$

$$i \in \{1,2,...,m\} \;\; j \in \{1,2,...,n\}$$

d) Compute S_i and R_i values by relations:

$$L_1^i = S_i = \sum_{j=1}^{n} \omega_j \left(1 - e^{\frac{|r_{ij} - T_j|}{-A_j}} \right) \quad (4)$$

L_1^i model implies a minimum average disagreement. The ranking of alternatives is obtained in terms of the maximization of the weighted sum of normalized performance indicators.

$$L_\infty^i = R_i = \underset{j}{Max} \left[\omega_j \left(1 - e^{\frac{|r_{ij} - T_j|}{-A_j}} \right) \right] \quad (5)$$

L_∞^i model represents the maximum deviation or disagreement. A_j {1 if elements of j^{th} criterion are normalized between 0 and 1, $max\left\{x_j^{\max}, T_j\right\} - min\left\{x_j^{\min}, T_j\right\}$ }otherwise. $r_j^{\max}$ and $r_j^{\min}$ are the maximum and minimum elements in j^{th} criterion respectively.

e) Compute the index value Q_i by relation:

$$Q_i = \begin{cases} \left[\dfrac{R_i - R^-}{R^+ - R^-} \right] & if \;\; S^+ = S^- \\ \left[\dfrac{S_i - S^-}{S^+ - S^-} \right] & if \;\; R^+ = R^- \\ \left[\dfrac{S_i - S^-}{S^+ - S^-} \right] \alpha + \left[\dfrac{R_i - R^-}{R^+ - R^-} \right] (1 - \alpha) & otherwise \end{cases} \quad (6)$$

where $S^+ = max\, S_i$, $S^- = \min S_i$, $R^+ = \max R_i$, $R^- = \min R_i$ and α is introduced as a weight for the strategy of 'the majority of criteria' (or 'the maximum group utility'), whereas, $(1 - \alpha)$ is the weight of the individual regret (disutility). Usually the value of α is taken as $\alpha = 0.5$. The alternative has the smallest index value determined to be the best compromise solution.

f) The L_1^i with the L_∞^i compromise programming models are combined through the formulation of the following composite compromise programming model:

$$\min L_\alpha^i = Z_i = \alpha S_i + (1-\alpha) R_i \tag{7}$$

g) Propose as a compromise solution the alternative ($a^{'}$) which is ranked the best by the measure Q (minimum) if the following two conditions are satisfied:

C_1: *Acceptable advantage:*

$$Q(a^{"}) - Q(a^{'}) \geq DQ \tag{8}$$

where $a^{"}$ is the alternative with the second position in the ranking list by Q; $DQ = 1/(m-1)$; m is the number of alternatives.

C_2: *Acceptable stability in decision making:*

Alternative $a^{'}$ must also be the best ranked by S or/and R. This compromise solution is stable within a decision making process, which could be: ''voting by majority rule'' (when $\alpha > 0.5$ is needed), or ''by consensus'' $\alpha \approx 0.5$, or ''with veto'' ($\alpha < 0.5$). Here, α is the weight of the decision making strategy ''the majority of criteria'' (or ''the maximum group utility'').

If one of the conditions is not satisfied, then a set of compromise solutions is proposed, which consists of

a) Alternatives $a^{'}$ and $a^{"}$ if only the condition C_2 is not satisfied, or
b) Alternatives $a^{'}, a^{"}, \ldots, a^{(M)}$ if the condition C_1 is not satisfied; $a^{(M)}$ is determined by the relation

$$Q(a^{(M)}) - Q(a^{'}) < DQ \tag{9}$$

for maximum M (the positions of the alternatives are ''in closeness'').

The ideal alternative, ranked by Q, is the one with the minimum value of Q. The main ranking result is the compromise ranking list of alternatives, and the compromise solution with the ''advantage rate''. Ranking by compromise programming method may be performed with different values of criteria weights, analyzing the impact of criteria weights on proposed compromise solution. The compromise programming method is a helpful model in multicriteria decision making, particularly in a situation where the decision maker is not able, or does not know to express his/her preference at the beginning of system design. The obtained compromise solution could be accepted by the decision makers because it provides a maximum ''group utility'' of the ''majority'', and a minimum of the individual regret of the ''opponent''. The compromise solutions could be the basis for negotiations, involving the decision makers' preference by criteria weights [28].

h) Finally, rank the alternatives, sorting by the values *S, R, Q* and *Z*, in decreasing order. The results are four ranking lists.

IV. Empirical Results

A. Constructing the Decision Matrix

The multiattribute decision making (MADM) multidimensional compromise programming is developed as an instrument for multiobjective optimization in complex systems. This algorithm is based on the comparison between the alternatives of selection on the basis of critical attributes characterized by different units of measurement.

In the multidimensional compromise programming model the ranking of optimality is obtained from the analysis of the distance of each alternative from the ideal solution, and the concept of compromise is related to the mutual granting of the different critical attributes.Therefore, depending on the ability to consider all the three categories of attribute (LTB, STB and Target), multidimensional compromise programming is adopted for digital commerce website selection. In Fig. 2. is shown the logical process of multidimensional compromise programming.

The application of multidimentional compromise optimization method starts with the development of the corresponding evaluation or decision matrix which shows the performance of the alternatives with respect to various criteria. It combines standard deviation and multidimentional compromise programming for outranking of digital commerce website alternatives. The three quantitative criteria considered in the evaluation of digital commerce website problem are determined as follows: Information Quality (C1), System Quality (C2), and Service Quality (C3). As a result, only these three criteria are used in evaluation and decision matrix is established accordingly. Decision matrix is structured with the criteria and the determined alternative digital commerce websites as presented in Table I. After constructing the decision matrix for the problem, the weights of the criteria used in evaluation process are calculated by using sandard deviation method. Thus, digital commerce website evaluation problem is considered with three dimensions and ten candidate websites. Standard deviation procedure is used to identify objective weights of the criteria.

Decision performance values are quantitatively assigned to each alternative with respect to criteria in the decision matrix. Then the selection and evaluation decisions of criteria and alternatives are performed using the proposed holistic MCDM methodology accordingly. The proposed hybrid model is applied in three basic stages. First, evaluation criteria are determined and the multidimentional compromise programming model is formed. Criteria weights are calculated via standard deviation, in the second stage. decision performance values are used to evaluate criteria weights. Finally, the performance of ten alternative digital commerce websites is evaluated and ranked using multidimentional compromise optimization solution.

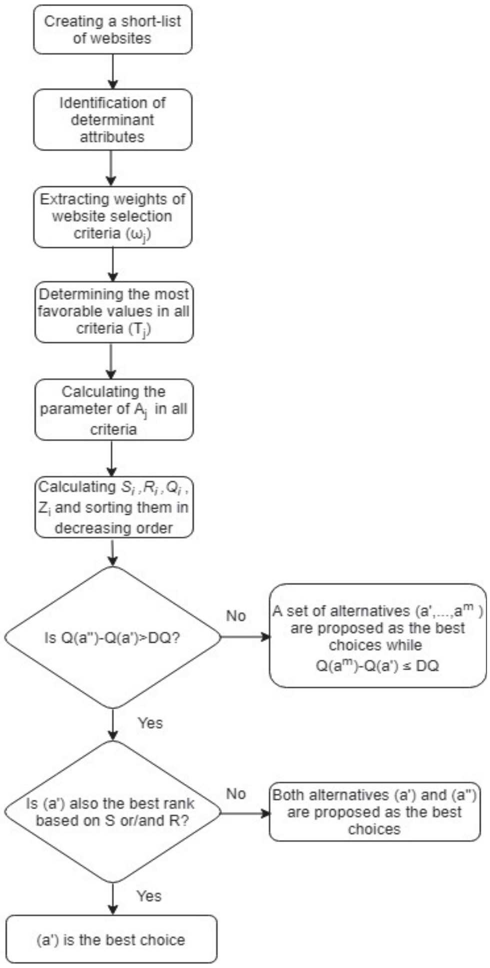

Fig. 2. Flowchart of multidimensional compromise programming for digital commerce website selection.

Finally, the multidimentional compromise optimization method is applied to rank the alternative digital commerce websites. The priority weights of alternative digital commerce websites with respect to criteria are calculated by standard deviation shown in Table II. Then the calculated objective weights are used as input for the weighted normalized decision matrix in Table III. Also, the ideal and the worst values of all criteria functions are shown in Table III.

B. Normalizing the Decision Matrix

The decision matrix in MCDM consideration first requires being normalized so that it becomes dimensionless and all of its elements are comparable. In Table II, application of the proposed methodology starts with the normalization as given in (2).

The objective weights of criteria are obtained using standard deviation equations (3). The objective weights of identified criteria are computed using standard deviation and shown in Table II. These objective weights are used to obtain S_i, R_i, Q_i, and Z_i.

TABLE I
DECISION MATRIX OF THE WEBSITE SELECTION PROBLEM

Alternative	C1	C2	C3
Optimization	max	max	max
A1	50	75	90
A2	75	85	85
A3	85	65	65
A4	75	85	65
A5	65	75	70
A6	60	90	75
A7	75	75	50
A8	70	75	80
A9	60	75	75
A10	75	80	70
$x_j^{\max}$	85	90	90
$x_j^{\min}$	50	65	50

TABLE II
NORMALIZED DECISION MATRIX

Alternative	C1	C2	C3
Optimization	max	max	max
A1	0,000	0,400	1,000
A2	0,714	0,800	0,875
A3	1,000	0,000	0,375
A4	0,714	0,800	0,375
A5	0,429	0,400	0,500
A6	0,286	1,000	0,625
A7	0,714	0,400	0,000
A8	0,571	0,400	0,750
A9	0,286	0,400	0,625
A10	0,714	0,600	0,500
σ_j	0,277	0,271	0,270
ω_j	0,339	0,332	0,330

C. Weighted Normalized Decision Matrix

The normalized decision matrix is weighted using (3) and a set of ideal ($u_j^{\max} = \omega_j r_{ij}^{\max}$) and negative ideal ($u_j^{\min} = \omega_j r_{ij}^{\min}$) solutions are indicated as shown in Table III.

TABLE III
WEIGHTED NORMALIZED DECISION MATRIX

Alternative	C1	C2	C3
Optimization	max	max	max
Weight ω_j	0,339	0,333	0,330
A1	0,147	0,052	0,115
A2	0,045	0,068	0,086
A3	0,118	0,144	0,059
A4	0,045	0,068	0,059
A5	0,045	0,052	0,023
A6	0,084	0,116	0,017
A7	0,045	0,052	0,143
A8	0,000	0,052	0,054
A9	0,084	0,052	0,017
A10	0,045	0,009	0,023
$u_j^{\max}$	0,147	0,144	0,143
$u_j^{\min}$	0,000	0,009	0,017

D. Computing the Multidimensional Compromise Solutions

The performances of the alternatives (S_i, R_i, Q_i, Z_i) for MCDM compromise programming problem are computed using (1)-(9) and shown in Table IV.

TABLE IV
COMPUTING THE MULTIDIMENSIONAL COMPROMISE SOLUTIONS

Alternative	S_j	Rank	R_j	Rank	Q_j	Rank	Z_j	Rank
A1	0,315	9	0,147	10	0,986	10	0,231	9
A2	0,199	6	0,086	6	0,451	6	0,143	6
A3	0,321	10	0,144	9	0,985	9	0,233	10
A4	0,172	5	0,068	4	0,304	4	0,120	5
A5	0,120	3	0,052	2	0,123	3	0,086	3
A6	0,217	7	0,116	7	0,631	7	0,166	7
A7	0,241	8	0,143	8	0,816	8	0,192	8
A8	0,106	2	0,054	3	0,102	2	0,080	2
A9	0,154	4	0,084	5	0,348	5	0,119	4
A10	0,077	1	0,045	1	0,000	1	0,061	1

The final ranking results for digital commerce websites are calculated for values of $\alpha = 0,5$, $S^+ =$ 0,321, S^-=0,077; R^+ =0,147, and R^-=0,045 shown in Table IV. The final results of multidimensional compromise solution are stable within a consensus decision making process for evaluation of digital commerce website quality.

V. CONCLUSION AND DISCUSSION

In this study, a comprehensive decision strategy procedure is proposed for digital commerce website selection. The proposed procedure starts with creating a set of websites and identifying their determinant dimensions of assessment, and continues with the compromise algorithm to evaluate the alternatives. This work combines the concepts of standard deviation and multidimensional compromise programming to evaluate and rank digital commerce websites. Evaluation of website quality is a multicriteria decision analysis problem whose quantitative and qualitative attributes must be taken into account for compromise solution.The three main criteria for measuring website quality are information quality, system quality, and service quality. Also, increasing the number of quantitative criteria leads to more genuinely robust results and evaluations. According to the considered dimensions, the digital commerce websites are ranked using the weighted criteria scores in compromise solutions. The multidimensional compromise optimization method is reputed by computational simplicity and capability of providing almost accurate results. Digital commerce website evaluation, selection, and ranking decisions are very important for global commerce and business development strategies. Consequently, there should be strategic planning activities, efforts and a long-term policy projections for the success of digital commerce business organizations. Increasing the efficiency of digital commerce websites using quantitative methods would also increase the performance of digital businesses. For further research, the results of this study may be compared with the results of fuzzy MCDM methods.

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