# Application of TOPSIS for Selecting D2C Website Development Platform

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## Abstract

Online shopping is an emerging trend in the e-commerce business. Developing an e-commerce website is the basic requirement to scale the business of any store digitally. Hence website development projects, specifically Direct-to-consumer website projects are increasing day by day, for which selecting the best website development platform is a difficult and important decision for the project manager. This paper proposes the solution to this problem by using multi-criteria decision-making method, TOPSIS to select the best website development platform. TOPSIS helps to evaluate these platforms on the basis of features and the services provided by the platform for developing and maintaining any D2C website.

## Keywords
TOPSIS (Technique for order preference by similarity to ideal solution), MCDM, ecommerce, website development

## 1. Introduction
In today's world of digitalization where the use of the internet has increased enormously, due to which lifestyle of the people has changed significantly. One of the major changes in people's day-to-day life is the use of online shopping. Recently, because of the efficient delivery services and secure transaction methods are available, online shopping has become popular among consumers. As websites show the review and complete description of the product to the user, selecting and buying the products of one's interest has become easier than visiting stores or malls and searching for goods and services, which again saves a lot of time. Also, websites can be used for shopping at any time and are accessible worldwide, which reduces the time and location constraints for the user. Due to such reasons, consumers are preferring E-shopping over traditional shopping. Hence developing an e-commerce D2C website for any brand has become an unavoidable need of the business. To scale the business, developing an interactive, high speed and well-designed website by considering marketing opportunities and competitors are the basic requirement of any ecommerce business model (S. Moertini et al. 2014). Due to such high demand for developing websites within a short time, there are many platforms that have developed and are available in the market with different features and services (Patel et al. 2011). These platforms provide an easy solution for small as well as established businesses to develop their own website without any programming knowledge. For building a website choosing the best platform can be hard for any project manager or website owner.

A comparative analysis of the features and services of these platforms can help to choose the best option for development. In this paper this analysis is done using multi-criteria decision-making technique TOPSIS. Multi criteria decision making techniques are widely use by decision makers to solve complex decision problems having multiple options and criteria (Eltarabishi et al. 2020). Platforms are considered as alternatives and they are compared using different factors such as yearly cost of subscription, search engine optimization, marketing analytics features, website languages supported by the platform, ease of use, maintenance and support features provided on the platform. Weights of the alternatives and criteria are decided using an internal survey of developers in a private organization.

## 2. Literature Review

Gupta (2014) defines ecommerce as 'E-commerce is the use of electronic communications and digital information processing technology in business transactions to create, transform, and redefine relationships for value creation between or among organizations, and between organizations and individuals.' Different e commerce models like B2B, B2C, B2G and C2C are enlisted by her and she elaborates on benefits of e commerce in terms of transition costs that compares traditional costing with ecommerce website online Payment methods. (1) Ray (2011) defines the degree to which ecommerce is operational in the country. Outlook of electronic commerce within organizational systems and its impact on operations management is given in the paper. 2. Aalam et al. (2020) have stated that E-commerce is leading to a change in the existing way of doing business. The emergence of electronic commerce has generated new financial needs like new payment services which cannot be fulfilled by traditional business methods and transaction services.3.

Moertini et al. (2014) given the case studies to understand requirement analysis and ecommerce business model for small-medium enterprises. Patel et al. (2011) identifies some of the open-source systems such as Joomla, Drupal, WordPress that are popular in the market and overview of these system's functionalities and the core features of every system are listed in the paper. The comparative study between these systems helps to analyze which of the open-source systems is more accepTable based on the different parameters such as popularity, average budget, social bookmarking etc. Singh et al. (2017) state that Usability is an important factor that affects the quality of the websites. They have identified the parameters like customer service support, easy access to the user, safe and successful transactions, privacy, user-friendly interface, recovery of passwords, speed, and efficiency based on a usability survey for websites such as Flipkart, Amazon, Snapdeal and Myntra. Results of the survey are analyzed using Analytical Hierarchy Process (AHP) method and Adaptive Neuro-Fuzzy Inference System (ANFI) method. 5.

Velasquez and Hester (2013) give the application of different MCDM methods along with comparison of advantages and disadvantages of these methods. Daghouri et al. (2018) State that TOPSIS is better method as compare to other MCDM methods in terms of selection and evaluation, by comparing the results of a case study. Eltarabishi et al. (2020) gives an literature review of the published literature in MCDM methods. They have identified the use of these methods for problem solving and state that AHP and TOPSIS are most used methods as per ranking obtained from the review. Gaur and Aggarwal (2019) describe different multi-criteria decision-making techniques. TOPSIS method is elaborated stepwise using formulae and application of the method for selecting a software development model. 7. Bączkiewicz et. al. (2021) propose use of different MCDM methods as solution for developing a Consumer decision support systems for the purchases made on e-commerce websites.

The literature review gives the understanding about different website development platforms, website development cycle and different factors affecting the performance of ecommerce websites. it also helped to understand multi criteria decision making approach and different MCDM methods to select the best solution from available options. From this review one can propose the methodology of using one of these MCDM methods, TOPSIS for choosing best available platforms for development of D2C website.

## 3. Method

Multi-criteria decision Making (MCDM) is a sub-area of operations studies that deals with problems that have multiple conflicting criteria (Gaur and Aggarwal 2019). MCDM methods are designed to assist decision makers to select the satisfactory choice from a fixed set of options. In lots of cases, the best alternative isn't always at once apparent, and MCDM can offer a scientific way to discover and evaluate the options.

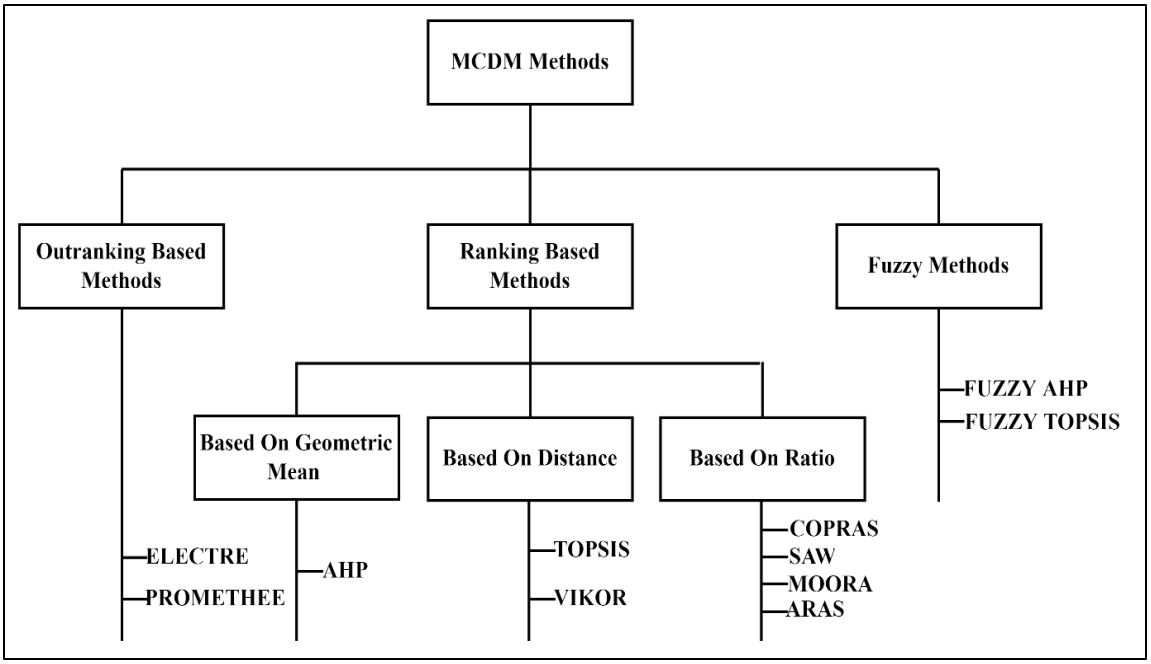


Figure 1. Hierarchical structure of MCDM methods (Gaur and Aggarwal 2019)

Hierarchical structure of MCDM methods given in the Figure 1. shows different types of MCDM techniques in operation research. Methods are divided into three types given below:

1. Outranking Based Methods
   There are a few different types of outranking methods, but they all work towards the same goal that is to identify the best possible option. These methods are used in a variety of different fields, from business to engineering. Outranking methods are a powerful tool that can help to make complex decisions. Electre and Promethee are two outranking methods commonly used by decision makers
2. Ranking Based Methods
   There are some of the ranking-based methods that produce a list of items in order from the most important or relevant to the least important or relevant as a result. This can be done using a variety of different criteria, but some of the most common are things like page views, search engine results, or social media engagement. TOPSIS and VIKOR are two mainly used ranking based methods that gives comparatively accurate results than others MCDM methods.
3. Fuzzy Methods
   Fuzzy methods can be used to represent and process vague information, and to make decisions in situations where traditional methods are not well suited. Fuzzy methods have been found to be particularly useful in fields such as image processing and pattern recognition, where data is often noisy and incomplete

### 3.1 TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution)

TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) method is one of the ranking based methods which is well-known and commonly used approach in the field of Multiple Criteria Decision Making. The method is used to find the best alternative from a set of options, based on a set of decision criteria. This method ranks alternatives based on how close they are to the ideal solution. The ideal solution is the alternative that has the best performance on all of the criteria (Daghouri et al. 2018). Each of the alternatives is evaluated on each criterion, and a relative closeness score is calculated for each alternative. The alternative with the highest closeness score is the one that is most preferred. The steps for the TOPSIS are given below

Step 1: The first step is to create a decision matrix. This matrix will have the different options being compared on the rows and the different criteria on the columns. Each option will then be given a score for each criterion based on how well it meets that criterion. Matrix is further evaluated to find the ranking of alternatives against criteria

$$M = \begin{array}{c} \\ Y_1 \\ Y_2 \\ Y_3 \\ \vdots \\ Y_m \end{array} \begin{array}{c} \begin{array}{ccccc} X_1 & X_2 & X_3 & \cdots & X_n \end{array} \\ \begin{bmatrix} a_{11} & a_{12} & a_{13} & & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & & a_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & am3 & & a_{mn} \end{bmatrix} \end{array}$$

Matrix M shown above represents alternatives and the criteria. In which Y are the alternatives that will be evaluated based on X criteria. Element $a_{mn}$ of the matrix represent original values of nth attribute for m-th alternative. All values in matrix are non-normalised.

Step 2:
Normalized decision matrix is calculated in this step using formula which is represented as

$$R_{mn} = a_{mn} / \sqrt{\sum_{n=1}^{m} a^2{}_{mn}} \quad \text{Equation 1}$$

Step 3:
Relative importance of the criterion is decided in this step which is used to calculate weighted decision matrix. A set of weights $W_n$ (for n=1, 2, ….. , K) such that

$$\Sigma W_n = 1.$$

Step 4:
Weighted normalised matrix is obtained in the following step where the element $V_{mn}$ is the multiplication of each $R_{mn}$ element and corresponding Weight $W_n$. Hence the formula to calculate weighted normalised matrix $V_{mn}$ is given as

$$V_{mn} = W_n * R_{mn} \quad \text{...Equation 2}$$

Step 5:
Ideal (best) and negative ideal (worst) values can be obtained from the weighted normalised matrix using the following formulae

$$V^+ = \{\sum_m^{\min} \text{Vmn}/n \in N), \sum_m^{max} \text{Vmn}/n \in N')/m = 1,2, \dots K\}, \quad \text{…Equation 3}$$

$= \{V_1^+, V_2^+, V_3^+, \ldots\ldots V_K^+\}$

$$V^- = \{\sum_m^{\max} \text{Vmn}/n \in N), \sum_m^{min} \text{Vmn}/n \in N')/m = 1,2, \dots K\}, \quad \text{…Equation 4}$$

$= \{V_1^-, V_2^-, V_3^-, \ldots\ldots V_K^-\}$

where N = (n = 1, 2, …, K) /n is associated with beneficial attributes, and
N'= (n = 1, 2, …, K) /n is associated with non-beneficial attributes.

Step 7:
Separation measures are obtained in this step. Euclidean distance is separation of each alternative from the ideal solution and calculated using the following formulae

$$S_m^+ = \{\sum_{n=1}^{K} (V_{mn} - V^+_n)^2\}^{0.5}, \; m = 1, 2, \ldots, N \quad \text{…Equation 5}$$

$$S_m^- = \{\sum_{n=1}^{K} (V_{mn} - V^-_n)^2\}^{0.5}, \; m = 1, 2, \ldots, N \quad \text{…Equation 6}$$

Step 8:
The relative closeness of alternatives is calculated in this step using the following formula

$$Pm = Sm^- / (Sm^+ + Sm^-) \quad \text{…Equation 7}$$

Step 9:
The alternatives are then arranged in descending order. The Pm value which is the value for the closeness from the ideal solution is compared. Alternative with highest Pm value is considered to be the best alternative.

## 4. Proposed Work

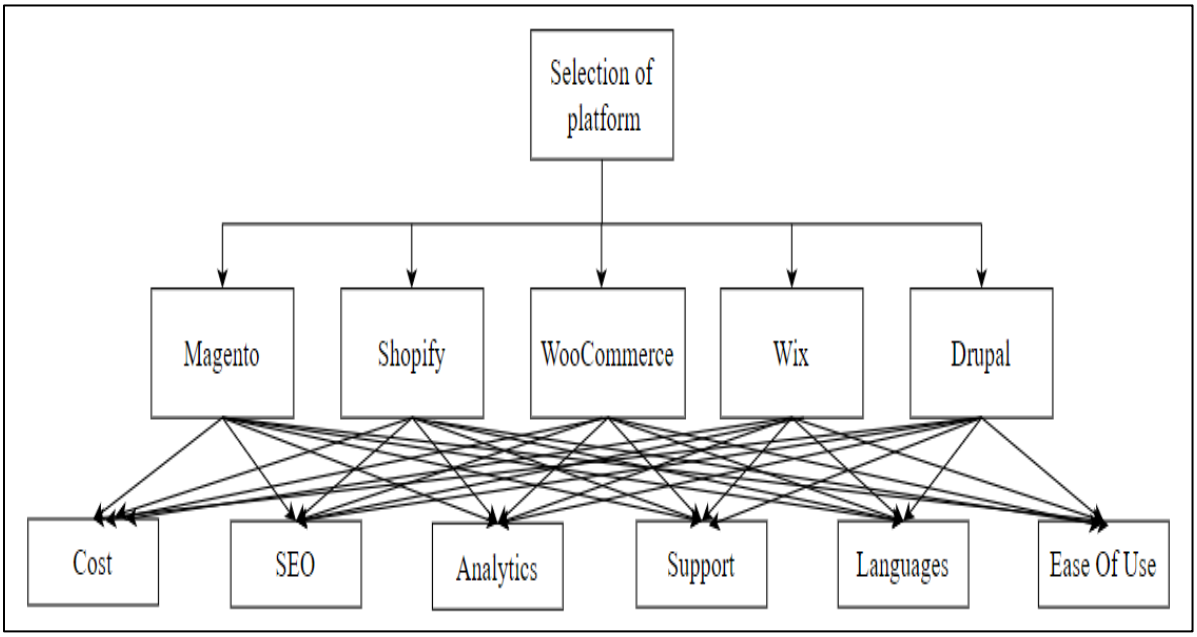


Figure 2. Selection Criteria of TOPSIS

In Figure 2 Selection Criteria for the alternatives are given. In this study five alternatives are considered. These alternatives include website development platforms i.e Magento, Shopify, WooCommerce, Wix and Drupal. For each of these platforms six criteria considered are Cost, SEO, Analytics, Support, Languages and Ease of Use. Alternatives are evaluated on basis of these criteria. All these alternatives are described below:

1. Magento

Magento is a powerful eCommerce platform that provides businesses with a flexible and scalable solution for their online store. With Magento, businesses can take advantage of a number of features and benefits that can help them grow and succeed online. Some of these features and benefits include the ability to create a custom online store, a wide range of customization options, and a robust set of tools and features.

2. Shopify

Shopify is a platform for businesses of all sizes to create an online store. Shopify offers to users a customizable platform, an easy-to-use checkout process, and a wide range of features. Some of the features of Shopify include the ability to sell online, in-person, and through social media; to manage inventory and orders; and to offer discounts and gift cards. Shopify also provides users with 24/7 support, and a wide range of integrations with other business tools.

3. WooCommerce

WooCommerce is a plugin that allows user to turn his WordPress site into an online store. WooCommerce comes with a lot of features, including the ability to accept payments, manage shipping, and track inventory. It can also use to create coupons and discounts, and to set up automatic tax calculations. WooCommerce makes it easy to set up an online store, and its features make it a great choice for businesses of all sizes

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4. Wix

Wix is a cloud-based web development platform that allows users to create HTML5 websites and mobile sites through the use of online drag and drop tools. Wix is free to use, but users can also purchase a premium plan for advanced features. Some of the features available on Wix include: a customizable HTML5 website builder, eCommerce functionality, web hosting, domain names, and 24/7 customer support.

5. Drupal Commerce

Drupal commerce is a powerful eCommerce solution that offers a variety of features to help you build a successful online store. With Drupal commerce, it is easy to manage inventory, create a custom checkout process, and set up shipping and tax rules. Also, it allows to accept payments from a variety of payment providers.

Selection criteria on which these alternatives are evaluated are described below:

1. Cost

The pricing of web development platforms can vary depending on the features and tools that are included. Some platforms may have a monthly subscription fee, while others may charge per project. As Open-source platforms are free to use and hosted platform comes with subscription-based pricing model, cost of a development platform should be considered when choosing a platform for any project. Platforms with less prising are given the high score and vice versa.

2. SEO- Search Engine Optimisation

Search engine optimization is a process of improving the visibility and ranking of a website or web page in search engine results pages. It is a common practice among web developers and is considered as an important part of website development. Platforms with more SEO features like tags customisation, better internal search, URL structure optimisation, etc are given the high scores whereas platforms with less SEO features are given less scores in decision matrix

3. Analytics

The analytics feature of web development platforms allows developers to track user engagement and activity on their website or application. This data can be used to improve the user experience by identifying areas of the site or app that are underperforming and need to be updated. The score for this criterion is given by the depth of statistical analysis and reports available on the platform.

4. Support

Support feature is beneficial for developers who need assistance with coding or debugging their projects. The support feature allows developers to get help from other developers who are more experienced. Score of the alternatives for these criteria are based on the how efficient support feature works for the particular platform.

5. Languages

Web development platforms that support multiple languages are very useful for developers who want to create applications that can be used by a global audience. By supporting multiple languages, these platforms make it possible for developers to reach a wider range of users.

6. Ease of use

Some platforms are more user-friendly than others. Features, functionalities and Interface making them easier to use for new users as well those with less experience. Other platforms offer more advanced features for experienced developers.

# 5. Data Collection

## 5.1 Internal Survey conducted at Shoptimize India Pvt. Ltd

To assign the weights to the alternatives based on the criteria, a survey is conducted in **Shoptimize India Pvt. Ltd**. The organization provides the service of development and growth for eCommerce websites by building the online website for stores and helps to scale the business of the website by providing marketing solutions as well.

Weights have been assigned by the employees in the organization who has an experience in eCommerce website development by considering requirements of the five websites developed on the different platforms. Average of these wights is considered for final decision matrix. All the weights to the alternatives are assign on a scale of 1 to 5 where 1 being the lowest and 5 being the highest. Based on the survey' data and linguistic scale which is shown in Table 1 the scores for the alternatives and the weights to criteria are assigned.

Table 1. Linguistic scale

| Linguistic Variable | Score |
|---|---|
| Low | 1 |
| Below Average | 2 |
| Average | 3 |
| Good | 4 |
| Excellent | 5 |

Feedbacks from conducted survey

1. Magento is an open-source platform but difficult to use with the basic version of the platform. Developing the website using this basic version of the platform, need resources with high coding and technical knowledge which increases the cost of the whole development process. The platform is better in terms of SEO as it provides alt text, URL structure, Canonical tags schema plugins, and automation apps. Many payment gateway integrations are available by default which reduces the third-party integration.

2. Shopify ranks higher in the ease-of-use features as it provides a strong interface platform for building the website without any coding. It is a highly used platform because of the many free analytical and marketing apps available in the basic version of the platform. The detailed analytical reports are generated based on the sales performance of the online store. It gives customization options as per the requirements of the website hence development is faster as compared to other platforms. For SEO platform has URL structure generation and some part of meta optimization which is rated as average in the survey.

3. The intention of the comparison of the platform here was specifically for D2C eCommerce website development. Hence though Wix is mostly used for development, it has less weights because it is observed that the platform is more famous for content-based websites than eCommerce websites. Wix does not support some of the files that are important for ecommerce websites, which makes it difficult to use. Otherwise, Wix can be considered a good solution as it allows more than 1000 languages and a strong community support feature on the platform which again increases its weight for the ease-of-use feature. Wix is comparatively high in pricing as the yearly subscription cost of the platform is higher than other platforms.

4. WooCommerce is the free plugin of WordPress that enables the website to be eCommerce. The platform has given more weight because it gives a very interactive interface and does not require much backend coding. The platform can be the best solution to use but the basic version of it does not support multiple features and the advanced version has more features. WooCommerce is a multi-lingual platform and allows to develop a single website with multiple translation versions. It has strong analytics feature but gives fewer details as compared to Shopify.

5. Drupal is an open-source platform with high-cost weights and requires strong backend coding for development. It lacks the weight due to weak analytical and support features still it can be considered a good solution for small-scale businesses with fewer product data due to optimized cost.

6. As per results of conducted survey from which the data on the scores of alternatives and weights of criteria are obtained, which forms the decision matrix given in Table 2 and Table 3.

Table 2. Weights of the Criteria's

| Cost | SEO | Analytics | Support | Language | Ease Of Use |
|---|---|---|---|---|---|
| 0.2 | 0.15 | 0.15 | 0.15 | 0.15 | 0.2 |

Table 3. Elements of decision matrix

| Alternatives | Criteria |
|---|---|

| | Cost | SEO | Analytics | Support | Language | Ease Of Use |
|---|---|---|---|---|---|---|
| Magento | 5 | 5 | 4 | 3 | 3 | 3 |
| Shopify | 3 | 3 | 5 | 4 | 4 | 5 |
| WooCommerce | 4 | 3 | 2 | 4 | 4 | 5 |
| Wix | 2 | 2 | 3 | 5 | 5 | 4 |
| Drupal | 4 | 2 | 2 | 3 | 3 | 3 |

Obtained decision matrix further evaluated based on the criteria using TOPSIS to find the best solution.

In the decision matrix given in Table 3, considered attributes are Cost, SEO, Analytics, Support, Language and Ease of Use. Where cost is the only non-beneficial criteria and remaining are beneficial.
As per the weights considered normalised matrix is calculated by using equation 1

Table 4. Normalised Decision Matrix

| Alternatives | Criteria's | | | | | |
|---|---|---|---|---|---|---|
| | Cost | SEO | Analytics | Support | Language | Ease Of Use |
| Magento | 0.59761 | 0.70014 | 0.52523 | 0.34641 | 0.34641 | 0.32733 |
| Shopify | 0.35857 | 0.42008 | 0.65653 | 0.46188 | 0.46188 | 0.54554 |
| WooCommerce | 0.47809 | 0.42008 | 0.26261 | 0.46188 | 0.46188 | 0.54554 |
| Wix | 0.23905 | 0.28006 | 0.39392 | 0.57735 | 0.57735 | 0.43644 |
| Drupal | 0.47809 | 0.28006 | 0.26261 | 0.34641 | 0.34641 | 0.32733 |

These normalised values in the Table 3 are then multiplied with the weights of criteria to obtain Weighted Normalised Matrix. Weights of the criteria are considered from Table 4
Weighted Normalised Matrix given in Table 5 and Table 6, is calculated using the equation 2

Table 5. Weighted Normalised Matrix

| Alternatives | Criteria's | | | | | |
|---|---|---|---|---|---|---|
| | Cost | SEO | Analytics | Support | Language | Ease Of Use |
| Magento | 0.11952 | 0.10502 | 0.07878 | 0.05196 | 0.05196 | 0.06547 |
| Shopify | 0.07171 | 0.06301 | 0.09848 | 0.06928 | 0.06928 | 0.10911 |
| WooCommerce | 0.09562 | 0.06301 | 0.03939 | 0.06928 | 0.06928 | 0.10911 |
| Wix | 0.04781 | 0.04201 | 0.05909 | 0.0866 | 0.0866 | 0.08729 |
| Drupal | 0.09562 | 0.04201 | 0.03939 | 0.05196 | 0.05196 | 0.06547 |

The ideal (best) and negative ideal (worst) solutions can be expressed from the obtained matrix as
$V^+$ = [Max of beneficial; Min of Non beneficial]
= [0.10502, 0.09848, 0.0866, 0.0866, 0.10911, 0.04781]

$V^-$ = [Min of beneficial; Max of Non beneficial]
= [0.04201, 0.03939, 0.05196, 0.05196, 0.06547, 0.11952]

The Separation distance of each competitive alternative from the ideal and non-ideal solution is calculated using equation 6

Table 6. Separation distance of each alternative

| Alternatives | Si+ | Si- |
|---|---|---|
| Magento | 0.09915 | 0.0743 |
| Shopify | 0.05413 | 0.09338 |
| WooCommerce | 0.09022 | 0.05925 |
| Wix | 0.07746 | 0.09171 |
| Drupal | 0.11853 | 0.02387 |

For each competitive alternative the relative closeness of the potential location with respect to the ideal solution is computed using equation 7 as
P1 =0.0743/ (0.09915+0.0743) =0.42836
P2 =0.09338/ (0.05413+0.09338) =0.63304
P3=0.05925/ (0.09022+0.05925) =0.39640
P4 =0.09171/ (0.07746+0.09171) =0.54211
P5 =0.02387/ (0.11853+0.02387) =0.16762

## 7. Results and Discussion

### 7.1 Numerical Results

As per the relative closeness obtained for each alternative, the ranking of the alternative is given in Table 7.

Table 7. Ranking of the alternatives

| Alternatives | Pi value | Rank |
|---|---|---|
| Magento | 0.42836 | 3 |
| Shopify | 0.63304 | 1 |
| WooCommerce | 0.39640 | 4 |
| Wix | 0.54211 | 2 |
| Drupal | 0.16762 | 5 |

Here, maximum value from obtained solution is 0.63304 which is less than 1 and it is acceptable (Gaur and Aggarwal 2019). As Shopify has the first rank, it can be considered as best solution followed by Wix, Magento, WooCommerce and Drupal.

## 8. Conclusion

The proposed method for comparative analysis of the website development platforms helps to select the best solution for the any website development project. The method and obtained results can be use in the requirement analysis phase of website development life cycle and it will help to increase the success of the project by choosing the best platform for implementation and maintenance of the online store. From the results it can be stated Magento, Shopify, WooCommerce, Wix and Drupal obtained ranking 3,1,4,2 and 5 respectively. Hence Shopify can be considered as the best platform available for website development based on the criteria considered. This method can be used effectively by changing the alternatives, criteria and weights of the alternatives as per the requirement of websites for different development projects.

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**Ms. Shachi Arkatkar** is currently working as Digital Marketer at Shoptimize India Pvt Ltd. She has completed her bachelor's in Computer Application in 2012 and Masters in Computer Application in 2016. She has industry experience of over 7 years in Information Technology and Digital Marketing.