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Car Model Selection using Multicriteria Decision Making Method Promethee Based On Entropy Weight.

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Abstract

A decision maker's ability to choose and purchase a new car is critical.Choosing the best option from a range of options is a difficult undertaking because numerous aspects are taken into account.The right car model might help one raise his competitive capability by increasing the efficiency.In this study, we combine Shannon's Entropy with PROMETHEE II. Shannon's entropy method was utilized for weight determination of every criterion and PROMETHEE II being employed to rank the assorted options.. PROMETHEE (Preference ranking organisation method for enrichment evaluation) is a useful multi-criteria decision-making (MCDM) approach that is frequently used to solve difficult situations. The suggested effort will assist in making a decision.

Keywords: Multi Criteria decision making, Entropy, PROMETHEE, Car model Selection, Ranking.

Introduction

As cities grew in importance and the populace migrated to the big cities, having a means of transportation became one of the essentials of individual and family life. Each country has far too many transportation options, owing to government politics, transportation infrastructure development, and a variety of other factors, the most important of which is economics. For years, governments in a number of countries have encouraged and promoted the use of non-motorized, non-polluting cars and public transportation networks. Other roadblocks to acquiring a car include the high cost of gasoline and autos, additional expenses, and government rules etc . Automobile manufacturers try to enhance their vehicles, comply with environmental rules, minimise unusually high fuel consumption, create processes, and improve the quality of their products in terms of aesthetics, utility, and application. Globalization and comparative markets are also important factors in raising the quality of producers' output. Companies in free-market economies are continually challenged to enhance their products and develop new ones that will meet the wants of their customers while maintaining a strong market position (Efe, Yerlikaya, Efe, 2020).

Automobiles have evolved into a necessary part of human life.Millions of people utilise automobiles around the world (Byun 2001). Major automakers have been driven to the Indian market by the emergence of the Indian middle class, their expanding purchasing power, and the country's solid economic growth in recent years.India produces the fourth-largest number of automobiles in the world
By 2026, India's automobile industry aims to be the world's third largest, contributing 12% of GDP. S.I.A.M. (Society of Indian Automobile Manufacturers, Annual Report 2019-20).These days, the middle and upper middle classes are buying more cars.The automobile industry is clearly planning for a diverse range of vehicle models. In the past, only high-end cars were accessible, and only the wealthy could buy them.In the modern era, the trend has begun to shift, the average person now ranks first in passenger automobile purchases. Customers face a lot of complexity and challenges when purchasing a compact passenger automobile for everyday use.

Every day, people make a number of decisions and it is common for different family members to have opposing views on car purchases. Each decision necessitates the use of a problem-solving technique. All of these decisions are made by weighing various decision options, which are typically based on decision maker's experience, and other data, Rehman, Saabun, Faizi, Hussain, and atróbski (2021). During the decision-making process, the consumer must decide which company to purchase a car from.Customers must choose a vehicle based on factors such as the company's face value, product cost, product maintenance cost, and product resale value, among others. During the selection process customers can give cars a rating based on their safety, comfort, price, exterior, convenience, dealer, and warranty. Because of the significant costs of owning an automobile, determining which model to buy is considered as critical in the buyer's long-term planning.The buyer must select a vehicle that will perform well, get decent gas mileage, and require little maintenance.When picking the best car model, examine the ex-showroom price, highway mileage, fuel tank capacity, servicing cost, engine displacement, maximum power, maximum torque, top speed, cargo volume, warranty, length, breadth, height, ground clearance, and wheelbase.Because of the costs connected with acquiring an automobile, the model choice is quite important in long-term planning for the owner.The buyer is given the opportunity to assess the cars using a variety of influencing factors and criteria.

Because choosing a specific car model necessitates balancing numerous objectives, it is frequently necessary to make compromises between potentially opposing requirements. Because of these factors, multi-criteria decision-making (MCDM) provides a viable solution to the car model selection dilemma. Multiple criteria decision making is when you make a decision based on various often competing criteria (MCDM). MCDM difficulties are ubiquitous in everyday life. The process of selecting a decision, acquiring information, and weighing potential possibilities is known as decision making (Sriram, Ramachandra, Chinnasamy and Mathivanan, (2022).In a personal environment, a car may be classed according to price, size, style, safety, comfort, and other aspects.In the business environment, MCDM problems are more intricate and frequently large-scale.

This study employs eleven different attributes to decide which of eight different car models from different manufacturers is the best.Because of these factors, multi-criteria decision-making (MCDM) provides a viable solution to the car model selection dilemma.Customers and manufacturers benefit from the MCDM approach for picking the best car. The preference ranking organisation method for enrichment evaluation (PROMETHEE II) is used in this work as a real-time method. PROMETHEE is widely used in environmental management, hydrology and water management, business and financial management, chemistry, logistics and transportation, manufacturing and assembly, energy management, and many other fields. Widianta, Rizaldi, Setyohadi, Riskiawan, (2018).

It is observed that this strategy demonstrates its application and potential for solving decision-making problems including several conflicting criteria and options.

Literature Review

Brans et al. devised the PROMITHEE, a multi-criteria decision-making approach (Brans and Vincke, 1985); Brans et al (1986).They had laid the groundwork for PROMETHEE, a new family of outranking procedures. It is based on a criterion that has been extended. Using the PROMETHEE technique, Brans J.P., Mareschal B., and Vincke P.H. (1986) explained how to choose and rank projects.

The PROMITHEE I approach may generate a partial ranking of the choice options, but the PROMITHEE II method can generate a complete ranking.The PROMITHEE II approach is used to acquire the full ranking of the car model in this study. Weber and Current (1993) suggested a multi-objective method to supplier selection that used systems' limitations and policy constraints in a mixed-integer model to minimise price, maximise quality, and on-time delivery. R. Maragoudaki and G. Tsakiris (2005) demonstrated how to use PROMETHEE to develop the best flood mitigation plan for a river basin. The PROMETHEE approach was used to combine the numerous criteria and stakeholder assessments and propose a final ranking of the alternative options.Jiang, Zhuang, and Lin (2006) show that supplier selection and integration have a significant impact on customer satisfaction and business performance.The entropy coefficient approach was utilised by Liu and Cui (2008) to assess the level of sustainable development of China's sports. To solve a real-time facility location selection problem, Athawale and Chakraborty (2010) used PROMETHEE II. Silva, VBS, and Morais, D.C. (2010) proposed a model for a group decision support system to assist water resource management committees.Through the use of the Multicriteria decision making methods PROMETHEE I and ELECTRE IV, their model provides a ranking of alternatives.For supplier selection, Safari et al. (2012) used the PROMETHEE method, which is based on entropy weight.A PROMETHEE-based approach to portfolio selection problems, by R. Vetschera and A. T. Almeida, published in 2012.PROMETHEE V is a technique for portfolio evaluation that only requires moderate computational resources.S.C. Deshmukh (2013) provided an overview of the PROMETHEE multicriteria decision-making methodology.

Giurca et al. (2014) discussed how to select multijunction photovoltaic panels using the PROMETHEE Method.AHP is used by Wang, Huang, and Dismkes (2004), and a preemptive goal programming-based MCDM methodology is then devised to take qualitative and quantitative criteria into account while selecting suppliers.In Fuzzy mathematics for wine quality assessment, Zhang (2015) used the Entropy technique to compute the index weights. The results show that applying the entropy weight technique empowers fuzzy comprehensive evaluation empowerment factors. The procedure is straightforward and requires only a few calculations.The end outcome is objective and logical.Taibi and Atmani (2017) use PROMITHEE to rank Algeria's industrial zones.Abdullah, Chan, and Afshani (2018) suggest using PROMITHEE methodologies to choose the best green supplier.

Elleuch and Frikha (2018) investigate the supply chain concept as well as the multi-objective facility location problem for a Tunisian aluminium company.Bagherikahvarin (2019) uses MCDM tools like DEA and PROMITHEE to rank various units.Nasnollahi, Ramezani, and Sadnai (2020) used a combination of the FBWM and PROMITHEE methods to evaluate robot options.PROMITHEE and Electre are being used to highlight transportation in Babahman and Duleba's (2021).The PROMITHEE methodology for supplier selection is being investigated by Agrawal (2021).Morfoulaki and Papathanasiou (2021) plan to rate the identified sustainable mobility measures using PROMITHEE.

The PROMITHEE method for evaluating environmental webpages and the resilience of different MCDM models are investigated by Kabansi and Martinis (2021).

Using the Preference Ranking Organization Method for Enrichment Evaluation, (PROMETHEE) Lim et al. (2006) evaluated the ranking of automobiles based on the influence of operational variables such as mileage, engine speed, fuel and lubricating oil compositions on emissions.In Taiwan, Tzeng et al. (2005) used the AHP and other outranking methods to choose the best bus.Sapuan et al. (2010) recommended using AHP to choose the finest composite material for car bumper beams.

Nepal et al. (2010) used FAHP to prioritise consumer satisfaction factors. Mayyas et al. (2011) contributed to the development of an AHP approach for selecting materials for vehicle body panels.In this literature, only a few scholars have contributed to the car selection problem using the MCDM technique.Despite the fact that the AHP is frequently utilised in various decision-making situations, few authors have noted its limits.AHP's ranking isn't precise enough.The traditional AHP is unable to reflect human thinking styles (Deng, 1999; Cheng et al., 1999).Numerical values are precise numbers that are only relevant for making quick decisions. Zadeh (1965) proposed the fuzzy set theory to convey linguistic concepts in the decision-making process to deal with the indistinctness of human mind. The fuzzy linguistic concepts are used with AHP and proposed as FAHP to solve the deficiency of the current study effort on the car purchasing model. The weights of the criterion are determined using the FAHP. Grey relation analysis (GRA) and PROMETHEE are used to determine the car model's rating.

Methodology

Shannon's Entropy is used to calculate the weights of each criterion in this research.The PROMETHEE algorithm is then used to rank the options.Finally, we classify the automobile models based on the findings.

Entropy Method of Shannon

Equation uses the m set for 'n' indicators to create the evaluation matrix (1).The 'i'th set of data for the 'kth indication is represented by element Xik of the evaluation matrix.(i=1, 2, …, m ; k= 1,2,…..,n) (Hwang and Yoon, 1981; Zeleny, 1998)

$$EM = \begin{bmatrix} X11 & X12 & X13 & \dots & X1n \\ X21 & X22 & X23 & \dots & X2n \\ X31 & X32 & X33 & \dots & X3n \\ .. & .. & .. & \dots & .. \\ Xm1 & Xm2 & Xm3 & \dots & Xm4 \end{bmatrix} \quad (1)$$

The following is the procedure for determining the weights of indicators:

Step 1: Normalization of the original evaluation matrix's elements:

To ensure that the n indicators have the same measurement scale, all of the matrix's initial input values are in the range of 0 to 1.
This is accomplished by using equation (2) & (3) to normalise the elements of the initial matrix.

$$X_{ik} / max\{X_{ik}\}_k \; : \; for \text{ max } criterion \qquad (2)$$

$$X_{ik} / min\{X_{ik}\}_k \; : \; for \text{ min } criterion \qquad (3)$$

In the given equation, the maximal criteria refers to the indicator with the preferred greater value.As a result, each element is divided by the total value of the 'k'th indicator (the highest value in column 'k' in equation) (1).The minimal criterion, on the other hand, refers to the indicator that prefers a lower value, and the minimum value is divided by each element. It is evident that rik € [0,1] using this technique.

Step2: Calculating the probability of the criterion to occur is defined by p_{ik} as :

$$p_{ik} = r_{ik} / \sum_{k=1}^{m} r_{ik} \qquad (4)$$

Step3: The entropy measurement of the ‘k’th criterion (indicator):

$$E_k = -C\sum^{m} [p_k.Ln(p_{ik})] \qquad (5)$$

Where C represents a constant defined here:

$$C=1/Ln(m) \qquad (6)$$

Step 4: Using the weight of entropy to calculate the objective importance of the indicators:

According to Zeleny (1982), the average intrinsic information provided by a particular collection of data and its subjective appraisal are directly related to the weight assigned to an attribute (indicator or criteria).As a result, the complementary entropy value is defined as the degree of diversification (dk) of the information provided by the 'kth indicator, as shown in Equation

$$d_k = 1 - E_k \quad (7)$$

Therefore, the objective importance of k th criteria is evaluated as follows:

$$W_k = d_k / \sum_{k=1}^{n} d_k \quad (8)$$

According to equations (7) and (8), indications with lower entropy values have a higher amount of information richness, and so are given a larger weight.

PROMETHEE Method

Brans and Vincke (1985) devised the PROMETHEE approach, a preference function-based outranking method that Brans and Mareschal expanded (1994). It was partly created to react to the complete aggregation multi attribute utility theory (MAUT) approaches, according to De Brucker et al. (2004), and it belongs to partial aggregation methods called outranking plans.The PROMOTHEE technique begins with the assessment Table, which ranks the options according to many criteria.

The PROMETHEE I method can only provide a partial rating of the options, whereas the PROMETHEE II method can provide a complete ranking. PROMOTHEE methods are a multi-criteria interactive decision-making strategy for dealing with discrete options and quantitative and qualitative criteria.
According to Athawale and Chakraborty (2010), this method constructs a preference function for each criterion by comparing the alternatives pairwise.A preference index between choices has been established based on this preference function. If alternatives are difficult to compare due to a trade-off connection between assessment standards, the PROMETHEE approach might identify them as non comparable. In a number of respects, the PROMETHEE methods outperform the other MCDM approaches. The stages of the PROMETHEE II approach are outlined here (Doumpos and Zopounidis 2004, Hajkowicz and Higgins).

Step 1: Using the following equation, normalise the evaluation matrix (decision matrix):

For Beneficial Criteria(BC) :

$$R_{ij} = [X_{ij} - min\ (X_{ij})] / [max(X_{ij}) - min\ (X_{ij})] \quad (9)$$

For non – beneficial criteria(NBC), Eqn. (9) can be written as follows :

$$R_{ij} = [max\ (X_{ij}) - X_{ij}] / [max\ (X_{ij}) - min\ (X_{ij})] \quad (10)$$

$i=1,2,3\ldots\ldots\ldots m$, $j=1,2,3\ldots\ldots\ldots n$

Beneficial Criteria: Criteria with a greater desired value. Criteria with a lower value are considered non-beneficial.

Step 2: Determine the evaluative differences between it and the other possibilities.
This stage entails determining pair-wise differences in criterion values between various possibilities.

Step 3: Calculate the preference function (Pj)(a,b).

The following simplified preference function is adopted here:

Pj (a,b) = 0,if Rij ≤ Ri'j ----------- here, if D(Ca-Cb) ≤ 0 (11)

Pj (i,i') = (Rij - Ri'j),if Rij≥ Ri'j ----------- here, if D(Ca-Cb) ≥ 0 (12)

The preference function Pj(a,b) is calculated using the difference between one and the other criterion
If the difference between one criterion and the other is ≤ 0, the preference function value is set to 0.
We utilise the difference value as the preference function value if the difference between one and the other criteria is ≥ 0.

Step 4: Using the criteria weights, calculate the aggregated preference function.

Aggregated preference function,

$$\pi(a,b) = \left[\sum_{j=1}^{m} w_j * Pj(a,b) \right] / \sum_{j=1}^{m} w_j \quad (13)$$

Where, π(a,b)) is the aggregated preference function
Pj(a,b) is the preference function
w_j is the relative importance (weight) of j^{th} criterion.
w j * Pj(a,b)) : wj is multiplied with Pj(a,b))

Step5**:** Determine the leaving and entering outranking flows as follows:

Leaving (or positive) flow for the i^{th} alternative

$$\varphi^{+}(i) = 1/ m-1 \sum_{i=1}^{m} \pi(a,b) \quad (14)$$

where $\varphi^{+}(i)$ is the leaving (or positive) outranking flow for the i^{th} alternative m is the number of alternatives.

Entering (or negative) outranking flow for the i^{th} alternative

$$\varphi^{-}(i) = 1/ m-1 \sum_{i=1}^{m} \pi(a,b) \quad (15)$$

where,
$\varphi^{-}(i)$ is the leaving (or positive) outranking flow for the i^{th} alternative m is the number of alternatives

Each choice is weighed against (m-1) additional options.The outgoing flow shows how much one option dominates the other options, and the incoming flow shows how much the other options dominate one option.Based on these outranking flows, the PROMETHEE I technique can generate a partial ranking of the options.On the other hand, the PROMETHEE II approach can provide a comprehensive ranking using a net flow, but it loses a lot of information regarding preference relations.

Step 6: For each option, determine the net outranking flow.

$$\varphi(i) = \varphi^{+}(i) - \varphi^{-}(i) \quad (16)$$

Where $\varphi(i)$ is the net outranking flow for each alternative.

Step7: Based on the values of $\varphi(i)$., ranked all of the alternatives that have been explored.

The better the alternative, the greater the value of $\varphi(i)$.As a result, the best option has the highest $\varphi(i)$ value. The PROMETHEE technique and outranking approaches have significant advantages over the MAUT approach (Macharis et al., 2004). To begin with, the PROMETHEE I approach eliminates the standard AHP trade-offs between criteria scores.

However, if the partial assessment is translated into a thorough evaluation of the options, as in PROMETHEE II, relevant information may be lost.

PROMETHEE also accomplishes synthesis in an indirect manner, requiring just that each option be assessed against each criterion. In AHP, on the other hand, the synthesis is based directly on the information in the evaluation matrix, requiring a large number of pairwise comparisons to be completed (De Brucker et al., 2004).

Eleven essential criteria that directly influence automobile model selection decision-making are identified from the websites and brochures of the respective car manufacturing companies.

These are prices for on-road travel The on road price (ORP) is the price a customer pays for an automobile, and it includes all types of costs such as tax, insurance, and excise duty.Mileage in Highway (MHW) Highway mileage is higher than the city mileage due to more constant driving with fewer gears on the highway than in the city. Fuel Tank Capacity (FTC) A fuel tank is a safe container for flammable fluids. Boot Space (BTS) is the legroom available inside the car.Seating Capacity (STC) in the car. The capacity of an engine's cylinders, or engine displacement (END), is a general measure of its size and power. It is stated in litres or cubic centimetres and represents the total air displaced by the pistons in all engine cylinders. Maximum Strength (MXP) Maximum power is the rate at which maximum energy is conveyed by force; power is the rate at which work is done.Maximum Torque(MXT): Torque is the maximum rotating force created by the engine (by which energy is delivered). Length (LNT) is calculated from the front-most point of the car to the rearmost point of the car. Width (WDT) is defined as the widest point without its mirrors., Height (HIT) is the height of the car, and Wheelbase(WHB) a wheelbase is the distance between a car's front and rear wheels. The wheelbase is measured from the centerline of your front wheel to the centerline of your rear wheel.

Eight selected car models:

Car#1: Maruti Wagon R (LXI)

Car#2: Maruti Celerio (LXI)

Car#3: Maruti Ignis (Sigma)

Car#4: Hyundai Santro (Era Executive)

Car#5: Tata Tiago XE

Car#6: Hyundai Grandi10 Nios(Era)

Car#7: Renault KWID 1.0 RXL AMT

Car#8: Datsun GO Plus (A Petrol)

(*Source:* Automobile Company Websites and Magazines, www.cardekho.com)

Table1. Quantitative Data of Eight Selected Car Models and the eleven criteria that directly affect the car model selection decision (Evaluation Matrix)

m=8 (Car models), n-11(Criteria)

	ORP	END	MXP	MXT	MHW	FTC	LNT	WDT	HIT	WHB	BTS
CAR#1	564412	998	67.05	90	21.79	32.0	3655	1620	1675	2435	341
CAR#2	561187	998	65.71	89	25.24	32.0	3695	1655	1555	2435	313
CAR#3	578316	1197	81.80	113	20.89	32.0	3700	1690	1595	2435	260
CAR#4	535671	1086	68.05	99.04	20.3	35.0	3610	1645	1560	2400	235
CAR#5	572922	1199	84.48	113	23.84	35.0	3765	1677	1535	2400	242
CAR#6	587277	1197	81.86	113.75	20.7	37	3805	1680	1520	2450	260
CAR#7	566845	999	67	91	22.0	28	3731	1579	1474	2422	279
CAR#8	568606	1198	67.05	104	19.02	35	3995	1636	1507	2450	347
Max (Xi)k	587277	1199	84.48	113.75	25.24	37	3995	1690	1675	2450	347

(***Source:* Automobile Company Websites and Magazines, website: www.cardekho.com**)

The quantitative measures of these 11 selected criteria for 8 Car models are given in Table1. All the ten criteria are beneficial criteria (BC), so their higher value is preferred. Only the criteria ORP is a non-beneficial criterion (NBC), so their lower value is preferred. The Shannon's Entropy method is used for determining the criteria weights.

m=8 alternatives

n=11 criteria's

Table 2. Normalization of the Quantitative data of eight car models.

RiK	ORP	END	MXP	MXT	MHW	FTC	LNT	WDT	HIT	WHB	BTS
CAR1	0.961	0.832	0.794	0.791	0.863	0.865	0.915	0.959	1.000	0.994	0.983
CAR2	0.956	0.832	0.778	0.782	1.000	0.865	0.925	0.979	0.928	0.994	0.902
CAR3	0.985	0.998	0.968	0.993	0.828	0.865	0.926	1.000	0.952	0.994	0.749
CAR4	0.912	0.906	0.806	0.871	0.804	0.946	0.904	0.973	0.931	0.980	0.677
CAR5	0.976	1.000	1.000	0.993	0.945	0.946	0.942	0.992	0.916	0.980	0.697
CAR6	1.000	0.998	0.969	1.000	0.820	1.000	0.952	0.994	0.907	1.000	0.749
CAR7	0.965	0.833	0.793	0.800	0.872	0.757	0.934	0.934	0.880	0.989	0.804
CAR8	0.968	0.999	0.794	0.914	0.754	0.946	1.000	0.968	0.900	1.000	1.000
Sum r(ik)	7.722	7.399	6.901	7.145	6.885	7.189	7.498	7.800	7.416	7.929	6.562

Source: Authors' calculation

Table.2 assumes that all of the initial entry values in the matrix are in the range of 0 to 1 in order to have the same scale of measurement for the n indicators.This is accomplished by using equation (2) to normalise the elements of the starting matrix (3). The maximal criteria in the preceding equation refers to the indicator with the preferred higher value.As a result, each element is multiplied by the maximum value of the 'k'th indicator (the maximum value in column 'k' in equation) (1).The minimal criterion, on the other hand, refers to the indicator with the chosen lower value, which is divided by each element. It is obvious that rik € [0,1] using this technique.

Table 3. Probability of the criterion to occur.

piK	**ORP**	**END**	**MXP**	**MXT**	**MHW**	**FTC**	**LNT**	**WDT**	**HIT**	**WHB**	**BTS**
CAR1	0.124	0.112	0.115	0.111	0.125	0.120	0.122	0.123	0.135	0.125	0.150
CAR2	0.124	0.112	0.113	0.109	0.145	0.120	0.123	0.126	0.125	0.125	0.137
CAR3	0.128	0.135	0.140	0.139	0.120	0.120	0.124	0.128	0.128	0.125	0.114
CAR4	0.118	0.122	0.117	0.122	0.117	0.132	0.121	0.125	0.126	0.124	0.103
CAR5	0.126	0.135	0.145	0.139	0.137	0.132	0.126	0.127	0.124	0.124	0.106
CAR6	0.129	0.135	0.140	0.140	0.119	0.139	0.127	0.127	0.122	0.126	0.114
CAR7	0.125	0.113	0.115	0.112	0.127	0.105	0.125	0.120	0.119	0.125	0.123
CAR8	0.125	0.135	0.115	0.128	0.109	0.132	0.133	0.124	0.121	0.126	0.152

Source: Authors' calculation

Table.4(a) Calculation of entropy of the Kth criterion (indicator) Ln(Pik)

Calculation of entropy of the Kth criterion (indicator) Ln(Pik)										
ORP	**END**	**MXP**	**MXT**	**MHW**	**FTC**	**LNT**	**WDT**	**HIT**	**WHB**	**BTS**
-2.084	-2.185	-2.163	-2.201	-2.076	-2.118	-2.104	-2.096	-2.004	-2.077	-1.899
-2.090	-2.185	-2.183	-2.212	-1.929	-2.118	-2.093	-2.075	-2.078	-2.077	-1.984
-2.060	-2.003	-1.964	-1.973	-2.119	-2.118	-2.091	-2.054	-2.053	-2.077	-2.170
-2.136	-2.100	-2.148	-2.105	-2.147	-2.028	-2.116	-2.081	-2.075	-2.091	-2.271
2.069	-2.001	-1.932	-1.973	-1.986	-2.028	-2.074	-2.062	-2.091	-2.091	-2.242
-2.044	-2.003	-1.963	-1.966	-2.128	-1.973	-2.063	-2.060	-2.101	-2.071	-2.170
-2.080	-2.184	-2.163	-2.190	-2.067	-2.251	-2.083	-2.122	-2.131	-2.082	-2.099
-2.076	-2.002	-2.163	-2.056	-2.212	-2.028	-2.015	-2.087	-2.109	-2.071	-1.881

Source: Authors' calculation

In the Table.4(a)the entropy measurement of the ‘k’th criterion (indicator) Ln(Pik)is calculated using equation (5) Where ‘C’ represents a constant defined here using equation (6)

Table.4 (b). Calculation of entropy of the Kth criterion (indicator) Pik*Ln(Pik)

Calculation of entropy of the Kth criterion (indicator) Pik*Ln(Pik)											
	ORP	END	MXP	MXT	MHW	FTC	LNT	WDT	HIT	WHB	BTS
	-0.259	-0.246	-0.249	-0.244	-0.260	-0.255	-0.257	-0.258	-0.270	-0.260	-0.284
	-0.259	-0.246	-0.246	-0.242	-0.280	-0.255	-0.258	-0.261	-0.260	-0.260	-0.273
	-0.263	-0.270	-0.276	-0.274	-0.255	-0.255	-0.258	-0.263	-0.264	-0.260	-0.248
	-0.252	-0.257	-0.251	-0.256	-0.251	-0.267	-0.255	-0.260	-0.261	-0.258	-0.234
	-0.261	-0.270	-0.280	-0.274	-0.273	-0.267	-0.261	-0.262	-0.258	-0.258	-0.238
	-0.265	-0.270	-0.276	-0.275	-0.253	-0.274	-0.262	-0.263	-0.257	-0.261	-0.248
	-0.260	-0.246	-0.249	-0.245	-0.262	-0.237	-0.259	-0.254	-0.253	-0.260	-0.257
	-0.260	-0.270	-0.249	-0.263	-0.242	-0.267	-0.269	-0.259	-0.256	-0.261	-0.287
Sum	-2.079	-2.076	-2.074	-2.074	-2.076	-2.076	-2.079	-2.079	-2.079	-2.079	-2.069
Ek	0.9984	0.9983	0.9974	0.9970	0.9980	0.9980	0.9990	0.9990	0.9980	0.9980	0.9951

Source: Authors' calculation

In the Table.4(b) the entropy measurement of the 'k'th criterion (indicator) Pik*Ln(Pik)is calculated using equation (5) Where 'C' represents a constant defined here using equation (6)

Table 5. Calculating the Objective importance of the indicators as the weight of entropy:

Ek	dk=Ek-1	Wk=dk/Sum(dk)	Weight
0.9984	0.0016	0.06717	W1
0.9983	0.001693	0.07106	W2
0.9974	0.002628	0.110335	W3
0.9970	0.003	0.125945	W4
0.9980	0.002	0.083963	W5
0.9980	0.002	0.083963	W6
0.9990	0.001	0.041982	W7
0.9990	0.001	0.041982	W8
0.9980	0.002	0.083963	W9
0.9980	0.002	0.083963	W10
0.9951	0.004903	0.205856	W11

	Sum(dk)= 0.02382		

	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11
Weights	0.06717	0.0710	0.1103	0.1259	0.0839	0.083963	0.041982	0.041982	0.0839	0.0839	0.2058

Source: Authors' calculation

In the Table.5 degrees of diversification (d_k) of the information provided by the ‘kth indicator is defined as the complementary entropy value as shown in Equation (7)

Therefore, the objective importance of k th criteria is evaluated as follows:

$$W_k = d_k / \sum_{k=1}^{n} d_k \qquad (8)$$

Equations (7) and (8) state that the indicators with fewer entropy values have an upper level of information content, and thus a higher weight is assigned to them.

Using the PROMETHEE II Method to find the ranking:

Table 6. Normalized Evaluation Matrix of Eight Car Models.

		NBC	BC	BC	BC	BC	BC	BC	BC	BC	BC	BC
	Weight	0.0671 70	0.071 060	0.110 335	0.125 945	0.083 963	0.083 963	0.041 982	0.041 982	0.083 963	0.083 963	0.205 856
	Criteria(Xij)	ORP	END	MXP	MXT	MHW	FTC	LNT	WDT	HIT	WHB	BTS
	Car1	564412	998	67.05	90	21.79	32	3655	1620	1675	2435	341
	Car2	561187	998	65.71	89	25.24	32	3695	1655	1555	2435	313
	Car3	578316	1197	81.8	113	20.89	32	3700	1690	1595	2435	260
Altern atives	Car4	535671	1086	68.05	99.04	20.3	35	3610	1645	1560	2400	235
	Car5	572922	1199	84.48	113	23.84	35	3765	1677	1535	2400	242
	Car6	587277	1197	81.86	113.75	20.7	37	3805	1680	1520	2450	260
	Car7	566845	999	67	91	22	28	3731	1579	1474	2422	279
	Car8	568606	1198	67.05	104	19.02	35	3995	1636	1507	2450	347
	Max(Xij)	587277	1199	84.48	113.7 5	25.24	37	3995	1690	1675	2450	347
	Min(Xij)	535671	998	65.71	89	19.02	28	3610	1579	1474	2400	235
	Max(Xij)-Min(Xij)	51606	201	18.77	24.75	6.22	9	385	111	201	50	112

In Table.6 the evaluation matrix (decision matrix) is normalized using the equation(9) and (10)

Source: Authors' calculation

Table.7 Evaluative differences of a^{th} alternative with respect to other alternatives

Car1	0.44307	0	0.07139	0.040404	0.44534	0.44444	0.11688	0.36937	1	0.7	0.946429
Car2	0.50556	0	0	0	1	0.44444	0.22078	0.68468	0.402985	0.7	0.696429
Car3	0.17364	0.99005	0.85722	0.969697	0.30064	0.44444	0.23377	1	0.60199	0.7	0.223214
Car4	1	0.43781	0.12467	0.405657	0.20579	0.77778	0	0.59459	0.427861	0	0
Car5	0.27817	1	1	0.969697	0.77492	0.77778	0.4026	0.88288	0.303483	0	0.0625
Car6	0	0.99005	0.86042	1	0.2701	1	0.50649	0.90991	0.228856	1	0.223214
Car7	0.39592	0.00498	0.06873	0.080808	0.4791	0	0.31429	0	0	0.44	0.392857
Car8	0.3618	0.99502	0.07139	0.606061	0	0.77778	1	0.51351	0.164179	1	1

In Table.7, the evaluative differences of a^{th} alternative with respect to other alternatives.
This step involves calculating differences in criteria values between different alternatives pair-wise.
Source: Authors' calculation

Table 8. Calculation of Preference function Pj(a,b)

Weight	**0.067170**	**0.071060**	**0.110335**	**0.125945**	**0.083963**	**0.083963**	**0.041982**	**0.041982**	**0.083963**	**0.083963**	**0.205856**
Criteria(Xab)	**ORP**	**END**	**MXP**	**MXT**	**MHW**	**FTC**	**LNT**	**WDT**	**HIT**	**WHB**	**BTS**
D(C1-C2)	**0**	**0**	**0.071391**	**0.040404**	**0**	**0**	**0**	**0**	**0.597015**	**0**	**0.25**
D(C1-C3)	**0.269426**	**0**	**0**	**0**	**0.144695**	**0**	**0**	**0**	**0.39801**	**0**	**0.723214**
D(C1-C4)	**0**	**0**	**0**	**0**	**0.23955**	**0**	**0.116883**	**0**	**0.572139**	**0.7**	**0.946429**
D(C1-C5)	**0.164903**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.696517**	**0.7**	**0.883929**
D(C1-C6)	**0.443069**	**0**	**0**	**0**	**0.175241**	**0**	**0**	**0**	**0.771144**	**0**	**0.723214**
D(C1-C7)	**0.047146**	**0**	**0.002664**	**0**	**0**	**0.444444**	**0**	**0.369369**	**1**	**0.26**	**0.553571**
D(C1-C8)	**0.08127**	**0**	**0**	**0**	**0.445338**	**0**	**0**	**0**	**0.835821**	**0**	**0**
D(C2-C1)	**0.062493**	**0**	**0**	**0**	**0.554662**	**0**	**0.103896**	**0.315315**	**0**	**0**	**0**
D(C2-C3)	**0.331919**	**0**	**0**	**0**	**0.699357**	**0**	**0**	**0**	**0**	**0**	**0.473214**
D(C2-C4)	**0**	**0**	**0**	**0**	**0.794212**	**0**	**0.220779**	**0.09009**	**0**	**0.7**	**0.696429**
D(C2-C5)	**0.227396**	**0**	**0**	**0**	**0.22508**	**0**	**0**	**0**	**0.099502**	**0.7**	**0.633929**
D(C2-C6)	**0.505561**	**0**	**0**	**0**	**0.729904**	**0**	**0**	**0**	**0.174129**	**0**	**0.473214**
D(C2-C7)	**0.109638**	**0**	**0**	**0**	**0.5209**	**0.444444**	**0**	**0.684685**	**0.402985**	**0.26**	**0.303571**
D(C2-C8)	**0.143762**	**0**	**0**	**0**	**1**	**0**	**0**	**0.171171**	**0.238806**	**0**	**0**
D(C3-C1)	**0**	**0.99005**	**0.785828**	**0.929293**	**0**	**0**	**0.116883**	**0.630631**	**0**	**0**	**0**
D(C3-C2)	**0**	**0.99005**	**0.857219**	**0.969697**	**0**	**0**	**0.012987**	**0.315315**	**0.199005**	**0**	**0**
D(C3-C4)	**0**	**0.552239**	**0.732552**	**0.56404**	**0.094855**	**0**	**0.233766**	**0.405405**	**0.174129**	**0.7**	**0.223214**
D(C3-C5)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.117117**	**0.298507**	**0.7**	**0.160714**
D(C3-C6)	**0.173643**	**0**	**0**	**0**	**0.030547**	**0**	**0**	**0.09009**	**0.373134**	**0**	**0**
D(C3-C7)	**0**	**0.985075**	**0.788492**	**0.888889**	**0**	**0.444444**	**0**	**1**	**0.60199**	**0.26**	**0**

D(C3-C8)	0	0	0.785828	0.363636	0.300643	0	0	0.486486	0.437811	0	0
D(C4-C1)	0.556931	0.437811	0.053277	0.365253	0	0.333333	0	0.225225	0	0	0
D(C4-C2)	0.494439	0.437811	0.124667	0.405657	0	0.333333	0	0	0.024876	0	0
D(C4-C3)	0.826357	0	0	0	0	0.333333	0	0	0	0	0
D(C4-C5)	0.721835	0	0	0	0	0	0	0	0.124378	0	0
D(C4-C6)	1	0	0	0	0	0	0	0	0.199005	0	0
D(C4-C7)	0.604077	0.432836	0.05594	0.324848	0	0.777778	0	0.594595	0.427861	0	0
D(C4-C8)	0.638201	0	0.053277	0	0.205788	0	0	0.081081	0.263682	0	0
D(C5-C1)	0	1	0.928609	0.929293	0.329582	0.333333	0.285714	0.513514	0	0	0
D(C5-C2)	0	1	1	0.969697	0	0.333333	0.181818	0.198198	0	0	0
D(C5-C3)	0.104523	0.00995	0.142781	0	0.474277	0.333333	0.168831	0	0	0	0
D(C5-C4)	0.278165	0.00995	0.139584	0	0.504823	0	0	0	0.074627	0	0
D(C5-C6)	0.278165	0.00995	0.139584	0	0.504823	0	0	0	0.074627	0	0
D(C5-C7)	0	0.995025	0.931273	0.888889	0.29582	0.777778	0.088312	0.882883	0.303483	0	0
D(C5-C8)	0	0.004975	0.928609	0.363636	0.77492	0	0	0.369369	0.139303	0	0
D(C6-C1)	0	0.99005	0.789025	0.959596	0	0.555556	0.38961	0.540541	0	0.3	0
D(C6-C2)	0	0.99005	0.860416	1	0	0.555556	0.285714	0.225225	0	0.3	0
D(C6-C3)	0	0	0.003197	0.030303	0	0.555556	0.272727	0	0	0.3	0
D(C6-C4)	0	0.552239	0.735749	0.594343	0.064309	0.222222	0.506494	0.315315	0	1	0.223214
D(C6-C5)	0	0	0	0.030303	0	0.222222	0.103896	0.027027	0	1	0.160714
D(C6-C7)	0	0.985075	0.791689	0.919192	0	1	0.192208	0.90991	0.228856	0.56	0
D(C6-C8)	0	0	0.789025	0.393939	0.270096	0.222222	0	0.396396	0.064677	0	0
D(C7-C1)	0	0.004975	0	0.040404	0.033762	0	0.197403	0	0	0	0
D(C7-C2)	0	0.004975	0.068727	0.080808	0	0	0.093506	0	0	0	0
D(C7-C3)	0.22228	0	0	0	0.178457	0	0.080519	0	0	0	0.169643
D(C7-C4)	0	0	0	0	0.273312	0	0.314286	0	0	0.44	0.392857
D(C7-C5)	0.117758	0	0	0	0	0	0	0	0	0.44	0.330357
D(C7-C6)	0.395923	0	0	0	0.209003	0	0	0	0	0	0.169643
D(C7-C8)	0.034124	0	0	0	0.4791	0	0	0	0	0	0
D(C8-C1)	0	0.995025	0	0.565657	0	0.333333	0.883117	0	0	0.3	0.053571
D(C8-C2)	0	0.995025	0.071391	0.606061	0	0.333333	0.779221	0	0	0.3	0.303571
D(C8-C3)	0.188156	0.004975	0	0	0	0.333333	0.766234	0	0	0.3	0.776786
D(C8-C4)	0	0.557214	0	0.200404	0	0	1	0	0	1	1

D(C8-C5)	0.083634	0	0	0	0	0	0.597403	0	0	1	0.9375
D(C8-C6)	0.361799	0.004975	0	0	0	0	0.493506	0	0	0	0.776786
D(C8-C7)	0	0.99005	0.002664	0.525253	0	0.777778	0.685714	0.513514	0.164179	0.56	0.607143

In Table.8 the preference function (Pj(a,b) is calculated, and the following simplified preference function as per equations (11) and (12) is adopted here,

The difference between one criteria & the other criteria is used to calculate the preference function Pj(a, b). If the difference between one criterion & the other criteria is ≤ 0, we substitute the preference function value as 0. If the difference between one criteria & the other criteria is ≥ 0, we use the difference value as the preference function value.

Table 9. Preference function Pij(a,b) multiplied by weights Wi

W1*Pref Func	w2*Pref Func	w3*Pref Func	w4*Pref Func	w5*Pref Func	W6*Pref Func	w7*Pref Func	w8*Pref Func	w9*Pref Func	w10*Pref Func	w11* Pref Func	Aggregate Pref. Value
0.000	0.000	0.008	0.005	0.000	0.000	0.000	0.000	0.050	0.000	0.051	0.115
0.018	0.000	0.000	0.000	0.012	0.000	0.000	0.000	0.033	0.000	0.149	0.213
0.000	0.000	0.000	0.000	0.020	0.000	0.005	0.000	0.048	0.059	0.195	0.327
0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.058	0.059	0.182	0.310
0.030	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.065	0.000	0.149	0.258
0.003	0.000	0.000	0.000	0.000	0.037	0.000	0.016	0.084	0.022	0.114	0.276
0.005	0.000	0.000	0.000	0.037	0.000	0.000	0.000	0.070	0.000	0.000	0.113
0.004	0.000	0.000	0.000	0.047	0.000	0.004	0.013	0.000	0.000	0.000	0.068
0.022	0.000	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.000	0.097	0.178
0.000	0.000	0.000	0.000	0.067	0.000	0.009	0.004	0.000	0.059	0.143	0.282
0.015	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.008	0.059	0.130	0.232
0.034	0.000	0.000	0.000	0.061	0.000	0.000	0.000	0.015	0.000	0.097	0.207
0.007	0.000	0.000	0.000	0.044	0.037	0.000	0.029	0.034	0.022	0.062	0.235
0.010	0.000	0.000	0.000	0.084	0.000	0.000	0.007	0.020	0.000	0.000	0.121
0.000	0.070	0.087	0.117	0.000	0.000	0.005	0.026	0.000	0.000	0.000	0.305
0.000	0.070	0.095	0.122	0.000	0.000	0.001	0.013	0.017	0.000	0.000	0.318
0.000	0.039	0.081	0.071	0.008	0.000	0.010	0.017	0.015	0.059	0.046	0.345
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.025	0.059	0.033	0.122
0.012	0.000	0.000	0.000	0.003	0.000	0.000	0.004	0.031	0.000	0.000	0.049
0.000	0.070	0.087	0.112	0.000	0.037	0.000	0.042	0.051	0.022	0.000	0.421
0.000	0.000	0.087	0.046	0.025	0.000	0.000	0.020	0.037	0.000	0.000	0.215
0.037	0.031	0.006	0.046	0.000	0.028	0.000	0.009	0.000	0.000	0.000	0.158
0.033	0.031	0.014	0.051	0.000	0.028	0.000	0.000	0.002	0.000	0.000	0.159
0.056	0.000	0.000	0.000	0.000	0.028	0.000	0.000	0.000	0.000	0.000	0.083
0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.059
0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.000	0.000	0.084
0.041	0.031	0.006	0.041	0.000	0.065	0.000	0.025	0.036	0.000	0.000	0.245
0.043	0.000	0.006	0.000	0.017	0.000	0.000	0.003	0.022	0.000	0.000	0.092
0.000	0.071	0.102	0.117	0.028	0.028	0.012	0.022	0.000	0.000	0.000	0.380
0.000	0.071	0.110	0.122	0.000	0.028	0.008	0.008	0.000	0.000	0.000	0.347
0.007	0.001	0.016	0.000	0.040	0.028	0.007	0.000	0.000	0.000	0.000	0.098

0.019	0.001	0.015	0.000	0.042	0.000	0.000	0.000	0.006	0.000	0.000	0.083
0.019	0.001	0.015	0.000	0.042	0.000	0.000	0.000	0.006	0.000	0.000	0.083
0.000	0.071	0.103	0.112	0.025	0.065	0.004	0.037	0.025	0.000	0.000	0.442
0.000	0.000	0.102	0.046	0.065	0.000	0.000	0.016	0.012	0.000	0.000	0.241
0.000	0.070	0.087	0.121	0.000	0.047	0.016	0.023	0.000	0.025	0.000	0.389
0.000	0.070	0.095	0.126	0.000	0.047	0.012	0.009	0.000	0.025	0.000	0.385
0.000	0.000	0.000	0.004	0.000	0.047	0.011	0.000	0.000	0.025	0.000	0.087
0.000	0.039	0.081	0.075	0.005	0.019	0.021	0.013	0.000	0.084	0.046	0.384
0.000	0.000	0.000	0.004	0.000	0.019	0.004	0.001	0.000	0.084	0.033	0.145
0.000	0.070	0.087	0.116	0.000	0.084	0.008	0.038	0.019	0.047	0.000	0.470
0.000	0.000	0.087	0.050	0.023	0.019	0.000	0.017	0.005	0.000	0.000	0.200
0.000	0.000	0.000	0.005	0.003	0.000	0.008	0.000	0.000	0.000	0.000	0.017
0.000	0.000	0.008	0.010	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.022
0.015	0.000	0.000	0.000	0.015	0.000	0.003	0.000	0.000	0.000	0.035	0.068
0.000	0.000	0.000	0.000	0.023	0.000	0.013	0.000	0.000	0.037	0.081	0.154
0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.068	0.113
0.027	0.000	0.000	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.035	0.079
0.002	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.043
0.000	0.071	0.000	0.071	0.000	0.028	0.037	0.000	0.000	0.025	0.011	0.243
0.000	0.071	0.008	0.076	0.000	0.028	0.033	0.000	0.000	0.025	0.062	0.303
0.013	0.000	0.000	0.000	0.000	0.028	0.032	0.000	0.000	0.025	0.160	0.258
0.000	0.040	0.000	0.025	0.000	0.000	0.042	0.000	0.000	0.084	0.206	0.397
0.006	0.000	0.000	0.000	0.000	0.000	0.025	0.000	0.000	0.084	0.193	0.308
0.024	0.000	0.000	0.000	0.000	0.000	0.021	0.000	0.000	0.000	0.160	0.205
0.000	0.070	0.000	0.066	0.000	0.065	0.029	0.022	0.014	0.047	0.125	0.438

In Table.9 Preference function Pij(a,b) is multiplied by the weights of Wi

Table 10. Aggregate Preference function π(a,b)

	Car1	Car2	Car3	Car4	Car5	Car6	Car7	Car8	Leaving Flow
Car1	0	0.114556689	0.212542384	0.326660698	0.310294	0.258100322	0.276034	0.113029	0.2301
Car2	0.068368	0	0.178429138	0.281873192	0.231799	0.207278009	0.23532	0.120857	0.1891
Car3	0.305479	0.317554187	0	0.34524849	0.121838	0.049340057	0.420622	0.214929	0.2525
Car4	0.157843	0.15924423	0.08349448	0	0.058929	0.083879511	0.24461	0.091569	0.1256
Car5	0.379771	0.347464694	0.098378873	0.083445039	0	0.083445039	0.441806	0.240878	0.2393
Car6	0.38915	0.384516768	0.087453766	0.383747231	0.145018	0	0.469584	0.20008	0.2942
Car7	0.016564	0.022039398	0.068216713	0.153957928	0.112859	0.079064821	0	0.042519	0.0707
Car8	0.243227	0.303294766	0.258242124	0.396635698	0.30765	0.205279665	0.438238	0	0.3075
Entering Flow	0.2229	0.2355	0.1409	0.2816	0.184	0.138	0.3608	0.1462	0

In Table#10, the aggregated preference function is calculated, considering the criteria weights as per equation(13).Where, π(a,b)) is the aggregated preference function, Pj(a,b) is the preference function, and w_j is the relative importance (weight) of the j^{th} criterion. w j * Pj(a,b)) : wj is multiplied with Pj(a,b)

Table 11. Outranking Flow φ(i)

	Leaving Flowφ+(a)	Entering Flowφ-(a)	Net Out Ranking Flowφ(a)	Rank	
Car1	0.2301	0.2229	0.0072	5	Maruti Wagon R
Car2	0.1891	0.2355	-0.0464	6	Maruti Celerio
Car3	0.2525	0.1409	0.1116	3	Maruti Ignis
Car4	0.1256	0.2816	-0.156	7	Hyundai Santro
Car5	0.2393	0.184	0.0553	4	Tata Tiago
Car6	0.2942	0.138	0.1562	2	Hyundai Grand i10
Car7	0.0707	0.3608	-0.2901	8	Renault Kwid
Car8	0.3075	0.1462	0.1613	1	Datson Go Plus

In Table#11The outranking flows for leaving and entering are calculated as follows :
Leaving (or positive) outranking flow for the i^{th} alternative is determined by using equation (14)

where $\varphi^{+}(i)$ is the leaving (or positive) outranking flow for the i^{th} alternative m is the number of alternatives.

Entering (or negative) outranking flow for the i^{th} alternative is determined by using equation(15)

where $\varphi^{-}(i)$ is the leaving (or positive) outranking flow for the i^{th} alternative m is the number of alternatives

Then the net outranking flow for each alternative is calculated using equation (16)

$$\varphi(i) = \varphi^{+}(i) - \varphi^{-}(i) \quad (16)$$

Where $\varphi(i)$ is the net outranking flow for each alternative.

Result

The values of the net outranking flow for all the alternative layouts are now computed using Equation (16), and based on these values, the alternative cars are ranked in Table.11 The best choice of Car Model is the Car 8 (Datson Go Plus). Car 6 (Hyundai Grand i10) is the second choice, and the last choice is car 7(Renault Kwid)

Conclusion

Because purchasing a new car is not always feasible for everyone, the car model you select has long-term repercussions.As a result, selecting the ideal car model to satisfy the buyer's needs while also giving good value for money is crucial.The goal of this paper is to describe the recommendations of decision-makers for selecting the best car model.In this work, the PROMETHEE II approach is employed to tackle the car model selection problem.The data acquired can assist the decision maker in selecting the best car model.This technique, which is founded on sound mathematical logic, can account for the decision maker's preferences regarding the relative importance of various aspects.To rank the various car models based on qualitative and quantitative criteria, as well as their relative importance.

As a result, more accurate evaluations of various car models are available.This Multicriteria decision making strategy is a basic preferable ranking methodology in conception and application when compared to other MCDM methods.It allows the decision-maker to quickly rank the possibilities.The PROMETHEE II and Entropy techniques' computational processes are demonstrated in the above real-time problem.This method can be used to solve any decision-making problem involving a number of qualitative and quantitative criteria as well as a number of possibilities.As a result, the same method can be applied to a variety of strategic decision-making problems.

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