PRIORITIZATION OF ADMINISTRATIONS TO CONNECT TO THE INTERNAL NETWORK WITH A MULTIPLE CRITERIA DECISION MAKING APPROACH (CASE STUDY: INFORMATION TECHNOLOGY ADMINISTRATION OF IRAN)

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ABSTRACT
The internal network consists of communication substructures, governmental and nongovernmental developed data centers and software substructures that have been expanded across the nation. This network provides the required capacity for "maintenance and exchange of local information in the nation for electronic services development" and "access of internet" through nationwide bandwidth connecting bed for home users, businesses and executive administrations. This network integrates specialized, local and national networks in the country, consisting of two private and public sectors. The private sector is to connect and to exchange information and services between the executive administrations and private sector, providing the required services for general users. These two sectors join each other at such points as data centers. The problem of this research is the fact that since many national administrations have a number of access points and that all administrations must join this network within the next five years, and that identifying information technology indices such as existing points, connected to national headquarters and number of existing points, connected to provincial and city offices and number of existing and connected points of associated businesses for executive administrations of the nation is of great importance for materialization of an electronic government in the nation, in this research, we have been determined to prioritize the aforesaid factors and indices. The research method is of descriptive mathematical type and the technique used is TOPSIS. Moreover, the names of ministries have not been given herein this survey.

Keywords: *National Information Network, TOPSIS and Connection Points*

INTRODUCTION

Information technology is more extensive (and complicated) than computer science. This term replaced the terms of data processing and management information systems in the 1990s, which was very common in the 19760s and 1970s. Information technology usually implies all technologies that are applied in five areas of collection, saving, processing, transfer and display of data. Information technology knowledge and computer are different from each other. They have many items in common. If computer science is considered similar to mechanical engineering, information technology is like transportation. In transportation industry, automobiles, railways, airplanes and ships are available. All of these items are put forth by mechanical engineers. Meanwhile, in transportation industry, the issues associated with navigation management, traffic management, determination of transportation strategy at the levels of company, city and country. It does not directly correspond to mechanical engineering. However, information technology and communication (ICT), which is said as FAVA in Persian, is the most important notation in this field. Seyed Hamed Khosravani Shariati propounds another definition of information technology. As he says, information technology engineering is a combined knowledge of software engineering, industrial engineering and marketing with an analytical, commercial and narrow-sighted

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approach toward modern information technologies. Having put forth this approach, he solved the gap between software designers, system analysts and target market. The problem of this research is the fact that in spite of many access points by national administrations and that all administrations must connect to this network, on the one hand and on the other hand, since identifying IT indices such as number of existing and connected points of the national headquarters, number of existing and connected points of provincial and city offices and number of existing and connected points of affiliated business is of great importance for realization of an electronic government, herein this research, we have been determined to prioritize state administrations in terms of the aforesaid elements and indices. The technique used for prioritization is multiple decision making and TOPSIS in particular.

INTERNAL NETWORK

An internal network consists of communication substructures, advanced governmental and nongovernmental data centers and software substructures that have been extended across the nation. This network provides the required capacity for "maintenance and safe exchange of local information in the nation for development of electronic services" and "access of internet" through nationwide bandwidth connection bed for home users, businesses and executive administrations. This network integrates specialized, local and national networks across the nation. It consists of two private and public sectors. The private sector is for communication and exchange of information and services of executive administrations and the public sector is for providing services for general users. These two sectors join each other at such points as data centers(sohrabi et al, 2015).

SHARE CENTER AND EXCHANGE OF INFORMATION

Share center and exchange of information among governmental administrations are commissioned as subdivision of this network. This center shall be launched upon approval and notification of the by-law for connection of executive administration and share of information among the said administrations. This center is similar to inter-bank acceleration network and is generated to share information among different administrations.

WHY INTERNAL NETWORK?

Generation and local development as a legal duty shall provide suitable substructure and required capacity for development of various applications of information technology in the nation. From among the characteristics of this network, one may point out provision of high speed accesses for all users. It consists of data centers as host of data of different types of application. In fact, internal network has notified all legal items for generating a uniform window, information systems and databases as an assigned duty to corresponding administrations and shall support them as substructure.

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ANALYTICAL RESEARCH MODEL

Any field research requires a model indicating the variables and their interrelations in form of an appropriate analytical means.

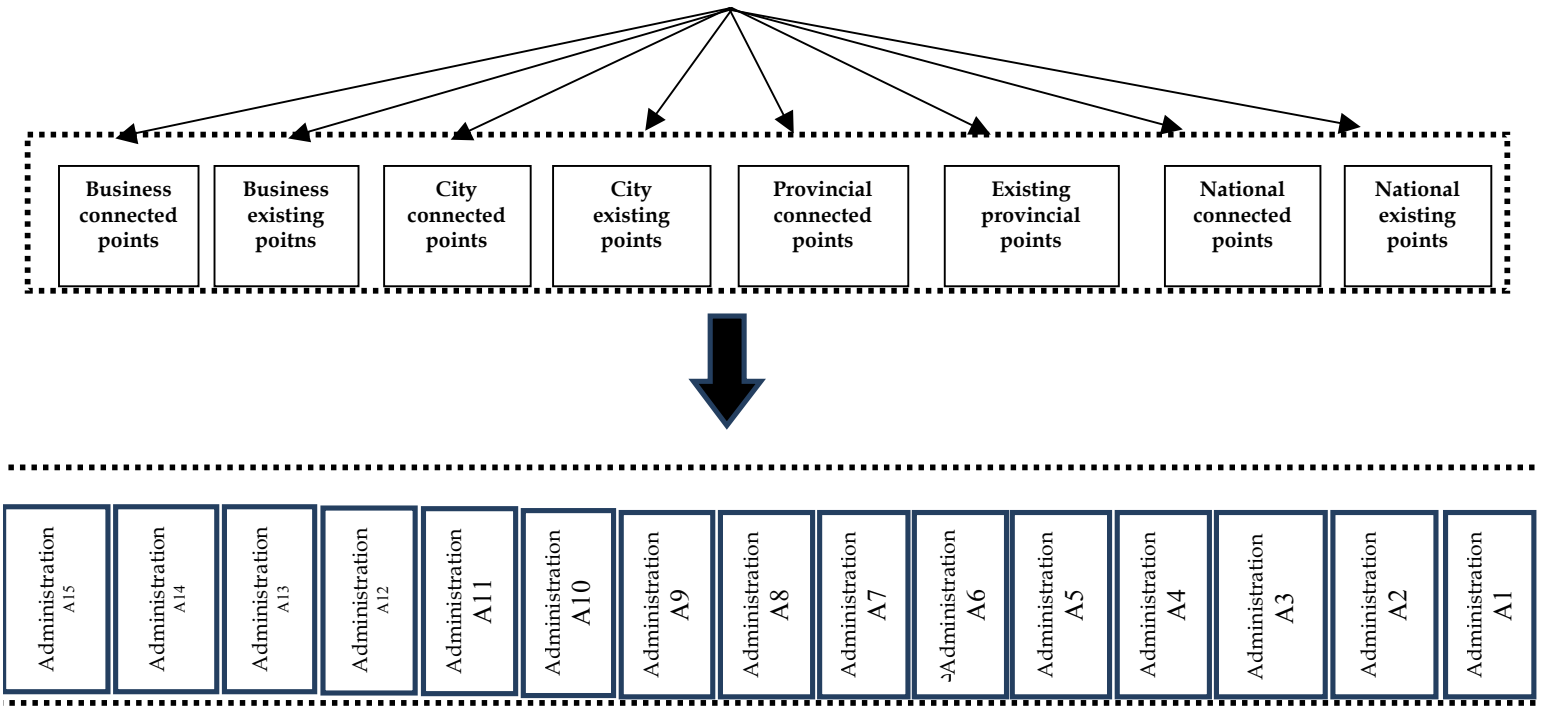

Figure: The conceptual research model based on prioritization of connection of administrations to an internal network

TOPSIS METHOD

Now, in order to achieve the final rating, these different ratings are put in matrix and will be solved using بردا figures and final rating of executive administrations shall be achieved.

Calculations

Furthermore, decision making and calculations matrixes performed on these matrixes shall be given.

Table 1: Matrix of Decision Making

First, table of decision making (number of connected and existing points of central administrations of the nation with subunits) shall be drawn.

Table 1: Matrix of Decision Making

Index	National Existing points	National connected points	Provincial existing points	Provincial connected points	city existing points	City connected points	business existing points	Business connecting points

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

Administration A1	13	13	64	64	714	714	89309	39845
Administration A2	84	81	131	69	0	0	78	78
Administration A3	7	0	30	30	0	0	9588	0
Administration A4	14	14	49	49	0	0	27000	9000
Administration A5	5	5	31	6	380	0	801	0
Administration A6	4	4	257	64	1408	214	1483	0
Administration A7	15	15	0	0	1107	666	0	0
Administration A8	5	5	31	31	1378	1378	0	0
Administration A9	5	5	0	0	0	0	911	2
Administration A10	26	12	31	0	93	0	0	0
Administration A11	30	16	31	30	337	291	100000	10000
Administration A12	29	24	290	252	1336	1050	18	0
Administration A13	12	11	89	79	1600	1354	941	904
Administration A14	1	0	31	0	361	0	20338	0
Administration A 15	13	13	288	288	9244	9244	11578	11578
Total	263	218	1353	962	17958	14911	262045	71407

TABLE OF WEIGHT OBTAINED FROM EACH ELITE FOR EIGHT CRITERIA

After we have obtained the importance of all eight criteria from eight elite, we develop table of weights of criteria. Thus, the surface of this table comprises elites and its column indicates existing criteria. At the end, using the average of weights obtained from each criterion, the weight of corresponding weight shall be achieved.

Table 2: The weights obtained from each elite for eight existing criteria

	Elite 1		Elite 2		Elite 3		Elite 4		Elite 5		Elite 6		Elite 7		Elite 8		Final weigh of criteri
Criterion	100	0.145	90	0.127	100	0.150	80	0.118	90	0.137	90	0.143	100	0.150	80	0.120	0.137

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

riterion 2	70	0.102	100	0.217	90	0.135	70	0.103	80	0.122	80	0.127	90	0.135	70	0.105	0.131
riterion 3	90	0.130	80	0.140	100	0.150	100	0.147	60	0.090	100	0.159	80	0.120	90	0.135	0.134
riterion 4	100	0.145	70	0.098	90	0.135	90	0.133	50	0.076	80	0.127	90	0.135	60	0.090	0.118
riterion 5	100	0.145	100	0.217	80	0.120	90	0.133	100	0.152	70	0.112	90	0.135	100	0.150	0.146
riterion 6	60	0.087	100	0.217	80	0.120	80	0.118	90	0.137	80	0.127	70	0.105	90	0.135	0.131
riterion 7	90	0.130	90	0.127	60	0.090	100	0.147	90	0.137	70	0.112	80	0.120	80	0.120	0.123
riterion 8	80	0.163	80	0.140	70	0.105	70	0.103	100	0.152	60	0.096	70	0.105	100	0.150	0.127
Total	690	1	710	1	670	1	680	1	660	1	630	1	670	1	670	1	1

Descaling of the figures given in the table:

Since number of existing and connected points of central administrations in order of subdivisions is different in each criterion, we should descale the figures inside each column. For this purpose, we use soft Euclidean formulation.

Table 3: Descaling of the points of decision making matrix

Index	National existing points	National connected points	Provincial existing points	Provincial connected points	City existing points	City connected points	Existing business points	Business connected points
Administration A1	0.80	0.88	1.74	2.06	5.33	5.85	174.46	149.11
Administration A2	5.18	5.49	3.56	2.22	0.00	0.00	0.15	0.29
Administration A3	0.43	0.00	0.82	0.97	0.00	0.00	18.73	0.00
Administration A4	0.86	0.95	1.33	1.58	0.00	0.00	52.74	33.68
Administration A5	0.31	0.34	0.84	0.19	2.84	0.00	1.56	0.00
Administration A6	0.25	0.27	6.99	2.06	10.51	1.75	2.90	0.00

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

Administration A7	0.92	1.02	0.00	0.00	8.26	5.45	0.00	0.00
Administration A8	0.31	0.34	0.84	1.00	10.28	11.28	0.00	0.00
Administration A9	0.31	0.34	0.00	0.00	0.00	0.00	1.78	0.01
Administration A10	1.60	0.81	0.84	0.00	0.69	0.00	0.00	0.00
Administration A11	1.85	1.08	0.84	0.97	2.51	2.38	195.35	37.42
Administration A12	1.79	1.63	7.88	8.12	9.97	8.60	0.04	0.00
Administration A13	0.74	0.75	2.42	2.55	11.94	11.09	1.84	3.38
Administration A14	0.06	0.00	0.84	0.00	2.69	0.00	39.73	0.00
Administration A15	0.80	0.88	7.83	9.29	68.98	75.70	22.62	43.33

Formation of normalized matrix of descaled weights

For normalization of weights, first, we should write down the weight of each criterion on top of each column.

Table 4: Table of multiplication of weight of each criterion by the column of the same criterion

The weights of criteria	0.137	0.131	0.134	0.118	0.146	0.131	0.123	0.127
Index	National existing points	National connected points	Provincial existing points	Provincial connected points	City existing points	City connected points	Business existing points	Business connected points
Administration A1	0.80	0.88	1.74	2.06	5.33	5.85	174.46	149.11
Administration A2	5.18	5.49	3.56	2.22	0.00	0.00	0.15	0.29
Administration A3	0.43	0.00	0.82	0.97	0.00	0.00	18.73	0.00
Administration A4	0.86	0.95	1.33	1.58	0.00	0.00	52.74	33.68
Administration A5	0.31	0.34	0.84	0.19	2.84	0.00	1.56	0.00
Administration A6	0.25	0.27	6.99	2.06	10.51	1.75	2.90	0.00
Administration A7	0.92	1.02	0.00	0.00	8.26	5.45	0.00	0.00
Administration A8	0.31	0.34	0.84	1.00	10.28	11.28	0.00	0.00
Administration A9	0.31	0.34	0.00	0.00	0.00	0.00	1.78	0.01
Administration A10	1.60	0.81	0.84	0.00	0.69	0.00	0.00	0.00

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

Administration A11	1.85	1.08	0.84	0.97	2.51	2.38	195.35	37.42
Administration A12	1.79	1.63	7.88	8.12	9.97	8.60	0.04	0.00
Administration A13	0.74	0.75	2.42	2.55	11.94	11.09	1.84	3.38
Administration A14	0.06	0.00	0.84	0.00	2.69	0.00	39.73	0.00
Administration A15	0.80	0.88	7.83	9.29	68.98	75.70	22.62	43.33

Then, the weight of each criterion is written in all figures of corresponding column to the said criterion and develop the following table, which is normalized table of weights:

Table 5: Normalized Table of Weights of each Criterion

Weights of criteria	0.137	0.131	0.134	0.118	0.146	0.131	0.123	0.127
Index	National Existing points	National connected points	Provincial existing points	Provincial connected points	City existing points	City connected points	Business existing points	Business connected points
Administration A1	0.11	0.12	0.23	0.24	0.78	0.77	21.46	18.94
Administration A2	0.71	0.72	0.48	0.26	0.00	0.00	0.02	0.04
Administration A3	0.06	0.00	0.11	0.11	0.00	0.00	2.30	0.00
Administration A4	0.12	0.12	0.18	0.19	0.00	0.00	6.49	4.28
Administration A5	0.04	0.04	0.11	0.02	0.41	0.00	0.19	0.00
Administration A6	0.03	0.04	0.94	0.24	1.53	0.23	0.36	0.00
Administration A7	0.13	0.13	0.00	0.00	1.21	0.71	0.00	0.00
Administration A8	0.04	0.04	0.11	0.12	1.50	1.48	0.00	0.00
Administration A9	0.04	0.04	0.00	0.00	0.00	0.00	0.22	0.00
Administration A10	0.22	0.11	0.11	0.00	0.10	0.00	0.00	0.00
Administration A11	0.25	0.14	0.11	0.11	0.37	0.31	24.03	4.75
Administration A12	0.25	0.21	1.06	0.96	1.46	1.13	0.00	0.00
Administration A13	0.10	0.10	0.32	0.30	1.74	1.45	0.23	0.43
Administration A14	0.01	0.00	0.11	0.00	0.39	0.00	4.89	0.00
Administration A15	0.11	0.12	1.05	1.10	10.07	9.92	2.78	5.50

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

Identifying a ideal positivesolution and a ideal negative solution

Now, we develop the table of positive and ideal negative solutions. For this purpose, we consider the corresponding criteria to existing points of administrations as negative nature (since it has cost nature), and the corresponding criteria to connected points as positive nature. Then, we develop the following table through ideal positive and ideal negative formula.

Table 6: Ideal positive and ideal negative solution

	National existing points	National connected points	Provincial existing points	Provincial connected points	City existing points	City connected points	Business existing points	Business connected points
A+	0.01	0.72	0.00	1.10	0.00	9.92	0.00	18.94
A^-	0.71	0.00	1.06	0.00	1.74	0.00	24.03	0.00

DISTANCE CALCULATION

Now that we have calculated the figures of the aforesaid table, we must calculate the distance between each option and ideal positive and ideal negative solution according to the formula for measurement of distances. The following results have been obtained:

d*A1 = 23.37

d*A2 =21.38

d*A3 = 21.53

d*A4 = 18.88

d*A5 = 21.42

d*A6 = 21.38

d*A7 = 21.13

d*A8 = 20.82

d*A9 = 21.42

d*A10 = 21.41

d*A11 = 29.53

d*A12 = 20.96

d*A13 = 20.45

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

d*A14 =21.97

d*A15 = 17.06

d*A = {d*A1 , d*A2 , d*A3 , d*A4 , d*A5 , d*A6 , d*A7 , d*A8 , d*A9 , d*A10 , d*A11 , d*12 , d*A13 , d*A14 , d*A15}

d*A = { 23.37 , 21.38 , 21.53 , 18.88 , 21.42 , 21.38 , 21.13 , 20.82 , 21.42 , 21.41 , 29.53 , 20.96 , 20.45 , 21.97 , 17.06}

d-A1 = 19.18

d-A2 =24.09

d-A3 = 21.82

d-A4 = 18.17

d-A5 = 23.90

d-A6 = 23.68

d-A7 = 24.08

d-A8 = 24.10

d-A9 = 23.91

d-A10 = 24.11

d-A11 = 5.07

d-A12 = 24.08

d-A13 = 23.87

d-A14 =19.22

d-A15 = 25.51

d-A = {d-A1 , d-A2 , d-A3 , d-A4 , d-A5 , d-A6 , d-A7 , d-A8 , d-A9 , d-A10 , d-A11 , d-12 , d-A13 , d-A14 , d-A15}

d-A = { 19.18 , 24.09 , 21.82 , 18.17 , 23.90 , 23.68 , 24.08 , 24.10 , 23.91 , 24.11 , 5.07 , 24.08 , 23.87 , 19.22 , 25.51}

Relative closeness and calculation of final figures for prioritization of administrations

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

Table 7: Final Administrational Figures

CA1	0.451
CA2	0.530
CA3	0.503
CA4	0.490
CA5	0.527
CA6	0.526
CA7	0.533
CA8	0.537
CA9	0.527
CA10	0.530
CA11	0.147
CA12	0.535
CA13	0.539
CA14	0.467
CA15	0.599

Final step: Prioritization of Central National Administrations

Finally, sorting out the figures of the above table on ascending-descending basis, we prioritize the central administrations as follows:

Table 8: Prioritization of Central National Administrations

Priority	Name of Administration
1	A15
2	A13
3	A8
4	A12
5	A7
6	A2
7	A10
8	A5
9	A9
10	A6
11	A3
12	A4
13	A14
14	A1
15	A11

Submit Date: 19.06.2016, Acceptance Date: 24.07.2016, DOI NO: 10.7456/1060AGSE/011

CONCLUSION

Relying on the fact that there are a number of the executive administrations across the nation and that it is not possible to connect all administrations to this network simultaneously and on parallel basis, it has been decided that first according an instruction notified to the central administrations stating that all administrations, general office and all departments across cities and counties as well as affiliated business to the data center should be connected to the corresponding ministry so that after finalization of specialized network connection of the respective administration, the required measures should be taken to connect the data center of the corresponding administration to share center. Thus, all central administrations shall be connected to this network.

As it has been mentioned earlier, considering connection of national central administrations to this network, no priority has been considered for order of connection of corresponding administrations. Thus, in this research , we have made up our mind to prioritize the administrations so that the said administrations shall be connected to this network based on the said prioritization. Consequently, through application of TOPSIS model, fifteen central national administrations have been prioritized based on eight criteria so that in this great national plan we could the order of connection of administrations based on this prioritization.

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