Ranking of Electronic Business Processes with TOPSIS Technique

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Abstract:

E-business is similar to e-commerce, but goes beyond simply buying and selling products and services online. E-business includes a wider range of business processes, such as supply chain management, electronic order processing and customer relationship management. Therefore, e-business processes can help companies operate more efficiently and effectively. The purpose of this research is to rank the main and key options in electronic business using the TOPSIS algorithm. The results showed that the most important among the indicators is related to the idea and creativity to find a new and effective customer in the market and the large and significant network of suppliers, and the indicators of continuous innovation and productivity and the ability to track orders in comparison with the indicators They are less important.

Keywords: ranking, electronic business, TOPSIS algorithm.

1- Introduction

E-business includes any process that a business organization conducts through a computer-mediated network [1]. Business organizations include any for-profit, governmental or non-profit entity. Their processes include production-based, customer-based, and internal or management-based business processes. E-business includes several main components: business intelligence, customer relationship management, supply chain management, enterprise resource planning, e-commerce, intra-company e-commerce, collaboration and online. Inter-occupational activities [2].

Innovations in communication technology allow businesses to operate globally like before. In the past, communications could take several days. Now all business transactions are performed in just few minutes. E-commerce, also known as e-commerce, refers to doing business over the Internet [3-5].

The benefits of such a business are many and increasing every day. Starting an e-business is about pursuing the dream of balancing professional goals and personal freedoms at a pace you can live with [6].

The emergence of communication technology facilitated communication, joining companies, creating value networks, and the increasing fading of industry boundaries, and replaced the concept of business model as the unit of analysis. Related business is one of the important and promising business areas that can create thousands of job and income opportunities, if the necessary technological, social and economic infrastructures of the country are provided [7].

There are as many types of business models [8,9]. For example, direct sales, advertising-based stores are the examples of traditional business models. Hybrid models also exist, such as businesses that combine online retail with brick-and-mortar stores or with sports organizations such as the NBA [10].

Veit's business model includes four parts: product, customer interface, infrastructure management, and financial resources. The product element includes the value provided; Customer interface including target customer, distribution channel and relationships. The sub-structure management includes the configuration of value, ability and cooperation, and financial resources including the cost structure and income model [11].

Veit considers this model to be a combination of three elements: value stream (value provided to business partners and customers), income stream (guaranteed income plan for operators) and support (various business supply chain design issues) for business [12].

After numerous reviews and studies, in order to conduct this research in the field of organizing and ranking internet businesses with the aim of creating culture and helping to improve the quality of e-commerce space, as well as compiling the ranking indicators of businesses with the electronic trust symbol [13]. In the first step, on How to monitor how businesses respond to the complaints received by buyers should be considered as a criteria for rating these businesses, and according to the way of interaction and response of franchise owners of internet businesses, initial scoring is based on definition indicators [14]. However, it is important to mention that interaction and response to customers is only one of several criteria considered for ranking internet businesses. Moreover, the indicators such as website security, product presentation quality, customer experience, integrated sales system, optimal and efficient website, full compliance with privacy issues, etc. are all factors that have been explored in most countries of the world to rank businesses. It is hoped that with the implementation of the ranking of internet businesses, a safer and more advanced environment will be provided for new businesses and their customers so that we can see the growth and progress of these businesses as much as possible.

In this research, we are looking for an answer to the question of what is the ranking of businesses active in the field of electronic services.

2- Literature Review

Lucia et al., in a research titled e-business implementation and performance, analysis of mediating factors with the aim of investigating the impact of e-business implementation (in terms of internal and external integration) on organizational performance through the mediating effects of differentiation, company agility, It is the development of customer relations and attracting partners. The results show that the measurement of all structures support this feature, except for internal integration. Foreign diffusion leads to differentiation, firm agility, relationship development and partner attraction for American and Spanish firms. However, internal integration has no effect on any outcome that the United States, for Spanish firms, considers to have a positive and direct effect on economic performance. The mediating role of non-financial performance between outsourcing and organizational performance depends on the country [15].

Maditinos et al., in a research entitled factors affecting the implementation of successful e-business with the aim of investigating the impact of organizational capabilities on the successful implementation of e-business, more specifically, the study of a three-dimensional conceptual framework, including " It suggests organizational capabilities of learning, "knowledge management capability", "organizational readiness". The results of this study show that "availability of training", "level of knowledge" and "sharing knowledge" are the most important factors for the successful implementation of e-business. In addition, "company size" seems to be another important factor. On the other hand, "technical expertise", "accumulation of knowledge" and the application of knowledge have a significant impact on the implementation of electronic business [16].

Caldwell et al., in a research entitled the effect of e-commerce on the understanding of supply chain risks with the aim of understanding the risks of

managers and individual supply chains in the understanding of e-business. The results show that e-business has the potential to bring benefits consider significant, but also include new and different risks. This research shows that small companies pay short attention to e-business instead of running it. E-business can support rather than reduce relationships within the organization [17].

Yuen, in an article titled Towards a ranking strategy for e-commerce products in Etihad Electronic Portal using the basic cognitive network process, presented that the basic cognitive network process for the ranking strategy is proposed according to multiple criteria and multiple options [18].

Barnes & Hinton in a research entitled the concept of measuring e-business performance using an innovation acceptance framework, the purpose of this article is to renew the evidence of e-business performance by studying it in the innovation acceptance theory. Studying the importance of individual, cognitive, social and cultural influences in environmental organization is a factor in the desire to adapt measurement criteria for online business activities. The findings point to the benefits available from incorporating new theoretical perspectives into performance measurement research [19].

Bordonaba-Juste et al., in a research entitled the antecedents and consequences of e-business adoption for European retailers with the aim of contributing to the discussion related to the antecedents of business e-mail use and the effect of this level in changing strategy, management and marketing. The results show that the application of electronic business means a change in strategy, company management and marketing in all the countries studied. The differences between the two groups of countries are minimal. The main factors influencing the level of business email usage are expertise and perceived benefits [20].

Wen et al, have evaluated the efficiency of these businesses in a research titled measuring the efficiency of e-businesses with the data envelopment analysis

method. The input and output variables were determined with three financial, operational and e-business specific criteria [21].

Serrano et al., studied measuring the efficiency of Internet companies using the data coverage analysis method and rank Internet companies based on their efficiency. In this regard. Three criteria have been considered as input and two criteria as output of the system; And by measuring the efficiency of this system, they have ranked internet companies [22].

There are very few researches about the ranking of active companies in the field of electronic business, so that most of these researches are focused on the long-term or short-term performance of electronic businesses.

3- Research method

1- Descriptive and demographic statistics of the research sample

The characteristics of the sample members, including gender, work experience and educational degree are reported below.

Gender

As seen in the graph below, 75% of the respondents were male and 25% were female.

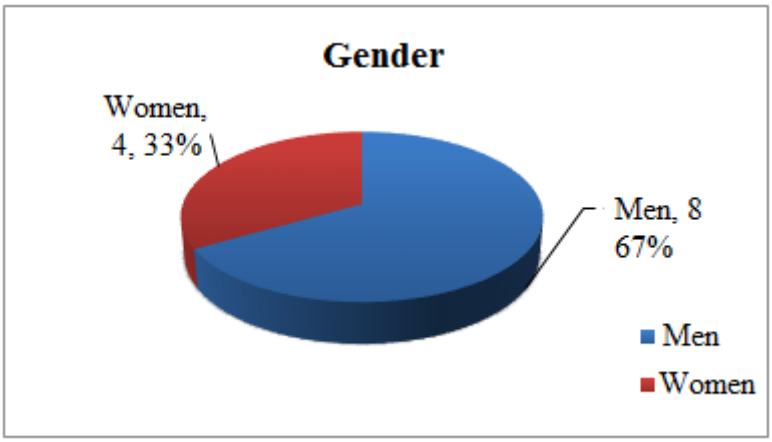

Figure 1- Gender of sample people

B- Work experience

As seen in figure (2), 25 percent of the respondents have a work experience between 5 and 10 years. 33% of the participants have a work experience between 11 and 15 years and 17% of the respondents between 16 and 20 years of experience and finally 25% of the participants have a work experience of more than 20 years.

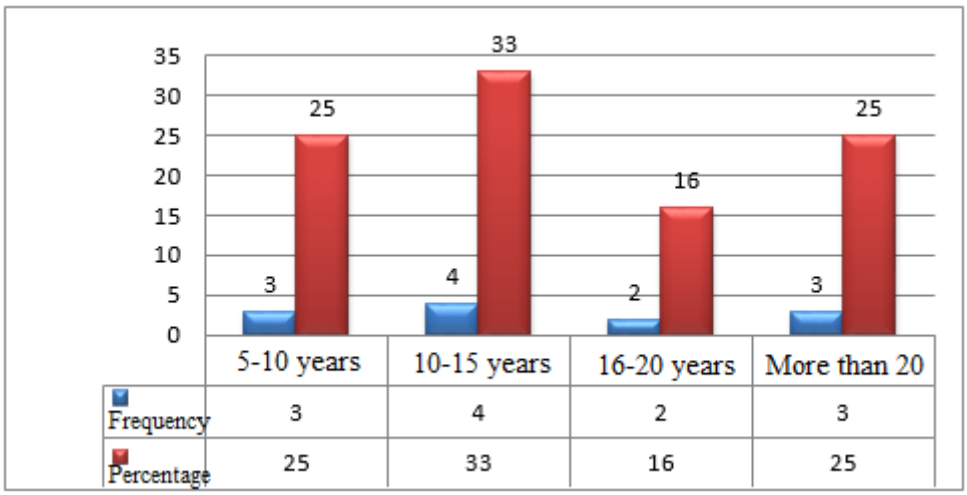

Figure 2- Professional Work experience of sample people

C- Educational Degree

As seen in Figure 3, 25% of the respondents had a master's degree (M.Sc) and 75% of the respondents had a Ph.D degree.

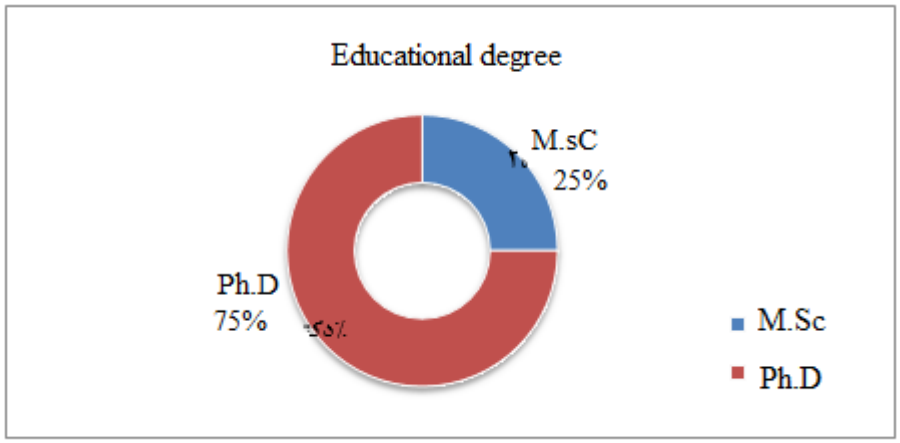

Figure 3- Educational degree of sample people

3-2- Data analysis

In according to the study of theoretical foundations and experts' opinions, the factors influencing the evaluation of electronic business ranking indicators are divided into six main categories (supply management, marketing and market management, supply and sales, logistics and distribution, warranty and customer relations, and internal business management), and 24 sub-factors were identified in the figure 2. Then, the matrix of AHP pairwise comparisons was made for the main and secondary factors and was provided to them in order to get the opinion of the experts.

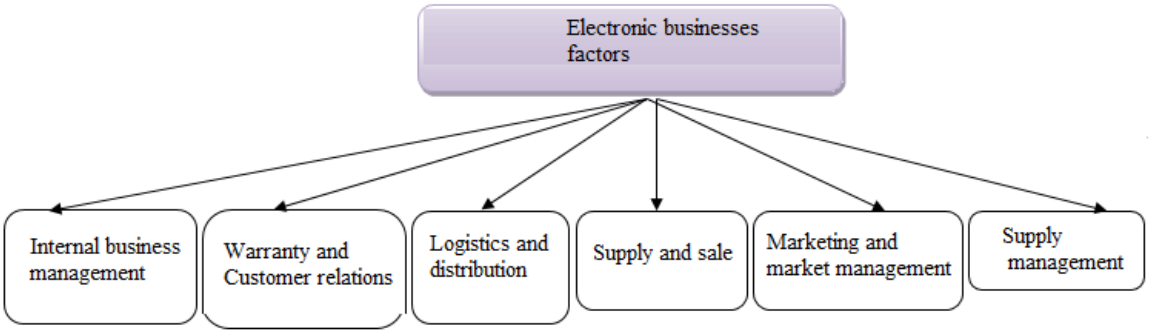

Figure 2: Conceptual model of e-business factors

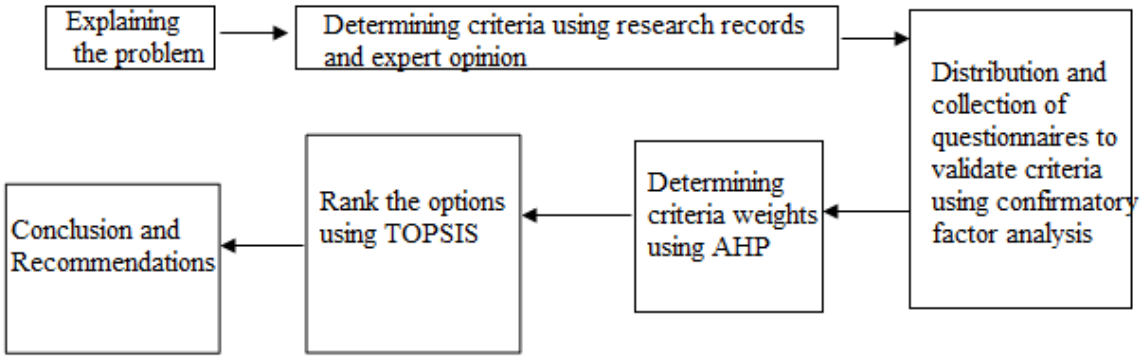

Figure 5: Research process

3-2-1- Steps of working with AHP

The working steps of the AHP model begin with defining the elements and deciding and prioritizing them. To use AHP in solving the evaluation problem, there are five basic steps as follows:

The first step: forming a hierarchical tree

The second step: determining the importance of criteria and sub-criteria

The third step: determining the importance coefficient of the options

The fourth step: determining the final score

The fifth step: Examining consistency in judgments.

Objective: The main question of the research or the problem that we intend to solve is called the objective. The goal is the highest level of the hierarchical tree and has only one parameter, the selection of which is the task of the highest level of project decision making.

Criteria: It is called the criteria that include the goal and the creator of that criterion. The standards are actually the touchstone of the goal or the means of measuring it. The more the criteria cover more of the target components and express the target more, the more accurate the result will be. Criteria are the second level of the hierarchical tree after the goal. At this level, we can draw and adjust the required number of criteria on the horizontal level as needed. The criteria can be divided into sub-criteria. This situation can be increased up to n below the standard on the vertical and horizontal level depending on the necessity.

Substitutes: Substitutes are actually the purpose and destination of the target in the hierarchical tree, and the target response is obtained from among the drawn alternatives. Alternatives are the last level of the hierarchical tree and it depends on how to use the AHP method.

Table 4: Valuation of indicators relative to each other

The preferred value	The comparison situation of i compared to j	Explanation
1	Equal importance	Option or index i has equal importance compared to j or they do not have priority over each other.
3	Relatively more important	Option or index i is slightly more important than j.
5	More important	Option or index i is more important than j.
7	Much more important	Option or index i has much more priority than j.
9	Absolutely important	Option or index is absolutely not more important than j and comparable to j.

2,4,6,8		Intermediate values show the priority values, for example, 8 indicates a higher importance than 7 and lower than 9 for I.

3-2-2- Weighing the options based on Chang's extended analysis method

In 1992, Chang presented a very simple method to extend the hierarchical analysis process to fuzzy space. This method, which was developed based on arithmetic mean of experts' opinions and hourly normalization method and using fuzzy triangular numbers, was investigated by researchers. The steps to perform this method are as follows:

Step 1; Draw a hierarchical tree: In this step, draw the structure of the decision hierarchy using the goal, criterion and option levels.

Step 2; Forming the matrix of paired comparisons:

Using the opinion of the decision maker, form the matrix of comparisons using triangular fuzzy numbers $t_{i.j} = (a_{ij}.b_{ij}.c_{ij})$ based on the opinions of several decision makers.

$$\tilde{A} = \begin{bmatrix} (1\ .1.1) & \begin{Bmatrix} \tilde{a}_{211} \\ \tilde{a}_{212} \\ \dots \\ \tilde{a}_{21P21} \end{Bmatrix} & \begin{Bmatrix} \tilde{a}_{1n1} \\ \tilde{a}_{1n2} \\ \dots \\ \tilde{a}_{1nP1n} \end{Bmatrix} \\ \begin{Bmatrix} \tilde{a}_{211} \\ \tilde{a}_{212} \\ \dots \\ \tilde{a}_{21P21} \end{Bmatrix} & (1\ .1.1) & \begin{Bmatrix} \tilde{a}_{2n1} \\ \tilde{a}_{2n2} \\ \dots \\ \tilde{a}_{2nP2n} \end{Bmatrix} \\ \dots & \dots & \\ \dots & \dots & \\ \dots & \dots & \\ \dots & \dots & \\ \begin{Bmatrix} \tilde{a}_{n11} \\ \tilde{a}_{n12} \\ \dots \\ \tilde{a}_{n1P_{n1}} \end{Bmatrix} & \begin{Bmatrix} \tilde{a}_{n21} \\ \tilde{a}_{n12} \\ \dots \\ \tilde{a}_{n1P_{n1}} \end{Bmatrix} & (1\ .1.1) \end{bmatrix}$$

In this matrix, P_{ij} is the number of people commenting on the priority of department i compared to j.

Step 3; Arithmetic mean of opinions: Arithmetic mean of decision makers' opinions in the form of the matrix below

Calculate:

$$\tilde{A} = \begin{bmatrix} (1.1.1) & \tilde{a}_{12} & \tilde{a}_{1n} \\ \tilde{a}_{21} & (1.1.1) & \tilde{a}_{2n} \\ \tilde{a}_{n1} & \tilde{a}_{n2} & (1.1.1) \end{bmatrix}$$

Mean of decision makers' opinions

$$\tilde{a}_{ij} = \frac{\sum_{k=1}^{p_{ij}} a_{ijk}}{P_{ij}} \qquad i.j = 1.2. \ldots . n$$

Step 4; Calculation of the sum of the row elements: Calculate the sum of the row elements:

$$\tilde{S}_i = \sum_{j=1}^{n} a_{ij} \qquad i = 1.2 \ldots . n$$

Step 5; Normalize: Normalize the sum of the rows in the following way.

$$\widetilde{M}_i = \tilde{S}_i \otimes \left[\sum_{i=1}^{n} \tilde{S}_i\right]^{-1} \qquad i = 1.2. \ldots . n$$

Step 6; Determining the degree of probability of being larger:

We calculate the degree of probability that each μi is larger than other μi and call it d'(Ai).

The degree of probability that the fuzzy triangular number ${}_2\mu_2=(l_2,m_2,u)$ is larger than the fuzzy triangular number ${}_1\mu_1=(l_1,m_1,u)$ is equal to:

$$V(M_2 > M_1) = sub_{y \geq x}\left[\min(\mu_{M_1}(x).(\mu_{M_2}(y)\right]$$

This relationship can be synonymously expressed as follows:

$$V(M_2 \geq M_1) = hgt(M_2 \cap M_1) = \mu_{M_2}(d)$$
$$= \begin{cases} 1 & m_2 \geq m_1 \\ 0 & l_2 \geq u_1 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)} & \text{otherwise} \end{cases}$$

Normalizing: by normalizing the vector and women, the normalized weights are obtained.

$$w = \left[\frac{\acute{d}(A_1)}{\sum_{i=1}^{n} \acute{d}(A_i)}.\frac{\acute{d}(A_2)}{\sum_{i=1}^{n} \acute{d}(A_i)} .\dots.\frac{\acute{d}(A_n)}{\sum_{i=1}^{n} \acute{d}(A_n)}\right]^T$$

The above weights are deterministic (non-phased) weights. By repeating this process, the weights of all the matrices are obtained.

By performing these calculations, the results are obtained in the following order.

Step 8: Combination of weights: By combining the option weights and criteria, the final weights are obtained.

$$\widetilde{U}_i = \sum_{j=1}^{n} \widetilde{W}_i \tilde{r}_{ij} \qquad \forall i$$

3-2-3- TOPSIS method

The main logic of the TOPSIS method presented by Huang and Yun in 1891 is the definition of an ideal solution and a negative ideal solution. The ideal answer is the answer that maximizes the benefit criteria and minimizes the cost criteria. On the contrary, the ideal answer is negative. The best option is the one that has

the least distance from the ideal and the most distance from the negative ideal. In this research, the method proposed by Kaya and Kahraman in 2011 was used to perform TOPSIS calculations. Consider the decision matrix related to each of the experts as follows (P is the number of experts, m is the number of options, and n is the number of criteria):

$$\tilde{Z}^{(k)} = \begin{bmatrix} \widetilde{Z_{11}}^{(k)} & \cdots & \widetilde{Z_{12}}^{(k)} \\ \vdots & \ddots & \vdots \\ \widetilde{Z_{21}}^{(k)} & \cdots & \widetilde{Z_{2n}}^{(k)} \\ \widetilde{Z_{m1}}^{(k)} & \widetilde{Z_{n2}}^{(k)} & \widetilde{Z_{mn}}^{(k)} \end{bmatrix} . k = 1.2. \ldots . P$$

In the next step, you get the average of experts' opinions collectively.

$$\widetilde{D}^{(k)} = \begin{bmatrix} \widetilde{x_{11}}^{(k)} & \widetilde{x_{12}}^{(k)} & \cdots & \widetilde{x_{1n}}^{(k)} \\ \vdots & & \ddots & \vdots \\ \widetilde{x_{21}}^{(k)} & \ddots & \cdots & \widetilde{x_{2n}}^{(k)} \\ \widetilde{x_{m1}}^{(k)} & \widetilde{x_{n2}}^{(k)} & \ldots & \widetilde{x_{mn}}^{(k)} \end{bmatrix}$$

4- Results

4-1- Determining the priority of criteria and indicators using AHP technique

In this research, Hierarchical analysis technique has been used to determine the weight of the extracted criteria and indicators from the records and library studies. In Table 2, the criteria and sub-criteria extracted from the research and the corresponding symbols are presented in the Expert Choice 11 software.

Table 2: Research criteria and sub-criteria and their corresponding symbols in the AHP software

Criteria	symbol	Sub-criteria	symbol
Supply management	C1	A large and significant network of suppliers	C11
		Communication with the supplier through electronic communication	C12
		Codified mechanism for selection, evaluation, ranking	C13
		Strategy and consultation and cooperation	C14
Marketing and market management	C2	Ideas and creativity to find new customers	C21
		Participation and cooperation in virtual space	C22
		Effective in the market	C23
Supply and sale	C3	Being up-to-date and having the quality of the products	C31
		Easy to use and stylish appearance of the product	C32
		Product customization	C33
		Technical capabilities, especially speed	C34
		security	C35
		Reasonable price compared to competitors	C36
Logistics and distribution	C4	Availability of products	C41
		Different products	C42
		Fast response	C43
		Ability to track orders	C44
		Ability to withdraw the product	C45
Warranty and customer relations	C5	Warranty	C51
		after sales service	C52
		Communication with customers after purchase	C53
Internal business management	C6	Training and updating employees	C61
		Continuous innovation and productivity	C62
		Cost management strategy	C63

4-2- Determining the priority and weight of sub-criteria based on the purpose of the research

At this stage, the research sub-criteria have been compared in pairs based on the goal. The final ranking of the 24 criteria affecting the ranking of electronic businesses is presented in Table 3. As can be seen, according to the reported results, the most important among the indicators is related to the idea and

creativity to find a new and effective customer in the market and a large and significant network of suppliers. Also, the indicators of continuous innovation and productivity and the ability to track orders are less important in comparison with other indicators.

Table 3: The final weights of 24 indicators affecting the ranking of electronic businesses based on the AHP technique

Factors	Weight factor	Indexes	Index weight in the subgroup	Final weight	Rank
Supply management	0.251	A large and significant network of suppliers	0.468	0.117	3
		Electronic communication with suppliers	0.174	0.044	6
		Codified mechanism for selection, evaluation, ranking	0.199	0.05	5
		Strategy and consultation and cooperation	0.159	0.04	7
Marketing and market management	0.457	Ideas and creativity to find new customers	0.587	0.268	1
		Participation and cooperation in virtual space	0.120	0.055	4
		Effective in the market	0.293	0.134	2
Supply and sale	0.116	Being up-to-date and having the quality of the products	0.184	0.021	14
		Easy to use and stylish appearance of the product	0.076	0.009	20
		Product customization	0.062	0.007	21
		Technical capabilities, especially speed	0.077	0.009	19
		security	0.328	0.038	8
		Reasonable price compared to competitors	0.273	0.032	10
Logistics and distribution	0.075	Availability of products	0.305	0.023	13
		Different products	0.427	0.032	9
		Fast response	0.135	0.01	18
		Ability to track orders	0.065	0.005	23
		Ability to withdraw the product	0.069	0.005	22
Warranty and customer relations	0.057	Warranty	0.337	0.019	15
		after sales service	0.462	0.026	12
		Communication with customers after purchase	0.201	0.011	17
Internal business management	0.045	Training and updating employees	0.239	0.011	16
		Continuous innovation and productivity	0.100	0.004	24
		Cost management strategy	0.661	0.03	11

4-3- Ranking of electronic business processes with TOPSIS technique

In this study, TOPSIS technique was used to rank the key processes of electronic business. The most suitable option is the option that has the most distance from negative factors and the least distance from positive factors. In this research, 5 of the key processes in the TOPSIS technique have been investigated, which are reported in Table 4.

Table 4: Key processes of electronic businesses

	process	Symbol in Topsis software
1	Business Intelligence	A1
2	Supply Chain Management	A2
3	customer relation management	A3
4	Enterprise Resource Planning	A4
5	Electronic commerce	A5

In the first stage of the TOPSIS technique, the final criteria extracted using the AHP technique are used as input and decision table columns in the TOPSIS technique. Due to the fact that several experts were used in this research, the decision matrix was obtained through the mean of all experts. This matrix can be observed in Table 5.

Table 5: The decision matrix of all experts

	C11	C12	C13	C14	C21	C22	C23	C31	C32	C33	C34	C35	C36	C41	C42	C43	C44	C45	C51	C52	C53	C61	C62	C63
A 1	6.5	7.5	6	6	8.5	5	6	6	5.5	8	7	7.5	4.5	7.5	7	8	4	5	4.5	6	8.5	8.5	8	8
A 2	8.5	6	9	7	5	7	5	4	3.5	4	4.5	6	4	5	8	9	8	7	7	8	4	4	7	5
A 3	4.5	8.5	4.5	6	9	6	7	7	6	6	3.5	9	6.5	8	5.5	5	8	7	9	9	9	5	8	5
A 4	3.5	4	4	3.5	4	4.5	3	3	2.5	3	3	4	3	4	4	4	3	4	2.5	4.5	4	9	6	4
A 5	4.5	5	5.5	5	5	8	7	8	7.5	6	8.5	5.5	5	6.5	7	7	7	6	5	5	8	6	8	7.5

The steps of the TOPSIS method

Step 1: Normalize the decision matrix

The following relationship is used for normalization.

$$r_{ij}(\mathrm{x}) = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}} \qquad i = 1, \dots, m \;\; ; j = 1, \dots \;\; , n \qquad\qquad 1$$

The results of the normalized matrix is reported in Table 6.

Table 6: The normalized matrix

	C11	C12	C13	C14	C21	C22	C23	C31	C32	C33	C34	C35	C36	C41	C42	C43	C44	C45	C51	C52	C53	C61	C62	C63
A1	0.503	0.523	0.443	0.477	0.574	0.359	0.463	0.455	0.463	0.63	0.549	0.506	0.424	0.526	0.485	0.522	0.281	0.378	0.334	0.399	0.538	0.56	0.481	0.586
A2	0.657	0.419	0.664	0.556	0.338	0.502	0.386	0.303	0.295	0.315	0.353	0.405	0.377	0.35	0.554	0.587	0.563	0.529	0.52	0.532	0.253	0.264	0.421	0.366
A3	0.348	0.593	0.332	0.477	0.608	0.43	0.54	0.531	0.505	0.473	0.274	0.607	0.613	0.561	0.381	0.326	0.563	0.529	0.668	0.598	0.57	0.33	0.481	0.366
A4	0.271	0.279	0.295	0.278	0.27	0.323	0.231	0.227	0.211	0.236	0.235	0.27	0.283	0.28	0.277	0.261	0.211	0.302	0.186	0.299	0.253	0.593	0.361	0.293
A5	0.348	0.349	0.406	0.397	0.338	0.574	0.54	0.606	0.632	0.473	0.666	0.371	0.471	0.456	0.485	0.457	0.493	0.454	0.371	0.332	0.507	0.395	0.481	0.55

Step 2: Calculate the normalized weight matrix

In according to equation 2, the normalized matrix is multiplied by the weight of the criteria and the weighted normalized matrix is obtained.

$$v_{ij}(\mathrm{x}) = w_j r_{ij}(x) \qquad i = 1, \dots, m \;\; ; j = 1, \dots \;\; , n \qquad\qquad 2$$

The obtained normalized weight matrix is shown in table 7.

Table 7: The normalized weight matrix

	C11	C12	C13	C14	C21	C22	C23	C31	C32	C33	C34	C35	C36	C41	C42	C43	C44	C45	C51	C52	C53	C61	C62	C63
A1	0.059	0.023	0.022	0.019	0.154	0.02	0.062	0.01	0.004	0.004	0.005	0.019	0.014	0.012	0.016	0.005	0.001	0.002	0.006	0.01	0.006	0.006	0.002	0.018

A 2	0.0 77	0.0 18	0.0 33	0.0 22	0.0 9	0.0 28	0.0 52	0.0 06	0.0 03	0.0 02	0.0 03	0.0 15	0.0 12	0.0 08	0.0 18	0.0 06	0.0 03	0.0 03	0.0 1	0.0 14	0.0 03	0.0 03	0.0 02	0.0 11
A 3	0.0 41	0.0 26	0.0 17	0.0 19	0.1 63	0.0 24	0.0 72	0.0 11	0.0 05	0.0 03	0.0 02	0.0 23	0.0 2	0.0 13	0.0 12	0.0 03	0.0 03	0.0 03	0.0 13	0.0 16	0.0 06	0.0 04	0.0 02	0.0 11
A 4	0.0 32	0.0 12	0.0 15	0.0 11	0.0 72	0.0 18	0.0 31	0.0 05	0.0 02	0.0 02	0.0 02	0.0 1	0.0 09	0.0 06	0.0 09	0.0 03	0.0 01	0.0 02	0.0 04	0.0 08	0.0 03	0.0 07	0.0 01	0.0 09
A 5	0.0 41	0.0 15	0.0 2	0.0 16	0.0 9	0.0 32	0.0 72	0.0 13	0.0 06	0.0 03	0.0 06	0.0 14	0.0 15	0.0 1	0.0 16	0.0 05	0.0 02	0.0 02	0.0 07	0.0 09	0.0 06	0.0 04	0.0 02	0.0 16

Step 3: Determine positive and negative ideal points

The basis of the TOPSIS method is to calculate the distance of the options from the positive and negative ideal. Therefore, at this stage, the positive and negative ideal solutions are determined according to the following relationships

$$A^+ = (v_1^+, v_2^+, \dots, v_n^+) \qquad 3$$

$$A^- = (v_1^-, v_2^-, \dots, v_n^-) \qquad 4$$

So that:

$$v_j^+ = \left\{\left(max\ v_{ij}(x)\middle|\ j\epsilon j_1\right), \left(min\ v_{ij}(x)\middle|\ j\epsilon j_2\right)\right\}\ i = 1, \dots, m \qquad 5$$

$$v_j^- = \left\{\left(min\ v_{ij}(x)\middle|\ j\epsilon j_1\right), \left(max\ v_{ij}(x)\middle|\ j\epsilon j_2\right)\right\}\ i = 1, \dots, m \qquad 6$$

j_1 and j_2 correspond to positive and negative criteria, respectively. The ideal positive and negative values for the criteria of this research is presented in table 8.

Table 8: Positive and negative ideal values

Criteria	Positive ideal	Negative ideal
A large and significant network of suppliers	0.077	0.032
Electronic communication with suppliers	0.026	0.012
Codified mechanism for selection, evaluation, ranking	0.033	0.015
Strategy and consultation and cooperation	0.022	0.011
Ideas and creativity to find new customers	0.163	0.072
Participation and cooperation in virtual space	0.032	0.018
Effective in the market	0.072	0.031

Sufficiency, accuracy and up-to-date content of the online store	0.013	0.005
Easy to use and stylish appearance of the product	0.006	0.002
Product customization	0.004	0.002
Technical capabilities, especially speed	0.006	0.002
security	0.023	0.01
Reasonable price compared to competitors	0.02	0.009
Availability of products	0.013	0.006
Different products	0.018	0.009
Fast response	0.006	0.003
Ability to track orders	0.003	0.001
Ability to withdraw the product	0.003	0.002
Warranty	0.013	0.004
after sales service	0.016	0.008
Communication with customers after purchase	0.006	0.003
Development, training and improvement of employees	0.007	0.003
Continuous innovation and productivity	0.002	0.001
Effective and sustainable cost management and revenue models	0.018	0.009

Step 4: Calculate the distance from positive and negative ideal points

The TOPSIS method ranks options based on how close they are to the positive ideal and how far they are from the negative ideal. Therefore, at this stage, the distance of each option to the positive and negative ideal is calculated based on the following relationships.

$$d_i^+ = \sqrt{\sum_{j=1}^{n} [v_{ij}(x) - v_j^+(x)]^2} \quad , \quad i = 1, \dots, m \qquad 7$$

$$d_i^- = \sqrt{\sum_{j=1}^{n} [v_{ij}(x) - v_j^-(x)]^2} \quad , \quad i = 1, \dots, m \qquad 8$$

The positive and negative distance to the ideal for key processes is shown in table 9.

Table 9: The distance to positive and negative ideal

Option	Positive ideal distance	Negative ideal distance
Business Intelligence	0.031	0.094
Supply Chain Management	0.078	0.06

customer relation management	0.042	0.104
Enterprise Resource Planning	0.116	0.004
Electronic commerce	0.084	0.052

Step 5: Calculate how close the options are to the ideal

At this stage, the degree of proximity of each option to the ideal solution is obtained through the following formula. The closer this amount is to 1, it means that the option has less distance from the positive ideal and more distance from the negative ideal.

$$C_i = \frac{d_i^-}{(d_i^+ + d_i^-)} \quad , \quad i = 1, \dots, m \qquad 9$$

The relative closeness of each process or option to the ideal solution and their ranking is shown in table 10. As it is clear from the results of the table, the closest distance to the ideal solution for electronic businesses belongs to business intelligence factors in the first place with a value of 0.755 and customer relationship management in the second place with a value of 0.712.

Table 10: Ranking and closeness of key processes to ideal

Option	Ci	Rank
Business Intelligence	0.755	1
Supply Chain Management	0.437	3
Customer relation management	0.712	2
Enterprise Resource Planning	0.03	5
Electronic commerce	0.381	4

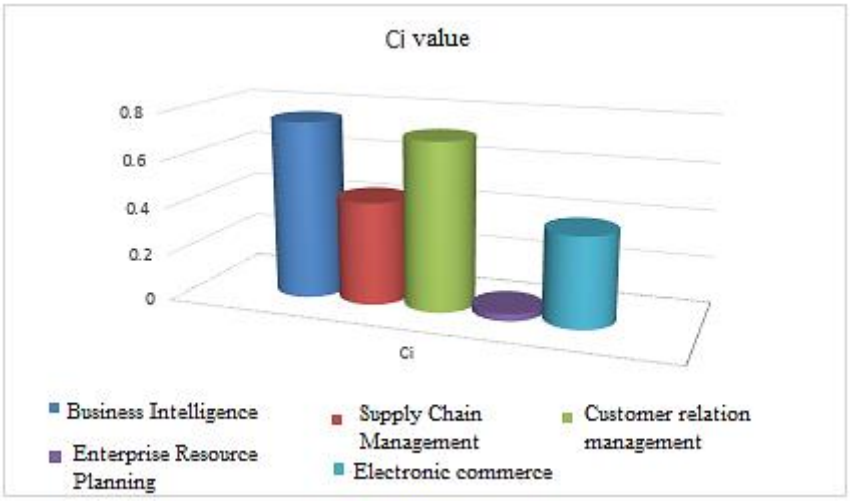

Figure 6: Ranking and closeness of key processes to ideal

Conclusion

In this research, the most important indicators affecting the ranking of electronic business were investigated and ranked.

Table 11: Electronic business weight based on AHP technique

Supply management	Marketing and market management	Supply and sale	Logistics and distribution	Warranty and customer relations	Internal business management
0.251	0.457	0.116	0.075	0.057	0.045
6	5	4	3	1	2

As shown in Table 11, the biggest weight of the main factors in the e-business ranking is related to marketing and market management. Also, determining the priority of the weight of the sub-criteria of supply management, the highest weight and importance among the sub-criteria of supply management is the large and significant network of suppliers with a weight of 0.468, and the least important weight is the sub-criterion of strategy and consultation and cooperation with a weight of 0.159.

It is concluded that among all the criteria and their sub-criteria in electronic business, the most important criteria is related to the idea and creativity to find a new and effective customer in the market and the large and significant network of suppliers. In addition, the Continuous innovation and productivity indicators and ability to track orders are less important in comparison with other indicators.

In this research, AHP and TOPSIS methods have been used to prioritize and measure them. which has been done in different steps of this work, in this research, five of the key processes in the TOPSIS technique have been examined, which include business intelligence, supply chain management, customer relationship management, organizational resource planning and business It is electronics, each of which has a symbol assigned to it in the Topsys software. The results in the step of determining positive and negative ideal points in business intelligence with a positive ideal distance of 0.031 and a negative ideal distance of 0.094. In supply chain management with a positive ideal distance of 0.078 and a negative ideal distance of 0.06 and in customer relationship management with a positive ideal distance of 0.042 and with a negative ideal distance of 0.104. In Enterprise Resource Planning with a positive ideal distance of 0.116 and with a negative ideal distance of 0.004 and in e-commerce with a positive ideal distance of 0.084 and with a negative ideal distance of 0.052 was achieved.

After calculating the degree of closeness of the options to the ideal, the closest distance to the ideal solution for electronic businesses belongs to business intelligence agents in the first place with a value of 0.755 and customer relationship management in the second place with a value of 0.712.

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