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A hybrid lexicographic and VIKOR approach for prioritizing construction projects by considering sustainable development criteria

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A B S T R A C T

Nowadays, one of the challenges in the organizations according to budget limitations in the companies, is how to prioritize their project portfolios in the events of their strategies. In other words, organizations are seeking to allocate resources in order to gain the maximum profit according to budget limitations. In this article, a hybrid decision making method is used to prioritize construction project portfolio by considering sustainability criteria. First, Lexicographic method is applied to weight the sustainability criteria. Then, by considering the weights derived from the Lexicographic and sustainability criteria, projects are prioritized based on VIKOR method. The proposed method of this study is applied for a case study of projects in the refinery scope.

1. Introduction

Nowadays, one of the major challenges of the organizations in regard to their budget limitations is to decide how to prioritize the project portfolio according to strategies. In other words, the organizations are seeking to determine the ways to allocate resources to their plans and projects to receive the maximum profit according to the budget limitations. The necessity of a management system that incorporates different dimensions of the organization has made the project portfolio management to be of great interest for many managers. The portfolio management, in contrast to the project management, is not started with the beginning of the project and not terminated with the end of the project and it is endless. In such a viewpoint, the projects are regularly monitored and revised. One of the main advantages of the portfolio management is that it shifts the monitoring parameters towards macro scale. Although all selected plans and projects take steps in line with the organization strategies and are aligned with the business of the organizations, their importance is not equal. Hence, the selected plans and projects are required to be prioritized so that their relative importance is identified. Usually, after the selection of the plans and projects of the organization, they are prioritized.

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To evaluate the projects, the ranking methods are usually used or the relative weight of each project is identified according to the organization's criteria using multi-criteria decision making techniques. These methods provide the manager with an ordered list in which the priority of the projects has been determined. These methods are easily understood and can be applied by the managers. But, one of the major deficiencies of these methods is that they provide the managers with no alarm about the irrelevancy of the projects with the organizational strategies. To tackle this problem, the selection process must first be accomplished on the portfolio and then the selected projects are prioritized.

Jabbarzadeh (2018) presented a multi-criteria method for contractor selection. The criteria used are namely; Experience, Financial stability, Quality performance, Manpower resources, Equipment resources and Current workload for evaluating different contractors. Analytical hierarchy process (AHP) (Saaty, 1989) with TOPSIS (Hwang & Yoon, 1981) were used in the study to rank the contractors as alternatives according to proposed criteria. Sadjadi and Sadi-nezhad (2017) used TOPSIS as a multi-criteria decision making method to rank different oil and gas projects in Canada in the field of investment. They considered different criteria such as net present value, rate of return, benefit-cost analysis and payback period along with the intensity of green gas effects for ranking the abovementioned projects.

Using the fuzzy multi-criteria decision making methods Rathi et al. (2016) prioritized and selected the six sigma projects. They used a hybrid method of the TOPSIS and VIKOR (Opricovic & Tzeng, 2007) in a fuzzy context, investigated 7 critical criteria for selecting the projects and applied the proposed method for a case study to evaluate its efficiency. Yousefi and Hadi-Vencheh (2016) prioritized and selected the six sigma projects using a combination of hierarchical analysis, TOPSIS, and data envelopment analysis (DEA) (Charnes et al., 1984) and assigned the weights to all the proposed criteria and projects as their priority. Finally, they selected the projects of high priority. Rahmani et al. (2012) used analytic network process (ANP) (Saaty, 2013) and TOPSIS in a fuzzy environment for selecting and prioritizing of oil and gas projects. First, their considered criteria were weighted by the analytic network process and then, the projects were prioritized by the fuzzy TOPSIS.

Abdollahi et al. (2015) used three methods of the DEA, DEMATEL (Yu, 1973; Duckstein & Opricovic, 1980), and ANP to select and prioritize the supplier portfolio. First, using the analytic network process, the criteria were weighted and then, to select and prioritize the projects, the DEA method was applied and finally, to identify the dependency existed among the criteria, the DEMATEL technique was used. To validate their proposed model, they implemented it in a case study. Baynal et al. (2016) used a combined method of two multi-criteria decision making methods (the hierarchical analysis and PROMETHE method) for prioritizing the studied cases of Turkish projects. First, using the hierarchical process analysis, they weighted the considered criteria and then, using the PROMETHE method, they prioritized the projects and selected ones with more priority. Salehi (2015) used a combination of multi-criteria decision making including the VIKOR and hierarchical analysis to prioritize the project portfolio and then selected the projects with a higher priority. Using three methods of MCDM methods including Delphi, hierarchical analysis, and TOPSIS, Pangsri (2015) selected and prioritized the projects. They first weighted the criteria by the hierarchical analysis and prioritized the projects by the TOPSIS method, and considering the acquired weights, selected the projects of high priority.

Taylan et al. (2014) prioritized the construction projects by means of a combined method of fuzzy hierarchical analysis and fuzzy TOPSIS. They used five criteria of the cost, time, quality, environmental sustainability and security in prioritizing the projects. They applied their model to 30 construction projects. Wang et al. (2013) addressed the problem of prioritizing six sigma projects with the aim of maximizing financial profit and considering other impacts on the organization. They used a combination of the analytic network process and VIKOR methods for prioritizing the projects. Also, they used the DEMATEL technique to identify the precise relationships of the proposed criteria. Khalili-Damghani et al. (2013) utilized a combination of the TOPSIS, goal programming, and hierarchical analysis process to select and prioritize the optimized project portfolio. Their study was carried out in two phases. In the first phase, the importance of the criteria provided by experts was identified using the goal programming and in the second phase, the TOPSIS and the hierarchical methods were used to prioritize the projects according to the priority score. Amiri et al. (2010) proposed a combined method of the hierarchical analysis process and TOPSIS for prioritizing and finally selecting the oil and gas portfolio projects.

In this paper, a combination of two decision making models has been used for prioritizing different projects. For this purpose, first, the factors that affect the success of the projects prioritization problem, which are sustainability criteria are studied. Then, using the lexicographic method, for each sustainability criteria, some weights are assigned and these weights are considered as the input of the VIKOR method which its outcome will be a rank for each project that represents the organization projects prioritization. Finally, the proposed method is applied for a case study. An obvious innovation of this paper is to consider the sustainability criteria that has not been considered before in the prioritization problem of the project portfolio. Also, applying the lexicographic method is another innovation of this model that considers the pair-wise comparisons in an interval form and somehow incorporates the uncertainty in the decision making and its combination with the VIKOR method (Yu, 1973) is a new hybrid method.

The rest of the paper is organized as follows. Section 2 explores the sustainability criteria that are important for the prioritization process. Section 3 introduces the proposed methodology and section 4 analyzes the data and research findings. Section 5 concludes the paper.

2. Identification of the prioritization criteria

Regarding the reviews that have been accomplished in the literature of sustainable development criteria in the context of the project portfolio (Siew, 2016; Wang et al., 2013; Xing et al., 2009), especially the construction projects, a set of sustainability criteria can be considered regarding the organization's objectives, which fall in three categories of the economic, environmental, and social criteria (Tables 1, 2, 3). Finally, in Table 4, all sustainability criteria have been gathered.

Table 1
Economic criteria

Economic	
Profit	Project revenue
	Benefit of society
	Operating cash flow
	Proportion of project cost funded
	Aid from government or organization
Cost	Disaster risk (replacement cost)
	Maintenance cost
	Direct cost
	Indirect cost
	Cost of society
	Life cycle cost
	Cost incurred to users
	Local economy
Technical requirements	Constructability
	Durability
	Functionality

Table 2
Environmental criteria

Environmental	
Soil	Ecological value
	Erosion and sedimentation
	Consumption
Water	Saving
	Consumption
	Pollution
	Protection of water resources
Atmosphere	Ventilation
	Noise
	GHG emission
	Particulate and dust emission
	NO_x & CO_2 & SO emission
	Ozone emission
Energy	Consumption
	Renewable
	Saving
	Efficiency
Biodiversity	Impacts on the environment
	Protection of flora and fauna
	Barrier effects of the projects
Waste	Management
	Production
Risk	Mitigating the effects of floods and draughts
	Adaption and vulnerability to climate changes
	Infrastructure control

Table 3
Social criteria

Social	
security	Safety and health of workers
	User security
	Impact on the global community
	Security of the infrastructure
	Number of injuries and fatalities
Public utility	Project declared of general interest
	Satisfaction of society
	Happiness
	Job creation
Social integration	Local workers during the implementation of project
	Raising levels of training and information
	Environmental campaign
	Integration into the society
Responsibility	Corporate social responsibility of the sponsor
	Environment and sustainable awareness
	Necessity and urgency of the work

Table 4
Effective criteria in prioritizing construction project portfolio

1.	Profit
2.	Cost
3.	Technical Requirements
4.	Soil, water and atmosphere
5.	Energy
6.	Waste
7.	Security
8.	Public Utility
9.	Risk
10.	Responsibility

3. The Methodology

In this section, a brief description of the proposed methods is given.

3.1. The Lexicographic Method

The preference of criterion i over the criterion j may fall between l_{ij} and u_{ij} that are non-negative real numbers and $l_{ij} \leq u_{ij}$. Hence,

$$A=(a_{ij})_{n\times n}=\begin{bmatrix} 1 & [l_{12},u_{12}] & \cdots & [l_{1n},u_{1n}] \\ [l_{21},u_{21}] & 1 & \cdots & [l_{2n},u_{2n}] \\ \vdots & \vdots & \vdots & \vdots \\ [l_{n1},u_{n1}] & [l_{n2},u_{n2}] & \cdots & 1 \end{bmatrix} \quad (1)$$

, where $l_{ij}=\dfrac{1}{l_{ji}}$, $u_{ij}=\dfrac{1}{u_{ji}}$, $l_{ij} \leq a_{ij} \leq u_{ij}$.

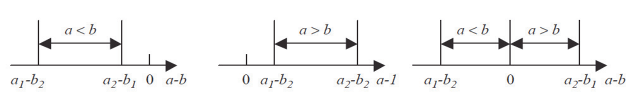
According to the Arbel and Vargas researches (1993), the matrix $A=(a_{ij})_{n\times n}$ is a comparison matrix of consistent intervals if and only if it satisfies the following inequality:

$$\max(l_{ik}.l_{kj}) \leq \min(u_{ik}.u_{kj}) \quad (2)$$
$$\forall i, j, k = 1,\dots,n.$$

The preference degree of interval a over b (or a > b) is defined as follows:

$$p(a>b)=\frac{\max(0,a_2-b_1)-\max(0,a_1-b_2)}{(a_2-a_1)+(b_2-b_1)} \quad (3)$$

If $a=[a_1.a_2]\ and\ b=[b_1.b_2]$ are the interval weights, the possible relations are shown in the following figure:



It's possible that the interval judgments be considered as a limitation on the weights. Therefore,

$$l_{ij} \leq \frac{w_i}{w_j} \leq u_{ij} \quad (4)$$

The following inequality is only for the consistent judgments. In case of inconsistency, the deviation variables $p_{ij}.q_{ij}$ can be defined as the following inequality:

$$l_{ij}w_{ij}-p_{ij} \leq w_i \leq u_{ij}w_{ij}+q_{ij} \quad (5)$$
$$i.j=1.\dots.n$$

in which $p_{ij}.q_{ij}$ are both nonnegative real numbers but they cannot be simultaneously positive, that is $p_{ij}.q_{ij}$=0. It's desirable that these deviation variables be small values as long as it's possible. To achieve this, the lexicographic goal programming model has been used:

$$\min j=\sum_{i=1}^{n-1}\sum_{j=i+1}^{n}(p_{ij}+q_{ij}) \tag{6}$$

$$\text{subject to}: w_i-l_{ij}w_j+p_{ij}\geq 0,\ i=1,\dots,n-1; \tag{7}$$

$j=i+1,\dots,n.$

$$w_i-u_{ij}w_j-q_{ij}\leq 0,\ i=1,\dots,n-1;\ j=i+1,\dots,n. \tag{8}$$

$$\sum_{i=1}^{n}w_i=1 \tag{9}$$

$$w_i,p_{ij},q_{ij}\geq 0; \tag{10}$$

3.2. The VIKOR Method

In decision making problems with *m* criteria and *n* alternatives, the VIKOR method is used for prioritizing the alternatives and selecting the best one. The steps of this method are as follows:

Step 1: Preparing the decision making matrix (the decision matrix *X* whose elements are x_{ij}.)

Step 2: Normalizing the decision making matrix and identifying the weighted decision making matrix

The normalization is carried out by the following formula:

$$n_{ij}=\frac{x_{ij}}{\sqrt{\sum_{i=1}^{m}x_{ij}^{2}}} \tag{11}$$

Then, to calculate the weighted decision matrix, the weight of each criterion is multiplied by the normalized decision matrix.

Step 3: Identifying the best and the worst value of each criterion from the weighted decision making matrix

In this step, the maximum and the minimum values of each column are identified. That is, the two elements that have the greatest positive value and the greatest negative value, respectively. Accordingly, if the criterion is a negative one, the maximum value will be the lowest value and the minimum value will be the greatest one, and vice versa.

$$f_i^{+}=\max_j(\mathrm{f}_{ij}) \tag{12}$$

$$f_i^{-}=\min_j(\mathrm{f}_{ij}) \tag{13}$$

Step 4: Calculating the utility index S_j and the regret index R_j

$$S_j=\sum_{i=1}^{n}w_i.\frac{f_i^{+}-f_{ij}}{f_i^{+}-f_i^{-}} \tag{14}$$

$$R_j=\max_i[\mathrm{w}_i.\frac{f_i^{+}-f_{ij}}{f_i^{+}-f_i^{-}}] \tag{15}$$

f_i^{+}: the maximum value of the weighted normalized matrix for each column

f_{ij} : the score of the corresponding alternative for each criterion in the weighted normalized matrix

f^{-}: the smallest number of the weighted normalized matrix for each column

In this method, for each alternative, a utility index is obtained for each criterion where the sum of these scores identifies the final index S_j. The biggest S_j of each alternative for each criterion is the regret index (R) of that alternative.

Step 5: Calculating the value Q

$$Q_j = v \cdot \frac{S_j - S^-}{S^+ - S^-} + (1 - v) \cdot \frac{R_j - R^-}{R^+ - R^-} \quad (16)$$

$\upsilon = 0.5$
S_j= The sum of values S for each alternative
S^-=The minimum value of index S for each alternative
S^+=The maximum value of index S for each alternative
R_j= The sum of values R for each alternative
R^-= The minimum value of index R for each alternative
R^+ = The maximum value of index R for each alternative

Step 6: The final ranking

In the last step of the VIKOR technique, according to the values of S, R, and Q, the alternatives are ascendingly sorted in three groups. The best alternative is the one has the smallest value of Q provided that the two following propositions.

Proposition 1: if the alternatives A1 and A2 have the first and second ranks, the following relation must be satisfied:

$$Q(A_2) - Q(A_1) \geq \frac{1}{m-1} \quad (17)$$

Proposition 2: the alternative A1 must be known as the best rank at least in one of the R and S groups. If the first condition is not satisfied, both alternatives are the best one. If the second condition is not satisfied, then both alternatives A1 and A2 are selected as the best one.

4. The Analysis of Research Data and Findings

To prioritize the project portfolio, a hybrid optimization method of the lexicographic and VIKOR methods has been used. First, the factors that are effective in prioritizing the project portfolio are selected using the lexicographic method. Then, the weights of these factors are identified. The decision making matrix in this method is an interval based matrix and can be seen in Tables 5 and 6. These tables respectively present the lower and upper limits of the decision makers' preferences. The proposed method has been applied to a case study of 19 construction projects in the field of the refinery. Due to the security concerns, we are not allowed to mention full information about the projects.

4.1. Results of the lexicographic method

Table 5
Lower bound of lexicographic decision matrix

l_{ij}	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	1	2	2	3	3	4	2	5	5
C2	1	1	1	2	3	2	3	3	4	4
C3	0.5	1	1	4	2	2	2	3	2	2
C4	0.5	0.5	0.25	1	0.33	3	2	2	3	5
C5	0.33	0.33	0.5	3	1	4	4	2	3	2
C6	0.33	0.5	0.5	0.33	0.2	1	2	3	4	3
C7	0.25	0.33	0.5	0.5	0.25	0.5	1	1	2	4
C8	0.5	0.33	0.33	0.5	0.5	0.33	1	1	3	4
C9	0.2	0.25	0.5	0.33	0.33	0.25	0.5	0.33	1	2
C10	0.2	0.25	0.5	0.2	0.5	0.33	0.25	0.25	0.5	1

Table 6
Upper bound of lexicographic decision matrix

u_{ij}	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	1	3	4	4	4	5	6	5	7	7
C2	0.33	1	3	5	5	4	5	6	5	8
C3	0.25	0.33	1	7	6	5	4	4	6	7
C4	0.25	0.2	0.14	1	0.2	6	5	5	4	5
C5	0.25	0.2	0.16	5	1	7	8	6	5	5
C6	0.2	0.25	0.2	0.16	0.14	1	5	4	8	5
C7	0.16	0.2	0.25	0.2	0.125	0.2	1	4	6	7
C8	0.2	0.16	0.25	0.2	0.16	0.25	0.25	1	6	8
C9	0.14	0.2	0.16	0.25	0.2	0.125	0.16	0.16	1	5
C10	0.14	0.125	0.14	0.2	0.2	0.2	0.125	0.125	0.2	1

After applying the lexicographic method, the weights obtained for each factor are given in Table 7.

Table 7
Weight of criterion derived from lexicographic method

Effective criteria in prioritizing construction project portfolio		**Weight of criterion**
Profit	**C1**	0.297
Cost	**C2**	0.235
Technical Requirements	**C3**	0.213
Soil, water and atmosphere	**C4**	0.073
Energy	**C5**	0.106
Waste	**C6**	0.041
Security	**C7**	0.02
Public Utility	**C8**	0.01
Risk	**C9**	0.003
Responsibility	**C10**	0.002

4.2. Results of the VIKOR method

Based on the results of the lexicographic method and the weights obtained for each factor, we apply the VIKOR method to prioritize the 19 projects of the organization. In Table 8, the initial decision making matrix has been shown.

Table 8
The initial decision matrix of the VIKOR method

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
w_{ij}	0.297	0.235	0.213	0.073	0.106	0.041	0.020	0.010	0.003	0.002
P1	7.290	8.843	6.377	271	20	8.809	6	17	7.210	6.366
P2	1.729	3.531	6.547	258	19	8.171	7	17	4.665	6.199
P3	2.663	8.426	7.706	116	21	3.487	9	17	3.257	2.429
P4	6.955	5.815	4.282	60	18	2.715	6	20	3.372	8.052
P5	5.660	5.186	7.768	241	24	7.617	9	18	8.865	7.265
P6	6.320	5.136	7.561	224	21	3.217	8	12	8.178	6.942
P7	6.001	7.643	5.843	132	20	8.596	7	34	8.967	7.718
P8	8.386	8.368	3.129	159	21	6.782	8	27	4.470	4.736
P9	4.017	6.366	8.809	71	35	8.809	6	30	5.416	3.651
P10	8.843	6.199	8.171	215	28	8.171	12	20	7.673	4.478
P11	3.531	2.429	3.487	110	29	3.487	7	29	6.066	7.409
P12	8.426	8.052	2.715	160	28	2.715	5	29	8.693	7.706
P13	5.815	7.265	7.617	117	12	7.617	6	24	5.893	6.223
P14	5.186	6.942	3.217	212	32	3.217	5	20	7.157	5.435
P15	5.136	7.718	8.596	120	23	8.596	12	22	3.052	8.545
P16	7.643	4.736	6.782	137	23	6.782	13	17	8.242	3.567
P17	8.368	7.561	8.843	324	28	2.715	8	19	8.310	7.257
P18	3.469	5.843	3.531	132	43	7.617	9	20	7.926	3.086
P19	6.377	3.129	8.426	159	17	3.217	7	30	7.472	8.653

Then, by multiplying the weighted values of each criterion by the x_{ij}, the weighted normalized matrix is obtained as Table 9.

Table 9

Weighted normalized matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
w_{ij}	0.297	0.235	0.213	0.073	0.106	0.041	0.020	0.010	0.003	0.002
P1	0.582	0.645	0.299	185.363	0.384	0.114	0.020	0.029	0.005	0.003
P2	0.033	0.103	0.316	168.006	0.347	0.098	0.027	0.029	0.002	0.003
P3	0.078	0.586	0.437	33.963	0.424	0.018	0.045	0.029	0.001	0.000
P4	0.530	0.279	0.135	9.086	0.311	0.011	0.020	0.040	0.001	0.005
P5	0.351	0.222	0.444	146.595	0.554	0.085	0.045	0.032	0.008	0.004
P6	0.437	0.218	0.421	126.643	0.424	0.015	0.036	0.014	0.007	0.003
P7	0.394	0.482	0.251	43.978	0.384	0.108	0.027	0.116	0.008	0.004
P8	0.770	0.578	0.072	63.809	0.424	0.068	0.036	0.073	0.002	0.002
P9	0.177	0.334	0.572	12.723	1.177	0.114	0.020	0.090	0.003	0.001
P10	0.856	0.317	0.492	116.671	0.753	0.098	0.080	0.040	0.006	0.001
P11	0.137	0.049	0.090	30.540	0.808	0.018	0.027	0.084	0.004	0.004
P12	0.777	0.535	0.054	64.614	0.753	0.011	0.014	0.084	0.008	0.004
P13	0.370	0.436	0.427	34.551	0.138	0.085	0.020	0.058	0.003	0.003
P14	0.294	0.398	0.076	113.437	0.984	0.015	0.014	0.040	0.005	0.002
P15	0.289	0.492	0.544	36.345	0.508	0.108	0.080	0.048	0.001	0.005
P16	0.639	0.185	0.339	47.372	0.508	0.068	0.094	0.029	0.007	0.001
P17	0.767	0.472	0.576	264.957	0.753	0.011	0.036	0.036	0.007	0.004
P18	0.132	0.282	0.092	43.978	1.777	0.085	0.045	0.040	0.006	0.001
P19	0.445	0.081	0.523	63.809	0.278	0.015	0.027	0.090	0.006	0.005

Now, using the information of Table 9, the best and worst values are calculated from the values of each criterion in the weighted normalized matrix (Table 10).

Table 10

The best and worst values for each criterion

	+	+	+	-	-	-	+	+	-	+
F+	0.856	0.645	0.576	9.086	0.138	0.011	0.094	0.116	0.001	0.005
F-	0.033	0.049	0.054	264.957	1.777	0.114	0.014	0.014	0.008	0.000
(F+)-(F-)	0.823	0.597	0.522	-255.870	-1.639	-0.103	0.080	0.101	-0.007	0.005

In the next step, we calculate the numerical values of each utility indicator S_j and satisfaction indicator R_j for each alternative. Table 11 shows the information of each utility and satisfaction indicators.

Table 11

Values of each utility and satisfaction indicator for each alternative

Projects	S	R
P1	0.349	0.113
P2	0.737	0.297
P3	0.412	0.281
P4	0.480	0.180
P5	0.522	0.182
P6	0.464	0.168
P7	0.448	0.167
P8	0.341	0.206
P9	0.502	0.245
P10	0.283	0.129
P11	0.767	0.260
P12	0.367	0.213
P13	0.382	0.175
P14	0.621	0.204
P15	0.359	0.205
P16	0.427	0.181
P17	0.239	0.073
P18	0.772	0.261
P19	0.440	0.222

In the next step, the values of the VIKOR index (Q) have been calculated and, along with the other utility and satisfaction indicators, shown in Table 12. Also, the final ranking of the alternatives is given in this table.

Table 12
Final ranking of the alternatives

Projects	Q	S	R	Rank of the projects
P1	0.132	0.349	0.113	**3**
P2	0.628	0.737	0.297	**17**
P3	0.311	0.412	0.281	**13**
P4	0.302	0.480	0.180	**12**
P5	0.344	0.522	0.182	**14**
P6	0.280	0.464	0.168	**10**
P7	0.263	0.448	0.167	**9**
P8	0.191	0.341	0.206	**4**
P9	0.370	0.502	0.245	**15**
P10	0.082	0.283	0.129	**2**
P11	0.629	0.767	0.260	**18**
P12	0.220	0.367	0.213	**7**
P13	0.207	0.382	0.175	**6**
P14	0.452	0.621	0.204	**16**
P15	0.207	0.359	0.205	**5**
P16	0.254	0.427	0.181	**8**
P17	0.000	0.239	0.073	**1**
P18	0.635	0.772	0.261	**19**
P19	0.295	0.440	0.222	**11**

As it can be seen in Table 12, the final results of prioritizing the selected projects have been shown in the form of a ranking. It is observed that the project 17 has the highest priority and the project 18 has the lowest priority. Considering the prioritization results, the chief managers of the organization can decide about the implementation and allocation of financial and non-financial resources to each project.

5. Conclusion

Nowadays, the problem of how to institutionalize the project management in project-based organizations and utilizing its advantages in the long term has been a main concern of the project portfolio and special techniques of project management have been usually neglected. In this regard, the project portfolio management can be an extremely useful tool in improving the efficiency and effectiveness of the organization's projects. Many organizations have defined and started a large set of projects that need a budget more than 10 times of what has been previously set. Here, the role of the high-level management was highlighted. Considering the organizational strategic requirements, they select and prioritize the suitable projects in each time period and allocate them the resources. In this paper, a hybrid decision making method has been proposed for prioritizing the projects by considering the factors of the sustainable development. This is a comprehensive and applicable method especially for prioritizing the construction projects. Also, using the lexicographic method that considers the pairwise comparisons in an interval form, the uncertainty has been incorporated into the decision making model that in turn minimizes the pairwise comparison errors. Finally, the prioritization of the construction projects is carried out in such a way that incorporates the environmental requirements that are from the essential concerns.

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