Internet Marketing in E-Commerce: Maximizing Online Success Using TOPSIS Method

Suresh Reddy Jakka
Mahatma Gandhi University, Nalgonda, Telangana, India.
Corresponding Email: jsureshreddy@gmail.com

Abstract: *Internet marketing, also referred to as web marketing, online marketing, or e-marketing, is the process of advertising products or services online. Media are available to a global audience thanks to the Internet. The interactive nature of Internet marketing, which prompts immediate answers, is what makes it stand out from other forms of media. Internet marketing is sometimes regarded to have a broad meaning because it includes marketing that is done via e-mail and wireless media in addition to marketing on the Internet. The exchange of goods and services, or the transfer of money or data, over an electronic network—most notably the internet—is known as electronic commerce. Digital customer data management and electronic customer relationship management systems are also included. These business transactions may be B2B, B2C, C2C, or C2B (business-to-business, consumer, or business-to-business). It's common to use the terms e-business and e-commerce interchangeably. Making a decision includes deciding which e-commerce site is best. The current ranking system doesn't rate each website based on user pleasure. Additionally, considering the multiple attribute decision making (MADM) approaches and the volume of studies committed to finding the most significant influencing factors for online customer satisfaction ,it becomes vital to determine the relative importance of website quality attributes based on both user feedback and manager interests. In this study, cash payments come in top, and prepaid cards with a 6- to 24-hour validity period come in last. Using this methodology, our study evaluated several e-commerce tactics and ranked them according to their effectiveness. The TOPSIS MCDM theory's techniques and methods. In order to rank e-commerce websites, the evaluation is done by conducting a survey on the opinions of online visitors. The goal of this research is to evaluate e-commerce websites based on the level of customer satisfaction. We suggest a factor structural model of influence on customer satisfaction.*
Keywords: E-commerce, MCDM Methods, security and privacy, payment and online behavior.

1. INTRODUCTION

One of the economic sectors with the fastest growth right now is e-commerce. The market for this industry is becoming more competitive, necessitating both ongoing service quality improvement and differentiation from competitors. Customers are using the possibility to buy goods and services online more and more frequently. [1] Consumers use and get more accustomed to e-commerce platforms. They offer the ability to locate a product among several retailers, assess its pricing, and conduct online shopping. These websites frequently offer product reviews from customers. These websites expand quite quickly, bringing new solutions and improvements for their consumers as a result of the e-commerce market's growth and the continuous increase in Internet users. A system using MCDM techniques that provides clients with a rating of the products they have chosen based on their desired criteria and a recommendation of the best option for them might be a useful tool that greatly enhances the features of e-commerce websites. [3] To increase customer pleasure, they offer tailored information. Numerous industries, including e-commerce, healthcare, business, and e-learning, use recommender systems. [4] All business operations with consumer happiness and corporate profit as their ultimate objectives are defined by the e-commerce strategy. The customer relationship management, enterprise information systems, and supply chain management strategies are all connected to the e-commerce strategy, which is a part of the company strategy [5]. E-commerce strategy: Porter's Theory of Market Forces, Resource-Based View, Transaction Cost Economics, and Channel Theory. There is currently no complete framework uniting these theories into a mechanism for systematically evaluating value delivery strategies, and in particular for figuring out how to maximize the effectiveness of the Internet as a value distribution channel. [9] Since e-commerce has become more popular and competitive globally over the past ten years, e-commerce platforms are

more concerned than ever with how to draw in new customers and keep existing ones for future purchases [11] Business-to-consumer (B2C), business-to-business (B2B), and consumer-to-consumer (C2C) e-commerce are the three primary categories of electronic commerce in India. A sizable interactive online market has been made possible by the ease of clients being able to buy 24 hours a day at home and the availability of a broad variety of products with accurate descriptions and lower pricing. So, higher-level management and policymakers must make a lot of decisions in order to adopt the e-commerce platform [12].

2. CUSTOMER SATISFACTION CRITERIA FOR E-COMMERCE WEBSITES

Three antecedents—security, content, and design—are part of a proposed model of criteria and sub-criteria that may favourably affect customer satisfaction. One numerical characteristic, the amount of hours per day to keep business online and selling, an attribute referring to online payment methods, and the remaining five variables were utilized to validate the model. [14]

Security and privacy: are two crucial aspects of our digital lives. While they are related, they address different aspects of protecting our information and ensuring our safety. Security is the steps taken to guard against unauthorized access, use, disclosure, interruption, modification, and destruction of computer systems, networks, and data. It encompasses various practices and technologies aimed at preventing, detecting, and responding to threats and vulnerabilities. Some key elements of security include:

1. Authentication: Verifying the identity of users or devices to grant access to authorized individuals only. This can involve passwords, biometrics (fingerprint or facial recognition), or two-factor authentication (2FA).

2. Encryption: Data is encrypted during encryption to render it unreadable to unauthorized persons. Data is encrypted to make sure that even if it is intercepted, it cannot be decoded without the correct decryption key.

3. Firewalls: Software or hardware firewalls monitor and control both incoming and outgoing network traffic on the basis of established security rules. Firewalls act as a barrier between internal networks and external networks (such as the internet).

4. Antivirus and Antimalware Software: Programmes created to identify, stop, and get rid of unwanted software, including as viruses, worms, Trojan horses, and spyware.

5. Maintaining current firmware, operating systems, and apps helps shield against known vulnerabilities and attacks. Privacy, on the other hand, concerns the protection of personal information and the right to control the collection, use, and disclosure of that information. It involves safeguarding sensitive data from unauthorized access or misuse. Key aspects of privacy include:

1. Data Collection and Consent: Personal information should be gathered, utilized, and shared by individuals only with their consent. Organizations are expected to obtain informed consent before collecting personal data.

2. Data Minimization: Collecting only the necessary information for a specific purpose and retaining it for only as long as necessary.

3. Anonymization and Pseudonymization: Techniques to de-identify personal data, making it less identifiable or completely anonymous, thus reducing privacy risks.

4. Privacy Policies and Transparency: Organizations should provide clear and accessible privacy policies that outline how they handle personal data. They should also be transparent about their data practices.

5. Secure Data Storage and Transfer: Employing encryption and secure protocols to protect personal data during storage and transmission.

6. Privacy by Design: It refers to the process of incorporating privacy protections into the planning and creation of goods and services rather than doing so after the fact.

In today's digital environment, privacy and security are equally important. Strong security measures must be in place to guard against unauthorized access and attacks, while also upholding people's right to privacy and making sure their personal data is treated appropriately. Content clarity: When it comes to payments, content clarity is of utmost importance to ensure transparency and understanding between parties involved. Here's a clearer explanation of content clarity in the context of payments:

1. Payment Terms: Clearly define the terms and conditions of the payment, including the payment amount, due date, and any applicable fees or penalties. This ensures that both the payer and payee have a mutual understanding of their financial obligations.

2. Payment Methods: Specify the accepted payment methods, such as credit cards, bank transfers, or digital wallets. Provide instructions on how to initiate the payment using each method to avoid confusion or errors.

Graphical interface: A graphical interface, often known as a graphical user interface (GUI), is an interface that makes use of graphical elements such icons, buttons, windows, and menus to allow users to interact with a computer system or software programme. It provides a visual representation of information and enables users to perform tasks by interacting with visual elements rather than relying solely on text-based commands.Graphical interfaces are designed to be intuitive and user-friendly, presenting information and controls in a visually appealing and accessible manner. Users can navigate through the interface by clicking on icons, buttons, or

menus, and perform actions by interacting with graphical elements. GUIs typically offer features such as drag-and-drop functionality, customizable layouts, and visual feedback to enhance the user experience.

Online service: An online service refers to a digital platform or application that is accessed over the internet and provides various functionalities, features, or resources to users. It enables individuals or organizations to perform tasks, access information, communicate, or conduct transactions online. Examples of online services include email providers, social media platforms, online banking, e-commerce websites, streaming services, and cloud storage platforms. These services are accessible through web browsers or dedicated applications, allowing users to utilize their functionalities remotely and conveniently via the internet.

Usefulness: Usefulness in payments refers to the extent to which a payment method, system, or service effectively meets the needs and requirements of users. A useful payment solution should offer convenience, efficiency, security, and accessibility, allowing users to easily and reliably make transactions or exchange value. It should simplify the payment process, provide options for different payment methods, ensure the security of sensitive information, and be widely accepted by merchants or recipients. The usefulness of a payment solution is determined by its ability to meet the expectations of users and enhance their overall payment experience.

Hour availability: Hour availability refers to the duration of time during which a service, business, or support system is operational and accessible to users. It indicates the hours of the day or night when a service is available for use or when customer support or assistance is provided. For example, if a service has 24-hour availability, it means it is accessible and operational at any time of the day or night. Hour availability is an important consideration for businesses and services to ensure that their customers or users can access and utilize their offerings within specified timeframes. Selected criteria from the customer satisfaction model for e-commerce websites have been used to test the suggested approach. [13]

3. TOPSIS METHOD

In this paper, a method using TOPSIS and MCDM methodologies is presented. The results show that the chosen set of methods are beneficial and adequate for selecting equipment and goods to be purchased, and they also point to the enormous potential of MCDM techniques in the area of online services and commerce. Using this methodology, our study evaluated several e-commerce tactics and ranked them according to their effectiveness. The TOPSIS MCDM theory employs the following procedures and methodologies.TOPSIS is an evaluation technique that is frequently applied to MCDM issues. It has a variety of practical uses, including comparing business success, analyzing financial ratio performance within a certain industry, and investing money in modern manufacturing processes, among others. There are certain restrictions, though. The TOPSIS approach does, however, have certain downsides. The fact that TOPSIS can result in the phenomena known as rank reversal is one of the issues it raises. This phenomenon causes the order of preference for the alternatives to fluctuate depending on whether an option is added to or removed from the choice issue. Total rank reversal, where the order of preferences is fully inverted and the alternative that was previously judged to be the best now becomes the worst, can occasionally occur when an alternative is added to or removed from the process. Such a phenomenon might not be acceptable in many situations. A variety of options must be examined and evaluated in MCDM based on a number of criteria. The purpose of MCDM is to aid the decision-maker in the process of selecting among alternatives. In this way, practical issues are frequently defined by a number of opposing criteria, and it's possible that no solution can satisfy all criteria at once. The solution is thus a compromise choice depending on the decision-maker's preferences. In this sense, TOPSIS is based on the notion that the ideal solution that is chosen in the end should be the one that is both the furthest away from and the closest to the Negative Ideal Solution (NIS). The proximity measure is used to determine the final ranking.

Step 1: The decision matrix X, which displays how various options perform concerning certain criteria, is created.

$$x_{ij} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \qquad (1)$$

Step 2: Weights for the criteria are expressed as

$$w_j = [w_1 \cdots w_n], \ where, \sum_{j=1}^{n}(w_1 \cdots w_n) = 1 \qquad (2)$$

Step 3: The matrix x_{ij}'s normalized values are computed as

$$n_{ij} = \frac{x_{ij}}{\sqrt[2]{\sum_{i=1}^{m} x_{ij}^2}} \qquad (3)$$

Weighted normalized matrix N_{ij} is calculated by the following formula

$$N_{ij} = w_j \times n_{ij} \qquad (4)$$

Step 4: We'll start by determining the ideal best and ideal worst values: Here, we must determine whether the influence is "+" or "-." If a column has a "+" impact, the ideal best value for that column is its highest value; if it has a "-" impact, the ideal worst value is its lowest value.

Step 5: Now we need to calculate the difference between each response from the ideal best,

$$S_i^+ = \sqrt{\sum_{j=1}^{n}(N_{ij} - A_j^+)^2} \qquad for\ i \in \lceil 1, m \rceil\ and\ j \in \lceil 1, n \rceil \qquad (5)$$

Step 6: Now we need to calculate the difference between each response from the ideal worst,

$$S_i^- = \sqrt{\sum_{j=1}^{n}(N_{ij} - A_j^-)^2}\ for\ i \in \lceil 1, m \rceil\ and\ j \in \lceil 1, n \rceil \qquad (6)$$

Step 7: Now we need to calculate the Closeness coefficient of i_{th} alternative

$$CC_i = \frac{S_i^-}{S_i^+ + S_i^-}\quad where, 0 \leq CC_i \leq 1, i \in \lceil 1, m \rceil \qquad (7)$$

The Closeness Coefficient's value illustrates how superior the alternatives are in comparison. A larger CC_i denotes a substantially better alternative, whereas a smaller CC_i denotes a significantly worse alternative.

4. RESULT AND DISCUSSION

TABLE 1. Data set of TOPSIS method

DATA SET						
	Security & privacy	Content Clarity	Graphical Interface	Online service	Usefulness	Hour Availability in day
Mobile Payment	0.895	0.735	0.643	0.779	0.768	1
Cash Payment	0.829	0.794	0.726	0.81	0.796	1
Charge Card	0.972	0.557	0.638	0.546	0.593	0.6667
Prepaid Card 1	0.984	0.794	0.5	0.81	0.796	0.25
Prepaid Card 2	0.995	0.798	0.726	0.733	0.879	0.50

The table 1 presents a comparison of different payment methods based on their scores in various categories. Security & Privacy: Mobile Payment has a score of 0.895, indicating a high level of security and privacy. Charge Card has the highest score of 0.972, while Prepaid Card 2 has the highest score of 0.995.Content Clarity: Prepaid Card 2 has the highest score of 0.798, indicating good content clarity. Cash Payment follows closely with a score of 0.794. Graphical Interface: Cash Payment has the highest score of 0.726 for graphical interface, followed by Prepaid Card 2 with a score of 0.726. Online Service: Mobile Payment has a score of 0.779, indicating good performance as an online service. Cash Payment has the highest score of 0.810. Prepaid Card 2 has the highest usefulness rating (0.879), while Mobile Payment comes in second with a score of 0.768.Hour Availability in Day: Mobile Payment, Cash Payment, and Charge Card have a score of 1, indicating 24-hour availability. Prepaid Card 1 has a score of 0.25, indicating limited availability, and Prepaid Card 2 has a score of 0.50. These scores provide insights into the evaluated aspects of each payment method, enabling a comparison of their strengths and weaknesses in terms of security, content clarity, graphical interface, online service performance, usefulness, and availability throughout the day.

TABLE 2. Normalized data

Normalized data						
	Security & privacy	Content Clarity	Graphical Interface	Online service	Usefulness	Hour Availability in day
Mobile Payment	0.4271	0.4434	0.4411	0.4694	0.4448	0.6023
Cash Payment	0.3956	0.4790	0.4981	0.4881	0.4610	0.6023
Charge Card	0.4638	0.3360	0.4377	0.3290	0.3434	0.4015
Prepaid Card 1	0.4696	0.4790	0.3430	0.4881	0.4610	0.1506
Prepaid Card 2	0.4748	0.4814	0.4981	0.4417	0.5091	0.3011

Table 2 presents the normalized scores for different payment methods in various categories. Security & Privacy: Mobile Payment has a normalized score of 0.4271, indicating moderate security and privacy. Charge Card has the highest score of 0.4638.Content Clarity: Prepaid Card 2 has the highest normalized score of 0.4814, indicating good content clarity. Cash Payment follows closely with a score of 0.4790.Graphical Interface: Cash Payment has the highest normalized score of 0.4981 for graphical interface, followed by Prepaid Card 2 with a score of 0.4981.Online Service: Mobile Payment has a normalized score of 0.4694, indicating moderate performance as an online service. Cash Payment has the highest score of 0.4881.Usefulness: Prepaid Card 2 has the highest normalized usefulness score of 0.5091, followed by Cash Payment with a score of 0.4610.Hour Availability in Day: All payment methods have a normalized score of 0.6023, indicating 24-hour availability. These normalized scores allow for a comparison of the payment methods in terms of their relative performance in each category. They give information about how each payment method was evaluated in terms of security, content clarity, graphical interface, online service performance, usefulness, and availability throughout the day.
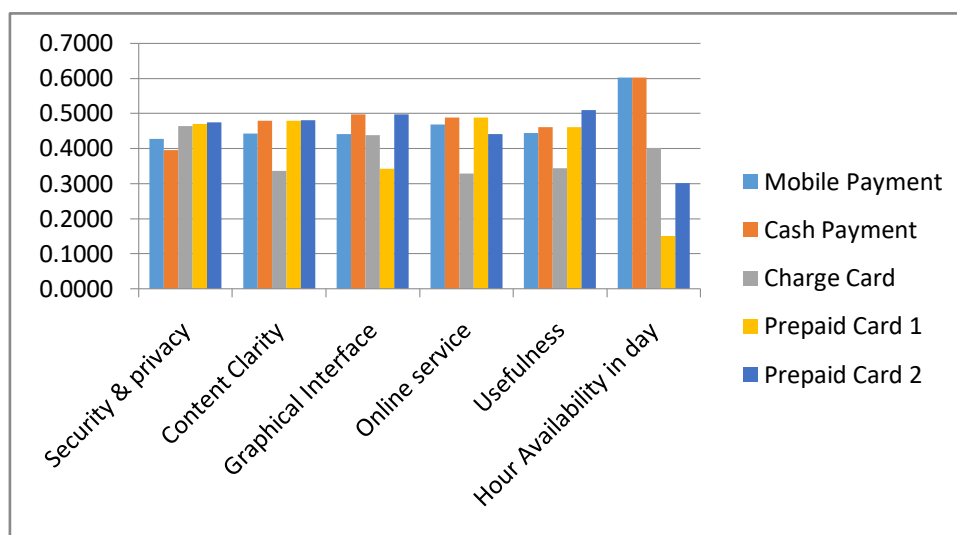

FIGURE 1. Normalized data

Figure 1 shows the normalized scores for different payment methods in various categories. These normalized scores allow for a comparison of the payment methods in terms of their relative performance in each category. They provide details on the security, content clarity, graphical user interface, online service performance, usefulness, and daytime availability of each payment option that was reviewed.

TABLE 3. Weights

weights						
	Security & privacy	Content Clarity	Graphical Interface	Online service	Usefulness	Hour Availability in day
Mobile Payment	0.16	0.16	0.16	0.16	0.16	0.16
Cash Payment	0.16	0.16	0.16	0.16	0.16	0.16
Charge Card	0.16	0.16	0.16	0.16	0.16	0.16
Prepaid Card 1	0.16	0.16	0.16	0.16	0.16	0.16
Prepaid Card 2	0.16	0.16	0.16	0.16	0.16	0.16

A number of parameters are taken into consideration when comparing the various payment options in table 3. Important factors to take into account include security and privacy, content clarity, graphical interface, online service, usefulness, and availability at all hours of the day. To provide a fair comparison, each factor is assigned a weight, with a value of 0.16, for each payment method.

TABLE 4. Weighted normalized decision matrix

weighted normalized decision matrix						
	Security & privacy	Content Clarity	Graphical Interface	Online service	Usefulness	Hour Availability in day
Mobile Payment	0.0683	0.0709	0.0706	0.0751	0.0712	0.0964
Cash Payment	0.0633	0.0766	0.0797	0.0781	0.0738	0.0964
Charge Card	0.0742	0.0538	0.0700	0.0526	0.0550	0.0642
Prepaid Card 1	0.0751	0.0766	0.0549	0.0781	0.0738	0.0241
Prepaid Card 2	0.0760	0.0770	0.0797	0.0707	0.0815	0.0482

According to the matrix's criteria for security and privacy, content clarity, graphical user interface, online service, usefulness, and day part availability (see figure 2), each payment option is evaluated. The weights assigned to each criterion were multiplied by an evaluation of the payment method that went along with it to get the normalized scores, which are represented by the values in the matrix.

TABLE 5. Positive matrix

Positive Matrix					
0.0760	0.0770	0.0797	0.0781	0.0815	0.0964
0.0760	0.0770	0.0797	0.0781	0.0815	0.0964
0.0760	0.0770	0.0797	0.0781	0.0815	0.0964
0.0760	0.0770	0.0797	0.0781	0.0815	0.0964
0.0760	0.0770	0.0797	0.0781	0.0815	0.0964

In this table 5 each row in the matrix represents a specific criterion, and each column represents a value associated with that criterion. The values provided in the matrix indicate a consistent score for each criterion across different cases or scenarios. This Positive Matrix can be useful for various purposes, such as analyzing the performance or satisfaction level of different factors based on the given values. It provides a clear overview and enables easy comparison between different criteria and their respective values.

TABLE 6. Negative matrix

Negative matrix					
0.0633	0.0538	0.0549	0.0526	0.0550	0.0241
0.0633	0.0538	0.0549	0.0526	0.0550	0.0241
0.0633	0.0538	0.0549	0.0526	0.0550	0.0241
0.0633	0.0538	0.0549	0.0526	0.0550	0.0241
0.0633	0.0538	0.0549	0.0526	0.0550	0.0241

In this table 6 presents each row in the Negative Matrix represents a specific criterion, and each column represents a value associated with that criterion. However, the values in this matrix indicate negative aspects or lower scores for the respective criteria. The Negative Matrix can be useful for identifying areas of improvement or weaknesses in a given scenario.

TABLE 7. Ci values

	SI Plus	Si Negative	Ci
Mobile Payment	0.0171	0.0810	0.8255
Cash Payment	0.0148	0.0858	0.8526
Charge Card	0.0549	0.0443	0.4462
Prepaid Card 1	0.0768	0.0408	0.3469
Prepaid Card 2	0.0487	0.0541	0.5259

Table 7 represents the values for SI Plus, SI Negative, and CI (Criteria Importance) for different payment methods. The values provided in the matrix correspond to the respective payment methods. For example, for the "Mobile Payment" method, the SI Plus value is 0.0171, the SI Negative value is 0.0810, and the CI value is 0.8255.
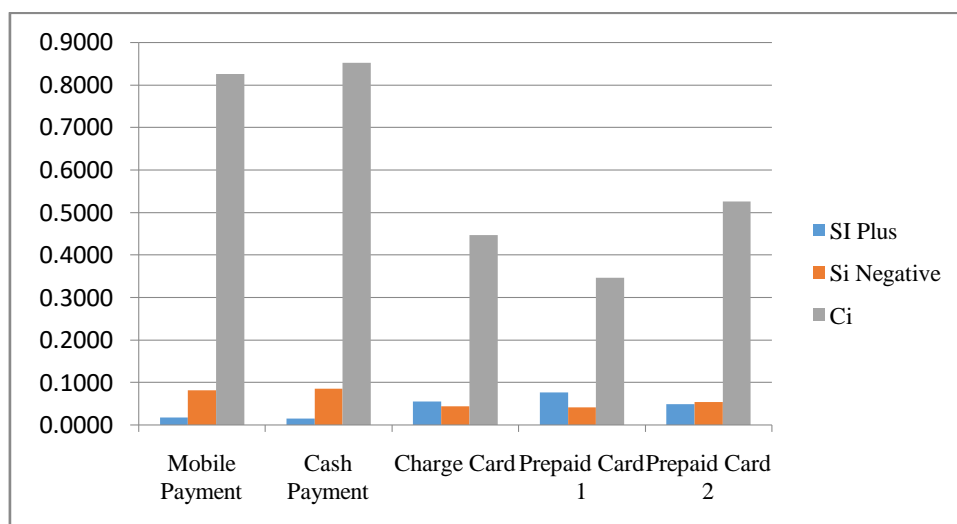

FIGURE 3. Ci values

Figure 3 represents the values for SI Plus, SI Negative, and CI (Criteria Importance) for different payment methods. The values provided in the matrix correspond to the respective payment methods. For example, for the "Mobile Payment" method, the SI Plus value is 0.0171, the SI Negative value is 0.0810, and the CI value is 0.8255.

TABLE 8. Rank

Rank	
Mobile Payment	2
Cash Payment	1
Charge Card	4
Prepaid Card 1	5
Prepaid Card 2	3

This table 8 provided ranks represent the ordering or ranking of different payment methods. The ranks are assigned as follows Cash Payment is Ranked 1, Mobile Payment is Ranked 2, Prepaid Card 2 is Ranked 3, Charge Card is Ranked 4 and Prepaid Card 1 is Ranked 5. Based on the specified criteria or evaluation, these rankings show the relative preference or order of the various payment options. Mobile Payment comes in second, followed by Cash Payment in the rankings.
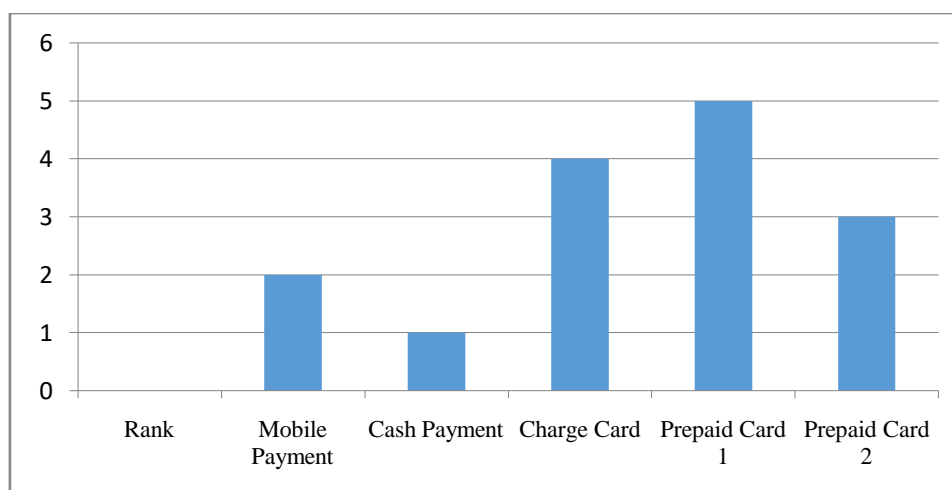
FIGURE 4. Rank

This figure4 provided ranks represent the ordering or ranking of different payment methods. The ranks are assigned as follows Cash Payment is Ranked 1, Mobile Payment is Ranked 2, Prepaid Card 2 is Ranked 3, Charge Card is Ranked 4 and Prepaid Card 1 is Ranked 5. Based on the specified criteria or evaluation, these rankings show the relative preference or order of the various payment options. Mobile Payment comes in second, followed by Cash Payment in the rankings.

5. CONCLUSION

A survey of online users' opinions is conducted in order to evaluate and rank e-commerce websites. This study aims to rate e-commerce websites according on their ability to satisfy customers. We propose a factor structural model of customer satisfaction influence. The relative importance of each website criterion weight is also shown in this study in order to assess the effects of each e-commerce website criterion on consumer satisfaction. The problem of choosing the best location is then formulated. It is also explained why these specific tactics were selected. Reliable and arbitrary data were used to create the sample that was used to evaluate the suggested model. Consumer behavior, however, is continuously shifting and must adapt to a new environment. The study's development of an extraction model for data collection would be particularly intriguing. Future studies will examine how our suggested model operates by automatically obtaining the most diagnostic site performance data. The following issues are anticipated to receive attention: - Creating an online survey form for consumers to answer questions regarding their expectations and opinions of the quality of products purchased from e-commerce websites. Including an emotional model that catalogues the behaviors, perceptions, and emotions of online shoppers engaged in the dialogue that takes place in an e-commerce setting. - employing click stream data records to analyze online customer navigation.

REFERENCE

[1]. Bączkiewicz, Aleksandra. "MCDM based e-commerce consumer decision support tool." *Procedia Computer Science* 192 (2021): 4991-5002.
[2]. Chiu, Yi-Chia, Joseph Z. Shyu, and Gwo-Hshiung Tzeng. "Fuzzy MCDM for evaluating the e-commerce strategy." *International Journal of Computer Applications in Technology* 19, no. 1 (2004): 12-22.
[3]. Bączkiewicz, Aleksandra, Bartłomiej Kizielewicz, Andrii Shekhovtsov, Jarosław Wątróbski, and Wojciech Sałabun. "Methodical aspects of MCDM based E-commerce recommender system." *Journal of Theoretical and Applied Electronic Commerce Research* 16, no. 6 (2021): 2192-2229.
[4]. Aggarwal, Anu G., and Aakash. "Multi-criteria-based prioritisation of B2C e-commerce website." *International Journal of Society Systems Science* 10, no. 3 (2018): 201-222.
[5]. Cheba, Katarzyna, Maja Kiba-Janiak, Anna Baraniecka, and Tomasz Kołakowski. "Impact of external factors on e-commerce market in cities and its implications on environment." *Sustainable Cities and Society* 72 (2021): 103032.
[6]. Davidavičienė, Vida, Olena Markus, and Sigitas Davidavičius. "Identification of the opportunities to improve customer's experience in e-commerce." *Journal of logistics, informatics and service science* (2020): 42-57.
[7]. Stanujkic, Dragisa, Darjan Karabasevic, Mladjan Maksimovic, Gabrijela Popovic, and Miodrag Brzakovic. "Evaluation of the e-commerce development strategies." *Quaestus* 1 (2019): 144-152.
[8]. Li, Ran, and Tao Sun. "Assessing factors for designing a successful B2C E-Commerce website using fuzzy AHP and TOPSIS-Grey methodology." *Symmetry* 12, no. 3 (2020): 363.
[9]. Huang, Chi-Yo, Gwo-Hshiung Tzeng, and Wen-Rong Jerry Ho. "System on chip design service e-business value maximization through a novel MCDM framework." *Expert Systems with Applications* 38, no. 7 (2011): 7947-7962.

[10]. Anand, Oshin, and Praveen Ranjan Srivastava. "A comparative gender based evaluation of e-commerce website: A hybrid MCDM approach." In *2015 Eighth International Conference on Contemporary Computing (IC3)*, pp. 279-284. IEEE, 2015.

[11]. Mohammadi, A., P. Ahadi, A. Fozooni, A. Farzadi, and K. Ahadi. "Analytical evaluation of big data applications in E-commerce: A mixed method approach." *Decision Science Letters* 12, no. 2 (2023): 457-476.

[12]. Yadav, Honey, Umang Soni, Shubham Gupta, and Girish Kumar. "Evaluation of barriers in the adoption of E-commerce technology in SMEs: A fuzzy DEMATEL approach." *Journal of Electronic Commerce in Organizations (JECO)* 20, no. 1 (2022): 1-18.

[13]. Zaim, Houda, Mohammed Ramdani, and Adil Haddi. "Multi-criteria analysis approach based on consumer satisfaction to rank B2C E-commerce websites." In *2016 11th International Conference on Intelligent Systems: Theories and Applications (SITA)*, pp. 1-6. IEEE, 2016.

[14]. Karabašević, Darjan, Dragiša Stanujkić, Edmundas Kazimieras Zavadskas, Predrag Stanimirović, Gabrijela Popović, Bratislav Predić, and Alptekin Ulutaş. "A novel extension of the TOPSIS method adapted for the use of single-valued neutrosophic sets and hamming distance for e-commerce development strategies selection." *Symmetry* 12, no. 8 (2020): 1263.

[15]. Tsai, Yuan-Cheng, and Yu-Tien Cheng. "Analyzing key performance indicators (KPIs) for E-commerce and Internet marketing of elderly products: A review." *Archives of gerontology and geriatrics* 55, no. 1 (2012): 126-132.

[16]. Kang, Daekook, Wooseok Jang, and Yongtae Park. "Evaluation of e-commerce websites using fuzzy hierarchical TOPSIS based on ES-QUAL." *Applied Soft Computing* 42 (2016): 53-65.

[17]. Alharbi, Salem, and Mohsen Naderpour. "E-commerce development risk evaluation using MCDM Techniques." In *Decision Support Systems VI-Addressing Sustainability and Societal Challenges: 2nd International Conference, ICDSST 2016, Plymouth, UK, May 23–25, 2016, Proceedings 2*, pp. 88-99. Springer International Publishing, 2016.

[18]. Tang, Michael T., Gwo-Hshiung Tzeng, and Shinn-Wen Wang. "A hierarchy fuzzy MCDM method for studying electronic marketing strategies in the information service industry." *Journal of International Information Management* 8, no. 1 (1999): 1.

[19]. Agrawal, Anushka, Sneha Bisht, Manisha Rathore, and Ankita Verma. "Application of Multi Criteria Decision Making in E-commerce sector." In *2020 Research, Innovation, Knowledge Management and Technology Application for Business Sustainability (INBUSH)*, pp. 61-67. IEEE, 2020.

[20]. Chi, Jinling, Xuefeng Sui, Mamoun Alazab, and BalaAnand Muthu. "Cloud Computing based E-commerce Management Ontransaction Security Concepts." (2021).

[21]. Sharma, Devendra Kumar, Valentina Emilia Balas, Rohit Sharma, and Korhan Cengiz, eds. *Micro-Electronics and Telecommunication Engineering: Proceedings of 3rd ICMETE 2019*. Springer, 2020.

[22]. Denguir-Rekik, Afef, Jacky Montmain, and Gilles Mauris. "A possibilistic-valued multi-criteria decision-making support for marketing activities in e-commerce: Feedback Based Diagnosis System." *European Journal of Operational Research* 195, no. 3 (2009): 876-888.

[23]. Ashraf, Mohd, and Md Zair Hussain. "Multi-criteria decision based recommender system using fuzzy linguistics model for e-commerce." *International Journal of Scientific Research in Science and Technology* 4, no. 5 (2018): 61-67.

[24]. Sharma, Himanshu, and Anu G. Aggarwal. "Finding determinants of e-commerce success: a PLS-SEM approach." *Journal of Advances in Management Research* 16, no. 4 (2019): 453-471.

[25]. Asemi, Adeleh, and Ali Alibeigi. "Evaluation of B2B IIM Critical Success Factors using a fuzzy decision analysis method." In *2015 9th International Conference on e-Commerce in Developing Countries: With focus on e-Business (ECDC)*, pp. 1-9. IEEE, 2015.

[26]. Kumar, Biresh, Sharmistha Roy, Kamred Udham Singh, Saroj Kumar Pandey, Ankit Kumar, Anurag Sinha, Shubham Shukla, Mohd Asif Shah, and Adil Rasool. "A Static Machine Learning Based Evaluation Method for Usability and Security Analysis in E-Commerce website." *IEEE Access* (2023).

[27]. Serap, T. E. P. E., and E. T. İ. Serkan. "A study on strategy development for e-commerce businesses with clustering and spherical fuzzy analytic hierarchy process." *Niğde Ömer Halisdemir Üniversitesi Mühendislik Bilimleri Dergisi* 11, no. 2 (2022): 294-302.

[28]. Indap, Sebnem. "Application of the analytic hierarchy process in the selection of storage rack systems for e-commerce clothing industry." *Journal of Management Marketing and Logistics* 5, no. 4 (2018): 255-266.

[29]. Mahendra, Gede Surya. "Implementation of the FUCOM-SAW Method on E-Commerce Selection DSS in Indonesia." *Tech-E* 5, no. 1 (2021): 75-85.