

## **Ranking Payam Noor University of Mazandaran province (using a numerical taxonomy analysis)**

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### **ABSTRACT**

*One of the characteristics of third world countries is intense focus and lack of balance, this feature is considered effect results of polarized growth policies that result of this policy, all the features and power is concentrated in one or more areas and other areas act as marginal. For creating balance and in order to make proper and homogeneous spaces in centers and Payame Noor universities of Mazandaran; This article addition introduction numerical taxonomy method and the Mathematical equations are examined inequalities centers and units by ranking them. In this study 2 the overall index been considered that these indicators were chosen in the field research and educational, and year examined in this study is period of 2011. For doing this work, first, using numerical taxonomy were identified entitlement status centers and units Payam Noor University of Mazandaran and universities in 3 categories were «entitlement», «semi Underserved» and «Underserved» in the next step, using methods Shannon Entropy and SAW, universities were ranked in terms of the enjoyment of these indices. The results showed in the field of Educational 29% of Payam Noor universities of Mazandaran are considered Entitlement 65% Semi Underserved and 6 percent Underserved. In the research index, 35% of Payam Noor universities of Mazandaran are considered Entitlement 53% Semi Underserved and 12 percent Underserved. The results showed in the field of Educational 29% of Payam Noor universities of Mazandaran are considered Entitlement 65% Semi Underserved and 6 percent Underserved. In the research index, 35% of Payam Noor universities of Mazandaran are considered Entitlement 53% Semi Underserved and 12 percent Underserved.*

**Keywords:** Payam Noor University, ranking, numerical taxonomy, Shannon entropy, SAW.

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### **INTRODUCTION**

Universities and Higher Education Institutions are considered always as higher thinking centers and community knowledge production and the presence and activities of scholars, researchers and scholars have essential role in order to promote science, for revealing direction intellectual movements, religious, cultural and political. In recent years, educational Planning at the University of the Third World, more has grown from quantitative aspects and has provided possible to train the large number of graduates. The issue of globalization educational is expansion of higher education centers, increasing enthusiasts to continue education, variety of academic disciplines and the other hand limitation of resources finance and budget and also technological advancement reveals the necessity assessment performance the universities. According to this thread we can say that the issue of education and how to provide educational services, yet is a socio - economic problems, also should from this perspective be shown evaluated and deliberation it, because optimal utilization of human and material resources for production and effective supply of educational services, is required knowledge of economical laws.

In Iran, day to day witness growing competition and irrational between public universities and the Azad create bachelor's degree, senior and PhD and commissioning educational departments and different schools. Fields that is

launched with the have minimum facilities the hope that will be given an opportunity for improvement the quality and quantity. Such explosive increase in public universities, university Network and institutions dependent devices in many fields because lack of Grand Strategy in higher education the country in many cases the unfortunately is detrimental to the quality of education (Mehr Ali Zadeh, 1383; Mehr Ali Safaei F. and Moghadam, 1382). Of the argument that every so often in the higher education Iran related to topic credit surveys or in other words is university ranking. Due to the complexity of the higher education system widespread upward it of qualitative and especially development of training centers Payam Noor University, that even in the end of the third development plan compared with it early in the province has been more than 50% and also necessity balanced and harmonious growth two dimensions quantitative and qualitative parallel to each other, it is necessary evaluation is done of it research and education indicators. Evaluation of research and education indicators to improve quality and Accountability Payam Noor University of Mazandaran helps and provides necessary information for University administrators for help to control and improvement programs and judgment in their performance. Therefore, the answers to these questions that ' what are all the more important and the more deprived Payam Noor University of Mazandaran according to research and education indicators? If existence the imbalance what is university desired rated in the cross section investigated? It makes up main axis present research. Also, to answer the research question, are designed two questions: subsidiary under that research hypotheses, also have been formulated based on them.

- Do is different together percent the enjoyment (Development) Payam Noor University of Mazandaran from the perspective research and education indicators?
- Do weight variables is different together in indicators research and education?

### MATERIALS AND METHODS

In the present level having (Development) Payam Noor University Mazandaran province and ratings are examined of access to indicators educational and research section. Data collection and documents and statistics is available at archive Center Payam Noor University of Mazandaran and website each academic unit. In this study is used application of Excel. Using numerical taxonomy can be determined entitlement most and most disadvantaged universities according to variables. The use Shannon entropy method and techniques SAW, Payam Noor University of Mazandaran province was ranking of aspect level entitlement from this index.

**Steps implementation numerical Taxonomy method:** We consider collection X which has been included n member and the is representing different regions 1, 2, 3,..., n. These is a group of variables 1, 2, 3,..., m Index (characteristic) that are represented to figure the following matrix.

$$X = \begin{bmatrix} X_{11} & X_{12} & X_{13} & \cdot & \cdot & X_{1m} \\ X_{21} & X_{22} & X_{23} & \cdot & \cdot & X_{2m} \\ X_{31} & X_{32} & X_{33} & \cdot & \cdot & X_{3m} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ X_{n1} & X_{n2} & X_{n3} & \cdot & \cdot & X_{nm} \end{bmatrix}_{n \times m}$$

The third step is that members standardized matrix Xij we form in the new matrix called Z that matrix Z, have dimensions n.m is as follows:

$$Z = \begin{bmatrix} Z_{11} & Z_{12} & Z_{13} & \cdot & \cdot & Z_{1m} \\ Z_{21} & Z_{22} & Z_{23} & \cdot & \cdot & Z_{2m} \\ Z_{31} & Z_{32} & Z_{33} & \cdot & \cdot & Z_{3m} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ Z_{n1} & Z_{n2} & Z_{n3} & \cdot & \cdot & Z_{nm} \end{bmatrix}$$

**Ranking regions based entitlement (Developed):** After mentioned operations can be within each group homogeneous, be classified regions. For this purpose again, the Z matrix for each homogeneous groups formed and the largest is calculated in each of the columns that is related to the selection criteria. The amount can be called ideal value. After finding the ideal values in each of the indicators, we choose university of development paradigm. Development paradigm is shown with the  $C_{io}$  that consists of region  $i_{th}$ , of the region ideal (o) in the matrix Z that is calculated from the following formula:

$$C_{io} = \sqrt{\sum_{i=1}^m (Z_{ij} - Z_{oj})^2} \quad (1)$$

**Shannon entropy method:** In the deciding problems multiple criteria and particular deciding problems several indicators, having and knowing the relative weights the existing indicators, has been effective step and is needed in the process of problem solving. Among methods determination of indices weights, can be said to the following methods: Using of Experts Answers, Linmap Method, Least Square method, Eigen Vector technique and Shannon entropy. In this study, of Shannon entropy method is used as one of the most famous methods for calculating the indexes weights. Entropy is a very important concept in the social sciences, Physics and Information Theory. When data in a decision matrix is specified completely, can Entropy method be used for weights evaluation. The method idea this is whatever distribution is more in the value of an index is more important index than other indicators (Momeni, 1385).

**SAW Technique:** Simple weighted sum technique, the SAW is one of the simplest methods decisions with multiple indicators. Of this technique in this study, is used for ranking provinces of the country of aspect level access to indicators at section of library. Before implementing this technique, must be specified weight of indicators, so that with calculated weighted indicators, can be Ranking units of the University the following steps (Momeni, 1385).

- Formation the data matrix: This step is similar to with the first stage of numerical taxonomy methods.
- Non-linear scaling the values of the data matrix: If have all indicators positive side, each amount we divided to the maximum amount available in the  $j^{th}$  column.

## RESULTS AND DISCUSSION

**Introduction to the study variables:** According to the cultural development is mentioned as infrastructure development in other aspects political, social, economic, and etc and on the other hand development Education and research has been proposed of essential prerequisites planning and community cultural development; in this project tried that is studied Payam Noor University of Mazandaran degree entitlement of aspect access to indicators in research and education. In this study, is used of two overall indexes educational and research that also each of their have been formed of subset of and it has been shown in the following table:

**Table- 1: Subsets of educational and research indicators**

Subsets in the index of educational					Subsets in the index of research		
X <sub>1</sub>	Number of Expert in field	X <sub>8</sub>	Number of faculty members Associate Professor	X <sub>15</sub>	Number of Students with average grade of 17 and more	Y <sub>1</sub>	Number of books published (Edited) Faculty members
X <sub>2</sub>	Number of associate degree student	X <sub>9</sub>	Number of faculty members Professor	X <sub>16</sub>	Number of Students associate degree accepted in the course bachelor	Y <sub>2</sub>	Number of books published (Translation) Faculty members
X <sub>3</sub>	Number of Bachelor student	X <sub>10</sub>	Number of Visiting Professors	X <sub>17</sub>	Number of students Bachelor accepted in the course Master	Y <sub>3</sub>	Number of articles published in the foreign publications the Faculty members
X <sub>4</sub>	Number of Masters student	X <sub>11</sub>	Number of Visiting Associate Professor	X <sub>18</sub>	Number of students Masters accepted in the course Ph.D	Y <sub>4</sub>	Number of articles published in the Journal Scientific- Research by the Faculty members
X <sub>5</sub>	Number of Educational Assistant	X <sub>12</sub>	Number of Visiting Assistant Professor	X <sub>19</sub>	Number of fields of study in the associate degree section	Y <sub>5</sub>	Number of articles published in the Journal Science - promotion by the Faculty members
X <sub>6</sub>	Number of Faculty members Lecturer	X <sub>13</sub>	Number of Visiting Lecturer	X <sub>20</sub>	Number of fields of study in the Bachelor section	Y <sub>6</sub>	Number of articles presented in the international conferences by the Faculty members
X <sub>7</sub>	Number of Faculty member Assistant Professor	X <sub>14</sub>	Number of incoming students	X <sub>21</sub>	Number of fields of study in the Masters section	Y <sub>7</sub>	Number of articles published (translated) in the internal publications by the Faculty members

Results determination of Entitlement Payam Noor University of Mazandaran by using methods of numerical taxonomy at this stage, after collection of the data related to universities Payam Noor province , First is formed matrix the its rows comprises university units and its columns indices used in this study. After preparation of primary data matrix, according to the index of it may be different scales, it be released indices used scale and disappear their lack of homogeneity. For this work, can be used method standardize and created data matrix (Z). To do this first we obtain average and standard deviation each index and then we gain matrix table Z. In the next step, calculate the distance between centers based on indicators presented is done and for assess their homogeneity with each other. We obtains this distance according to information matrix, formation distance matrix at This stage, Due to the standardized numbers in the standard matrix Z, composite intervals between various units of universities, for indicators educational and research obtains as follows. If the distance units of the University acquire two by two, in the case is obtained matrix composite intervals. Since the matrices are a symmetric matrix, Can be concluded the matrix have been symmetric and their main diameter is equal to zero. While are square matrix and with dimensions 18 at 18. Members of the two matrices show distance combination each unit of the University of other universities and in each row of the matrix lowest amount is indicative the shortest distance between it University, with other universities and or maximum close.

So the unit is not homogeneous and other is homogeneous because their distance is less than two standard deviation than average. The result, Payam Noor University Sari because being heterogeneous, is removed aspect of educational indicators. Also, the aspects of research index since the distance of Payam Noor University Ramsar Unit is more than two standard deviations than average and has been exceeded the high limit therefore the unit has not been homogeneous and other centers because the their distance is less than two standard deviations are homogeneous than average. As a result, Payam Noor University Ramsar, be removed because heterogeneous in terms of research indicators. Now, again new data matrix has formed and also with its help are formed matrixes of the new standard. In the table Related to educational indicators, there is total 17 Unit university homogeneous and 17 different adjectives related to education indicators, also in the table Related to Index Research, there is total 17 Unit of university homogeneous and 7 different adjectives related to research indicator. Therefore elements in each column of the data matrix shows homogeneous centers amount an adjective that has been standard. Therefore, the greatest value of this adjective shall consider and this operation we perform for each column will be achieved row that every its element is maximum adjectives and consider the row reagent adjectives ideal center. Now, distance each center we find of ideal Center, It is clear that whatever the distance is less to center is closer to ideal center. If the calculated number of taxonomy method for a unit of Payam Noor University, is between zero and 0.725. Province in terms of entitlement (development) in the indicators relevant entitlement (developed); If is between 0.725 to .0865 with limited facilities (partially developed) ; and if is between 0.865 to 1, is considered deprived (undeveloped).

**Table- 2: The results of the application methods of numerical taxonomy related to Educational indicators**

Entitlement status	Entitlement Degree $F_i$	The distance to the center of the ideal $C_{io}$	Unit Payam Noor University	No.
Entitlement (developed)	0.393854	6.997761	Babol	1
	0.533007	9.470152	Behshar	2
	0.649623	11.54211	Amol	3
	0.707163	12.56445	Ramsar	4
	0.720827	12.80722	Ghaemshahr	5
Semi - Entitlement (partially developed)	0.751376	13.35001	Mahmudabad	6
	0.788735	14.01377	Zirab	7
	0.801087	14.23308	Rineh	8
	0.81289	14.44295	Kalebast	9
	0.814717	14.47541	Polesefid	10
	0.815057	14.48146	Tonekabon	11
	0.815264	14.48513	Noshahr	12
	0.824918	14.65666	Neka	13
	0.825846	14.67314	Juybar	14
	0.842276	14.96506	Bndpey	15
0.851769	15.13373	Bahnamir	16	
Deprived (undeveloped)	0.87475	15.54204	Chamestan	17

By using numerical taxonomic methods, status Entitlement was tested the first hypothesis of research namely:

$H_0$ : Percent rate entitlement (developed) Payam Noor University of Mazandaran not differs from each other terms of educational and research.

$H_1$ : Percent rate entitlement (developed) Payam Noor University of Mazandaran is different terms of educational and research.

As observed it Table (2) and (3), of educational Indicators in 2011 in the province Payam Noor Universities of Babol, Behshahr, Amol, Ramsar and Ghaemshahr are considered entitlement (developed) and University of Mahmoud Abad, Zirab, Rineh, Kalebast, Polesefid Tonekabon, Noshahr, Neka, Juybar, Bandpey and Bahnamir are considered semi - entitlement (relatively advanced) and University Chamestan is considered deprived (undeveloped). Also of research indicators in the Mazandaran province Payam Noor Universities Behshahr, Amol Ghaemshahr, Babol, Sari and Bandpey are considered entitlement (developed) and universities Neka, Zirab, Kalebast , Bahnamyr, Polesefid , Juybar, Mahmoud Abad, Tonekabon and Chamestan semi - entitlement (relatively advanced) and university Noshahr and Rineh are considered deprive (undeveloped). The results of the applying the methods of numerical taxonomy related to two indicators educational and research are listed below:

**Table- 3: The results of the application methods of numerical taxonomy related to Research indicators**

Entitlement status	Entitlement Degree $F_i$	The distance to the center of the ideal $C_{i0}$	Unit Payam Noor University	No.
Entitlement (developed)	0.388113	4.206033	Behshahr	1
	0.507175	5.496126	Amol	2
	0.577075	6.253845	Ghaemsgahr	3
	0.616274	6.678643	Babol	4
	0.707929	7.671922	Sari	5
	0.709266	7.686413	Bandpey	6
Semi - Entitlement (partially developed)	0.732214	7.935104	Neka	7
	0.744393	8.067084	Zirab	8
	0.782593	8.481066	Kalebast	9
	0.792418	8.587543	Bahnamir	10
	0.803362	8.706145	Polesefid	11
	0.814859	8.830739	Juybar	12
	0.820673	8.893745	Mhmudabad	13
	0.825734	8.94859	Tonekabon	14
Deprived (undeveloped)	0.861723	9.338612	Chamestan	15
	0.872714	9.457719	Noshahr	16
	0.892327	9.670267	Rineh	17

Results in Table (2) and (3) shows in the field indicator Educational 29 percent of Payam Noor universities of Mazandaran are considered Entitlement, 65 percent Semi - Entitlement and 6 percent deprived. In the research indicators, 35 percent of Payam Noor universities of Mazandaran are considered Entitlement, 53 percent Semi - Entitlement and 12 percent deprived. General, we can say that in the Payam Noor universities of Mazandaran in terms of indicators studied in 1390, in total inequalities has been high in the desired indicators and this has been due to the various policies and sometimes contradictory in the management Payam Noor universities of Mazandaran during the last years. Thus, the hypothesis  $H_0$  is rejected and accepted hypothesis  $H_1$ .

**Calculating the indexes Weights:** Before implementing steps technique SAW, weight and importance indicators were obtained by using Shannon entropy method. The its results has been shown in the following tables, Using the Shannon entropy method related to indicators educational and Research, status indicators Weights was tested in the second hypothesis of the study namely:

$H_0$ : Weight of variables isn't different with together in the Educational and Research indicators.

$H_1$ : Weight of variables is different in the Educational and Research indicators with together.

As it is clear from Table (4) educational indicators, 8, 2, 4, 21, 16, 12, 7, 13, 10, 15, 17, 1, 5, 14, 3, 6 and 20 respectively with importance 0.122591, 0.120554, 0.107355, 0.093253, 0.08209, 0.075262, 0.063858, 0.05552, 0.040716, 0.035202, 0.024726, 0.02262, 0.01968, 0.019493, 0.017575, 0.011469 will be considered in the ranking Payame Noor University of Mazandaran province. Therefore, educational Indicators 8 (the number faculty member associate professor) and training of 20 (number of academic disciplines the undergraduate level) will be considered respectively with most and the lowest effect, in the ranking universities. Also according to table (5), research Indices 2, 7, 5, 6, 1, 4 and 3 respectively will be considered with importance 0.2810510, 0.177549, 0.132974, 0.114599, 0.109814, 0.104267, and 0.079745 in the ranking Payam Noor University of Mazandaran province.

Table- 4: weight indices obtained of Shannon entropy method related to Educational indicators

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>	X <sub>10</sub>
E <sub>j</sub>	0.844	0.237	0.877	0.321	0.857	0.889	0.524	0.225	0.649
1-E <sub>j</sub>	0.156	0.762	0.123	0.679	0.143	0.111	0.476	0.775	0.351
W <sub>j</sub>	0.025	0.12	0.019	0.107	0.023	0.017	0.075	0.122	0.055

Continue Table-4

	X <sub>12</sub>	X <sub>13</sub>	X <sub>14</sub>	X <sub>15</sub>	X <sub>16</sub>	X <sub>17</sub>	X <sub>20</sub>	X <sub>21</sub>
E <sub>j</sub>	0.481	0.596	0.875	0.742	0.443	0.777	0.927	0.410
1-E <sub>j</sub>	0.519	0.404	0.124	0.257	0.557	0.223	0.072	0.589
W <sub>j</sub>	0.082	0.064	0.019	0.041	0.088	0.035	0.011	0.093

Table- 5: weight indices obtained of Shannon entropy method related to Research indicators

	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	Y <sub>7</sub>
E <sub>j</sub>	0.8	0.488	0.855	0.81	0.758	0.791	0.676
1-E <sub>j</sub>	0.2	0.512	0.145	0.189	0.242	0.209	0.323
W <sub>j</sub>	0.11	0.281	0.08	0.104	0.133	0.14	0.177

Results in Table (4) and (5) shows that research indicator 2 (Number of published books (translated) faculty members) and research indicator 3 (Number of articles published in international journals by faculty members) respectively with maximum and lowest effect, in the ranking of universities. So H0 hypothesis is rejected and accepted hypothesis H1.

**Results of ranking Payam Noor University of Mazandaran Province:** Using the weights obtained the Shannon entropy method and performance steps technique SAW, were obtained Payam Noor University of Mazandaran ranking in terms of the country indicators in of educational and research. In Table (6), Payam Noor University unit Babol in terms of educational indicator has highest rank (first rank) and Payam Noor University unit Chamestan lowest rank (rank seventeenth). Also in Table (7), Payam Noor University unit Behshahr in terms of research indicator has highest rank (first rank) and Payam Noor University unit Rineh lowest rank (ranking seventeenth).

Table- 6: Results Ranking Payam Noor University of Mazandaran in terms of educational Indicator

University ranking	SAW Indicator	Payam Noor University of Mazandaran	No.
16	0.033252	Bandpey	1
13	0.047808	Kalebast	2
12	0.048474	Bahnamir	3
8	0.06089	Polesefid	4
10	0.051443	Noshahr	5
3	0.262949	Amol	6
2	0.443084	Behshahr	7
5	0.161414	Zirab	8
6	0.161374	Ramsar	9
9	0.055876	Tonekabon	10
11	0.050614	Rineh	11
1	0.697387	Babol	12
4	0.167875	Ghaemshahr	13
14	0.040962	Neka	14
7	0.099522	Mahmudabad	15
15	0.038043	Juybar	16
17	0.013372	Chamestan	17

Therefore in reply to the first main question the research can say: Universities entitlement and deprived of aspect educational and research indicator in the period 2011 is as follows; in terms of educational Payam Noor University Babol as most University Entitlement and also Payam Noor University Chamestan have been introduced as most deprived University and in terms of Research Payam Noor University Behshahr as most University Entitlement and also Payam Noor University Rineh have been introduced as most deprived university. Also in reply to the second main question this study can say: Ranked Universities in terms of research and Education indicator in the period 2011 is as follows; Payam Noor University unit Babol in terms of educational indicator as the highest ranking (ranked first) and University of Payam Noor unit Chamestan have been introduced as lowest rank (ranked seventeenth). In addition, Payam Noor University unit Behshahr in terms of research indicator as highest rank (ranked first) and Payam Noor University unit Rineh are presented as lowest rank (rank seventeenth).



Table- 7: The results of ranking of Payam Noor University of Mazandaran in terms of research Indicator

University ranking	SAW Indicator	Payam Noor University of Mazandaran	No.
8	0.173241	Bandpey	1
10	0.113746	Kalebast	2
11	0.112077	Bahnamir	3
12	0.090329	Polesefid	4
15	0.032835	Noshahr	5
2	0.474239	Amol	6
1	0.783382	Behshahr	7
9	0.1377	Zirab	8
7	0.197126	Tonekabon	9
17	0.00316	Rineh	10
6	0.20874	Sari	11
4	0.313531	Babol	12
3	0.42718	Ghaemshahr	13
5	0.271622	Neka	14
13	0.076058	Mahmudabad	15
14	0.067009	Juybar	16
16	0.02949	Chamestan	17

### CONCLUSION

Since the most important action in planning is goal setting, based on recognition and knowledge of current status of universities relative to each other and grading them of entitlement of blessings development be in planning the there are for allocation of credits and resources, universities that are with most of deprivation, be in priority programs remove exclusions. In other words, based on what at development programs been realized during recent decades, it is essential until be performed for reduction inequalities available Payam Noor University of Mazandaran; to planning centers and units of Payam Noor and away from sectoral planning, following of balancing policies and equal in creating equal opportunities for all centers of Payam Noor University, decentralization of of Payam Noor University in the provincial capital and distribution resources and capital in the intermediate centers and small University in order to integrated Development Payam Noor University of Mazandaran province. Hence it is obvious that in the academic planning deprived centers (undeveloped) in the first priority academic development and centers Semi - Entitlement (relatively advanced) and Entitlement (developed) order placed in the second and third priorities. Of course it would not be means little attention to relatively developed centers and developed because general indicators developmental in our country than global level is low, hence promotion its overall level is inevitable in the future plans necessary. Actually greater volume of indicator of educational Payam Noor University of Sari and Babol and greater volume of research indicator Payam Noor University of Sari and Behshahr have been allocated to as centers of Payam Noor University of Mazandaran and small amount of it be granted peripheral centers and frontier Province. Considering that ultimate goal for doing such an investigations is reaching balanced development in universities and identification position various centers of Universities the province of Payam Noor and subsequent identification disadvantaged centers and effort in order to reduce and finally fix it and also balanced distribution and achieving justice in the centers of Payam Noor Universities of Mazandaran; the best and most efficient solution, is emphasis on small centers and medial in the academic Development and decentralization of the central university in the province. For the purposes of this study and according to the indicators used the following approach is suggested:

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