

**STUDYING THE RELATIONSHIP LEVELS OF INNER AND OUTER-ORGANIZATION
FACTORS OF KNOWLEDGE PRODUCTION IN THE MINISTRY OF
SCIENCE, RESEARCH AND TECHNOLOGY OF IRAN**

Marzieh Niaz Azari ^{*1}, Dr. Mohammad Salehi ²

¹Department of Educational Management, Sari Branch, Islamic Azad University, Sari, Iran

²Department of Educational Management, Sari Branch, Islamic Azad University, Sari, Iran

Correspond Author: **Marzieh Niaz Azari**

Marziyeniaz@ymail.com

ABSTRACT

Today knowledge production has found a special place in the literature of Iran, in a way that the words knowledge production, software movement, scientific birth are of terms that occupied the minds of most policy-makers and scientific and research planners of the country; because today sale of technology bear the least cost. So the main issue of this study is the lack of model and pattern of knowledge production process in Iran. This study is applied one in respect of purpose, quantitative in respect of data, and descriptive in respect of execution method. To analyze the extracted data on the basis of network analysis and fuzzy DEMATEL technique, Excel software is used. The results showed that the proposed model in this article on the increase of scientific productions in educational and research institutions of Iran bears the necessary effectiveness on economic structure and is recommended during tough international sanctions.

KEY WORDS: Human resource, knowledge production, Iran's Ministry of Science and Research, fuzzy DEMATEL

INTRODUCTION

The science policy refers to a set of government's strategies, policies and plans to improve and develop research and educational activities on their increase. Of course, scientific and technological policies of « Innovations in Technology » and «knowledge productions» in more general view consider effective use of science and technology as the factors of economic growth and social development. Therefore, scientific and technological policy is not just supervising a program to develop research and knowledge productions. Thus scientific and technological policy cannot be considered apart from the totality of social - economic construction of a country (Webster, 2011). Historically, government's direct interference in science and scientific activities in Europe clearly begins from seventeenth century, although in this century government's interference has been very limited (Salomon , 2008). In this period science and religion were closely linked and researchers based on religious motivation devoted their life to the scientific research (Fuller, 2007).

With regard to this fact, until «enlightenment period» in eighteenth century, scientists were generally "self-relied" in respect of investment. From this period onwards gradually European governments found that scientific research leads to lots of interests in consolidation and expansion of their military and political power and domination on economic markets. As Solingen properly reasons, power, political and economic credit strategic position of Western governments have been highly relied on their scientific and technological advances (Solingen, 2010). Advancement in nuclear sciences, nuclear weapons and nuclear energy production and its link to political and economic power and economic growth in this century caused that science places in the focus of policy-making of European and American governments (Porter, 2011). Governments again reviewed the budget increase in research and the outcome of this review was planning for huge increase of budget for scientific research (Hayton & Paczuska , 2010).

Model

Based on literature and background of research and theoretical principles and with regard to the purpose of research that is to propose a proper model of knowledge production process in Iran's Ministry of Science, Research and Technology, extracted components from the literature and background of research is presented in the table below. Also, based on the achieved results and ideas of research group Figure 1 has been considered as the primary basis of research's theoretical model, which is presented based on the dimensions of table (1).

Table (1): Factors affecting the knowledge production

Factors affecting knowledge production (components)	Source
Researcher's personal and inner motivations	(Gray, 2008; Scarbrough, 2001)
Internationalization of universities and academic exchanges	(Kennedy, 2003)
Determining research priorities of country	(Nowotny et al., 2003)
Development of new technologies and their application	(Gerard, 2001; Evers & Solvay, 2004)
Development of research capabilities and searching spirit among faculty members	(Gray, 2008; Scarbrough, 2001)
Development of innovation and creativity spirit in society	Gibbons, 2001; Campbell, 2006)
Development of Application of academic research	(Salomon, 2008; BA, 2002)
Political stability	Majumder (2004), Heningza & Stivenson (2004)
Political-government support	Solingen, 2010; Hayton & Paczuska, 2010
Capital yield period in knowledge-based plans	(Solingen, 2010)
Developed structure to issue the results of academic research	Kennedy, 2003
Culture of teamwork and social communications	(Nowotny et al., 2003; Nowotny et al., 2001; Gibbons et al., 1994; Campbell, 2006)
Social dialogue	(Brown, 1992; Brown, 1998; Gross, 1990)
Professional responsibility-accepting by faculty members	(Jimenez, 2008)

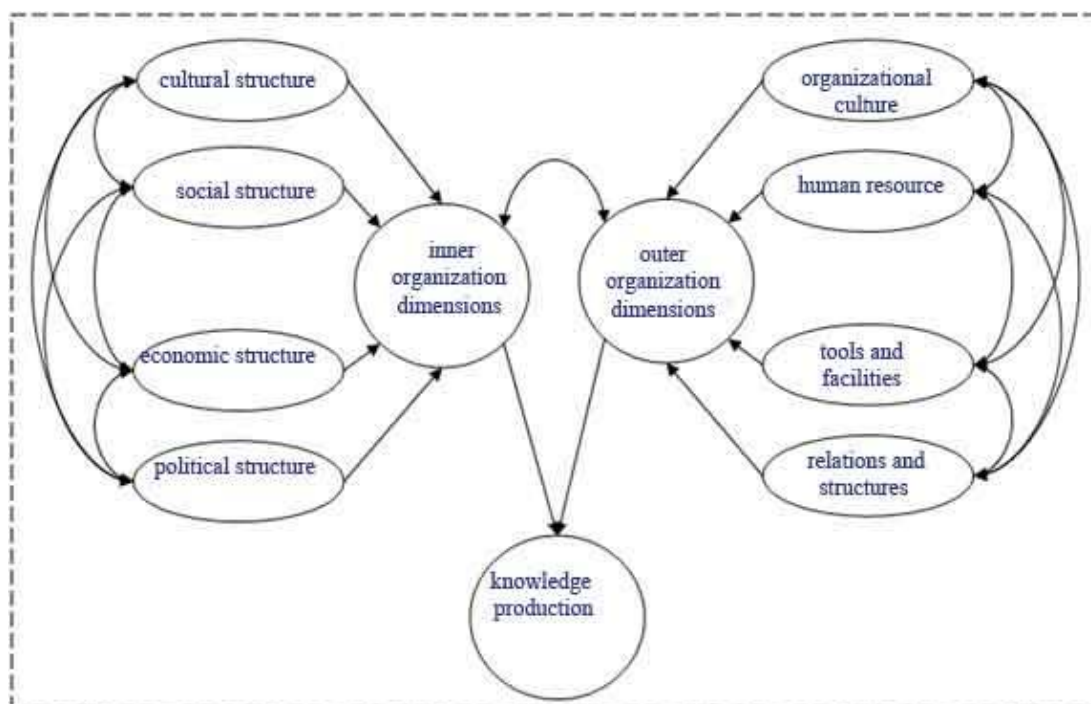


Figure 1: Theoretical model of research

MATERIALS AND METHODS

This study is applied one in respect of purpose, quantitative in respect of data, and descriptive in respect of execution method, since it seeks to describe and extract components and dimensions of knowledge production and a suitable model for its development so that with its help be able to produce knowledge. The statistical population in this study consists of all faculty members of the university with academic rank of professor, who have had teaching and research activities in the academic year 2014-2015. According to Cochran sampling formula, at 95 percent of confidence level, the sample size has been considered 365 persons. To analyze the data obtained from the questionnaires according to the main aim of this research fuzzy DEMATEL has been used. All analyzes were performed using Excel software.

RESULTS AND DISCUSSION

Assuming basic model of Figure 1, inter-dimension communications levels for two groups of inner- and outer-organization is analyzed based on necessary information gathered by fuzzy DEMATEL method and the research population's views. With regard to the views of the research population and fundamentals of fuzzy DEMATEL techniques, communications levels of dimensions under study were extracted according to Table 2.

Table 2: integrated matrix of expert group opinions based on verbal variables about the relationships of research variables dimensions

Outer-organization				Inner-organization				variable	
<i>political</i>	<i>Economic</i>	Social	<i>cultural</i>	Relations and structures	Tools and facilities	Human resource	Organizational culture	Dimensions	
VL	VL	VL	L	H	L	L	NO	<i>Organizational culture</i>	Inner-organization
VL	VL	L	VL	H	H	NO	VL	<i>Human resource</i>	
VL	L	VL	VL	H	NO	L	VL	<i>Tools and facilities</i>	
L	VL	VL	VL	NO	L	L	L	<i>Relations and structures</i>	
L	L	H	NO	VL	VL	VL	VH	<i>cultural</i>	Outer-organization
H	L	NO	VL	L	VL	VH	VL	<i>Social</i>	
H	NO	L	L	L	VH	L	VL	<i>Economic</i>	
NO	L	VL	VL	VH	VL	VL	L	<i>political</i>	

In case of converting above information into fuzzy values Table (3) is extracted.

Table (3): integrated matrix of expert group opinions based on fuzzy values about the relationships of research variables dimensions

matrix Z_λ									
Outer- organization				Inner- organization				Variable	
<i>political</i>	<i>Economic</i>	<i>Social</i>	<i>cultural</i>	Relations and structures	Tools and facilities	Human resource	Organizational culture	Dimensions	
0	0	0	0.25	0.5	0.25	0.25	0	Organizational culture	Inner- organization
0	0	0.25	0	0.5	0.5	0	0	Human resource	
0	0.25	0	0	0.5	0	0.25	0	Tools and facilities	
0.25	0	0	0	0	0.25	0.25	0.25	Relations and structures	
0.25	0.25	0.5	0	0	0	0	0.75	<i>cultural</i>	Outer- organization
0.5	0.25	0	0	0.25	0	0.75	0	<i>Social</i>	
0.5	0	0.25	0.25	0.25	0.75	0.25	0	<i>Economic</i>	
0	0.25	0	0	0.75	0	0	0.25	<i>political</i>	
matrix Z_m									
0.25	0.25	0.25	0.5	0.75	0.5	0.5	0	Organizational culture	Inner- organization
0.25	0.25	0.5	0.25	0.75	0.75	0	0.25	Human resource	
0.25	0.5	0.25	0.25	0.75	0	0.5	0.25	Tools and facilities	
0.5	0.25	0.25	0.25	0	0.5	0.5	0.5	Relations and structures	
0.5	0.5	0.75	0	0.25	0.25	0.25	1	<i>cultural</i>	Outer- organization
0.75	0.5	0	0.25	0.5	0.25	1	0.25	<i>Social</i>	
0.75	0	0.5	0.5	0.5	1	0.5	0.25	<i>Economic</i>	
0	0.5	0.25	0.25	1	0.25	0.25	0.5	<i>political</i>	
matrix Z_u									
0.5	0.5	0.5	0.75	1	0.75	0.75	0	Organizational culture	Inner- organization
0.5	0.5	0.75	0.5	1	1	0	0.5	Human resource	
0.5	0.75	0.5	0.5	1	0	0.75	0.5	Tools and facilities	
0.75	0.5	0.5	0.5	0	0.75	0.75	0.75	Relations and structures	
0.75	0.75	1	0	0.5	0.5	0.5	1	<i>cultural</i>	Outer- organization
1	0.75	0	0.5	0.75	0.5	1	0.5	<i>Social</i>	
1	0	0.75	0.75	0.75	1	0.75	0.5	<i>Economic</i>	
0	0.75	0.5	0.5	1	0.5	0.5	0.75	<i>political</i>	

According to the definition:

$$\tilde{a}_i = \sum_{j=1}^n \tilde{Z}_{ij} = \left(\sum_{j=1}^n \lambda_{ij}, \sum_{j=1}^n m_{ij}, \sum_{j=1}^n u_{ij} \right)$$

$$r = \max_{1 \leq i \leq n} \left(\sum_{j=1}^n u_{ij} \right)$$

Thus, according to the expression $\tilde{X}_{ij} = \frac{\tilde{Z}_{ij}}{r} = \left(\frac{\lambda_{ij}}{r}, \frac{m_{ij}}{r}, \frac{u_{ij}}{r} \right)$ for implementation and analysis of the structural

model, we have:

$$\lim_{w \rightarrow \infty} \tilde{X}_{ij}^w = 0$$

$$\tilde{X}_{ij} = (\lambda_{ij}, m_{ij}, u_{ij})$$

In which:

$$X_u = \begin{bmatrix} 0 & u_{12} & \cdots & u_{1n} \\ u_{21} & 0 & \cdots & u_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ u_{n1} & u_{n2} & \cdots & 0 \end{bmatrix} \quad X_m = \begin{bmatrix} 0 & m_{12} & \cdots & m_{1n} \\ m_{21} & 0 & \cdots & m_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ m_{n1} & m_{n2} & \cdots & 0 \end{bmatrix} \quad X_\lambda = \begin{bmatrix} 0 & \lambda_{12} & \cdots & \lambda_{1n} \\ \lambda_{21} & 0 & \cdots & \lambda_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \lambda_{n1} & \lambda_{n2} & \cdots & 0 \end{bmatrix}$$

That next according to the definition we have:

$$\tilde{T} = \lim_{w \rightarrow \infty} (\tilde{X} + \tilde{X}^2 + \dots + \tilde{X}^w) = X \times (I - X)^{-1}$$

$$\text{In which } \tilde{T} = \begin{bmatrix} \tilde{t}_{11} & \tilde{t}_{12} & \cdots & \tilde{t}_{1n} \\ \tilde{t}_{21} & \tilde{t}_{22} & \cdots & \tilde{t}_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \tilde{t}_{n1} & \tilde{t}_{n2} & \cdots & \tilde{t}_{nn} \end{bmatrix} \text{ and } \tilde{t}_{ij} = (\lambda_{ij}^'', m_{ij}^'', u_{ij}^''); \text{ then:}$$

$$\text{Matrix } [\lambda_{ij}^''] = X_\lambda \times (I - X_\lambda)^{-1}$$

$$\text{Matrix } [m_{ij}^''] = X_m \times (I - X_m)^{-1}$$

$$\text{Matrix } [u_{ij}^''] = X_u \times (I - X_u)^{-1}$$

These values has been depicted in table (4).

Table (4): The matrix of relationship intensity about the relationships of research variables dimensions

$Matrix [\lambda_{ij}^{\lambda}] = X_{\lambda} \times (I - X_{\lambda})^{-1}$								
Outer- organization				Inner- organization				Variable
<i>political</i>	<i>Economic</i>	Social	<i>cultural</i>	Relations and structures	Tools and facilities	Human resource	Organizational culture	Dimensions
0.0080	0.0050	0.0070	0.0460	0.1040	0.0560	0.0540	1.0110	Organizational culture
0.0100	0.0070	0.0470	0.0006	0.1060	0.0980	1.0160	0.0050	Human resource
0.0090	0.0470	0.0050	0.0020	0.1010	1.0160	0.0540	0.0050	Tools and facilities
0.0470	0.0050	0.0030	0.0020	1.0210	0.0540	0.0520	0.0490	Relations and structures
0.0610	0.0540	0.0950	1.0090	0.0320	0.0170	0.0240	0.1420	<i>cultural</i>
0.1000	0.0520	1.0090	0.0030	0.0780	0.0240	0.1450	0.0080	Social
0.1030	1.0160	0.0530	0.0470	0.0830	0.1490	0.0650	0.0150	<i>Economic</i>
1.0110	0.0470	0.0030	0.0050	0.1480	0.0170	0.0120	0.0530	<i>political</i>
$Matrix [m_{ij}^m] = X_m \times (I - X_m)^{-1}$								
0.138	0.125	0.125	0.151	0.255	0.189	0.187	1.092	Organizational culture
0.139	0.126	0.161	0.109	0.256	0.228	1.108	0.13	Human resource
0.134	0.158	0.119	0.107	0.247	1.104	0.181	0.125	Tools and facilities
0.168	0.119	0.116	0.106	1.128	0.181	0.178	0.164	Relations and structures
0.199	0.181	0.218	1.085	0.205	0.168	0.173	0.268	<i>cultural</i>
0.234	0.178	1.095	0.122	0.245	0.172	0.282	0.144	Social
0.248	1.112	0.188	0.171	0.263	0.298	0.22	0.16	<i>Economic</i>
1.098	0.163	0.122	0.113	0.296	0.153	0.149	0.174	<i>political</i>
$Matrix [m_{ij}^m] = X_m \times (I - X_m)^{-1}$								
0.844	0.775	0.771	0.743	1.065	0.894	0.889	1.698	Organizational culture
0.844	0.775	0.803	0.703	1.064	0.928	1.77	0.777	Human resource
0.814	0.782	0.741	0.68	1.027	1.743	0.857	0.75	Tools and facilities
0.842	0.743	0.736	0.677	1.869	0.856	0.852	0.783	Relations and structures
0.931	0.856	0.885	1.663	1.048	0.901	0.901	0.894	<i>cultural</i>
0.959	0.848	1.722	0.738	1.079	0.899	0.964	0.815	Social
1.027	1.794	0.905	0.831	1.16	1.037	0.998	0.88	<i>Economic</i>
1.731	0.782	0.74	0.682	1.027	0.825	0.82	0.788	<i>political</i>

At the end, we will need fuzzy-removing for three spans of general relationships intensity that according to the definition we'll have:

$$\tilde{n}_k^{def} = L + \Delta \times \frac{(m-L)(\Delta+u-m)^2(R-\lambda) + (u-L)^2(\Delta+m-\lambda)^2}{(\Delta+m-\lambda)(\Delta+u-m)^2(R-\lambda) + (u-L)(\Delta+u-m)}$$

In which $L = \min(\lambda_k)$ and $R = \max(u_k)$; $k = 1, 2, \dots, n$ and $\Delta = R - L$. Therefore, according to the data in table 4, we have:

Table (5): De-fuzzy matrix of direct and indirect relationships about the relationships of research variables dimensions

De-fuzzy matrix of direct relationships								
Outer- organization				Inner- organization				Variable
<i>political</i>	<i>Economic</i>	Social	<i>cultural</i>	Relations and structures	Tools and facilities	Human resource	Organizational culture	Dimensions
0.282	0.257	0.257	0.273	0.419	0.332	0.329	0.223	<i>Organizational culture</i>
0.283	0.259	0.293	0.231	0.421	0.37	0.25	0.26	<i>Human resource</i>
0.273	0.286	0.246	0.224	0.405	0.242	0.318	0.251	<i>Tools and facilities</i>
0.306	0.246	0.243	0.223	0.287	0.318	0.315	0.29	<i>Relations and structures</i>
0.348	0.318	0.354	0.21	0.372	0.313	0.318	0.393	<i>cultural</i>
0.382	0.314	0.23	0.246	0.412	0.317	0.418	0.278	<i>Social</i>
0.406	0.258	0.334	0.305	0.443	0.446	0.376	0.304	<i>Economic</i>
0.234	0.289	0.247	0.228	0.441	0.287	0.283	0.297	<i>political</i>

To calculate the hierarchy of impressibility and effectiveness according to the table (5), we have:

Table (6): impressibility and effectiveness matrix of dimensions of research variables

Interaction rate in communications system (R+J)		Net effectiveness (R-J)		Impressibility (J)		Effectiveness (R)		Dimensions	variable
Rank	Scores	Rank	Scores	Rank	Scores	Rank	Scores		
7	4.67	4	0.077	5	2.296	4	2.373	<i>Organizational culture</i>	Inner-organization
3	4.974	6	-0.24	3	2.607	5	2.367	<i>Human resource</i>	
4	4.87	7	-0.38	2	2.625	7	2.245	<i>Tools and facilities</i>	
1	5.428	8	-0.97	1	3.2	8	2.228	<i>Relations and structures</i>	
8	4.565	1	0.686	8	1.94	2	2.626	<i>cultural</i>	Outer-organization
6	4.8	3	0.394	7	2.203	3	2.597	<i>Social</i>	
2	5.099	2	0.643	6	2.228	1	2.871	<i>Economic</i>	
5	4.821	5	-0.21	4	2.514	6	2.307	<i>political</i>	

Accordingly, as it is seen outer-organization dimensions are in higher ranks in terms of effectiveness indicating their greater impact on the system. Also relationships and structures dimension is the most affected dimension in available communications systems. Of other results it can be referred to the position of cultural dimension in outer-organization factors that is the most effective dimension in the model. Also interactions rate of this dimension bear special importance. About the dimensions of inner-organization variable, organizational culture dimension bears the most affecting rate. In order to achieve a relationship graph it should be noted that based on the values in Table 5 it can be concluded that all the dimensions affect each other with a similar coefficient, which will be very difficult in terms of its execution, analysis, and validity and stability description of the presented model. Moreover, complicated relations can't help researchers in predicting future events. Accordingly in order to achieve more stable and more possible model, in this section regardless of indirect and feedback relations, we analyze the model based on direct relations. Therefore, based on highest element of indirect relations we adjust direct relations matrix with elements of table (5). Accordingly,

if the filtration rate be $F = \max_{1 \leq i \leq 8} \left(\sum_{j=1}^8 S'_{i \rightarrow j} \right) = 0.352$, for modified direct relations we will have:

Table (6): de-fuzzy matrix of modified direct relations of research dimensions variables

Outer- organization				Inner- organization				Variable	
<i>politica l</i>	<i>Economi c</i>	<i>Socia l</i>	<i>cultura l</i>	Relations and structure s	Tools and facilitie s	Human resourc e	Organizati onal culture	Dimensions	
0	0	0	0	0.419	0	0	0	<i>Organizati onal culture</i>	Inner- organiza tion
0	0	0	0	0.421	0.37	0	0	<i>Human resource</i>	
0	0	0	0	0.405	0	0	0	<i>Tools and facilities</i>	
0	0	0	0	0	0	0	0	<i>Relations and structures</i>	
0	0	0.354	0	0.372	0	0	0.393	<i>cultural</i>	Outer-organiza tion
0.382	0	0	0	0.412	0	0.418	0	<i>Social</i>	
0.406	0	0	0	0.443	0.446	0.376	0	<i>Economic</i>	
0	0	0	0	0.441	0	0	0	<i>political</i>	

Thus at the end based on the purpose of this research communications level of dimensions under-study can be assumed through separating variables under-study according to the Figure(2).

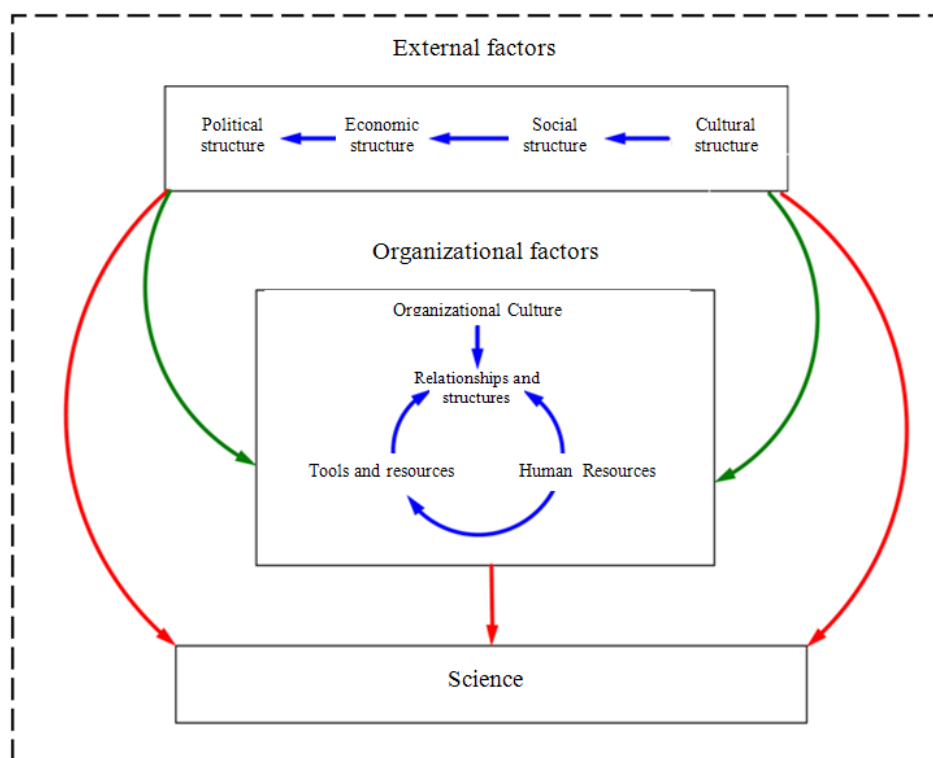


Figure (2): communications levels of dimensions under-study according to the separation of research variables (Source: research findings)

Discussion and conclusion

As the results showed, two groups of inner and outer- organization factors affecting knowledge production in our country Iran have significant effects. Based on examined studies, eight factors of the economic, political, social and cultural structures as outer-organization factors and tools and resources, relationships and structures, organizational culture and human resources in other parts of the world also have been of effective factor on knowledge production, which in Iran this effect was proved too. Based on the findings, the greatest effect is the relationship between social structure and economic structure that indicates the number 0.987. Minimal impact in this network is for the impact of the economic structure on human resource, which indicates the number 0.570. At the end these relationship can be assumed in our country, Iran, and based on it plan necessary policy-makings for knowledge production. Accordingly, with regard to the various factors influencing in this research, it is worthy that directors and educational institutions officials give adequate and full attention to these factors. In this regard, it is recommended to use the formulated model on the increase of scientific productions in educational and research institutions of the country and its impact on economic structure under strict international sanctions.

REFERENCES

- Adamsen L.; Larsen. K.; Bjerregaard. L.; Madsen. JK (2003).** Danish research-active clinical nurses overcome barriers in research utilization. *Scand. J. Caring (Sci)*. 17: 57-65.
- BA (2002).** Science in Society: Advice to Office of Science and Technology from the BA; London British Association for Advancement of Science, Boston: Harvard Business School Press.
- Brown, RH (1998).** Toward a Democratic Science: Scientific Narration and Civic; Ch 2 Science Policy 06.10.02.doc 14 06.08.02.
- Brown, RH (ed.) (1992).** Writing The Social Text: Poetics and Politics in Social Science .
- Campbell, David, F. J, (2006).** The University, Business Research Networks in Science and Technology / Knowledge Production Trends in The United States / European Union and Japan, London: Praeger.

- Evers Hans-Dieter and Solvay Gerke, (2004).** Closing The Digital Divide Soutest Asia`S Path Towards A Knowledge Society, University of Lund, Sweden.
- Fuller S. (2007).** Science; Minneapolis: University of Minnesota Press.
- Gerard Delanty (2001).** Challenging Knowledge: The University in the Knowledge Society; London: The Society for Research into Higher Education, and Open University.
- Gibbons M, Limoges C., Nowotny H., Schwartzman S., Scott P. and M. Trow (1994).** The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies, London: Sage.
- Gibbons M. (2001).** Innovation and Developing System of Knowledge Production , Competitiveness and Sustainability in The North American Region, Simon Fraser University Institute On Innovation.
- Gray Mel. (2008).** knowledge production in social work: The gold standard of mode 2?, 34th Biannual Congress of the International Association of Schools of Social Work (IASSW) Transcending Global-Local Divides, Durban, South Africa, 20 -24th.
- Gross A.G (1990).** The Rhetoric of Science; New Haven, CT: Yale University Press .
- Hayton A. and A. Paczuska (2010).** Introduction: Education in Demand ?, In Hayton, A. & Paczuska (eds); Access, Participation and Higher Education: Policy and Practice; London: Kogan Page .
- Hennink M. and Stephenson R., (2004).** Using research to inform health policy: barriers and strategies in developing countries", opportunity and choices working paper, No. 9, pp. 1-37.
- Hicks C.B.A. (1996).** Study of nurses' attitude towards research: a factor analytic approach", Journal of Advance Nursing, No. 23, pp. 376-379.
- Jimenez Jaime (2008).** "Research Socially Responsible: May We Speak of A Mode 3 Knowledge Production? ", *Electronic J. Communication Info. Innovation Health.* 2(1): Jan-Jun.
- Kajermo K., Nordström G., Krusebrant A. and Björvell H. (1998).** Barriers to and facilitators of research utilization-as perceived by a group of registered nurses in Sweden. *Journal of Advanced Nursing*, Blackwell Publishing. Vol. 27, No. 4, pp: 798-807.
- Kennedy Donald (2003).** "Europe, Science and Unity"; *Science Magazine*, 29 August, Politics in Social Science Discourse; RH Brown (ed.); New York: Walter de Gruyter.
- Ledley F.D., Lovejoy F.H. (1993).** Factors influencing the interest, career paths, and research activities of resent graduates from an academic pediatric residency program. *PEDIATRICS.* 92(3):436-441, will retrieve in: [http:// www.ebscohost.org](http://www.ebscohost.org)
- Majumder M.A.A. (2004).** Issues and priorities of medical education research in Asia. *Annals Acad. Medicine.* 33(2): 257-263.
- Nowotny Lt, Scott, P & Gibbons, Michel, (2001).** Re-Thinking Science: Knowledge and Public in an Age of Uncertainty, Cambridge: Polity Press.
- Nowotny Tt, Scott, P., Gibbons M. (2003).** "Mode 2" Revisited: The New Production of Knowledge ", *Minerva*, 41 (3). pp. 179-194.
- Parahoo K., (2000).** Barriers to and facilitators of research utilization among nurses in Northern Ireland", *Journal of Advanced Nursing*, 2000, Vol. 30, No. 1, pp. 89-98.
- Porter, Michael E. (2011).** The Competitive Advantage of Nations; In *Strategy: Seeking and Public Policy*; Harvey Brooks and Chester L. Cooper (eds), Oxford: Pergamon Press.
- Salomon Jean-Jacques (2008).** Science and Government: A European Perspective; In *Science for Securing Competitive Advantage*; Cynthia A. Montgomery and Michael E. Porter (eds).
- Sax L.G., Hagedorn L.C., Arredondo M and Dicrisi F.A. (2002).** "Faculty research productivity: exploring the role of gender and family related factors", *Research in Higher Education*, August 2002, Vol. 43, Issue 4, pp. 423-446.
- Scarborough Harry (2001).** Knowledge A La Mode: The Rise of Knowledge Management and Its Implications for Views of Knowledge Production. *Social Epistemol.* 15 (3): 201-213.
- Solingen Etel (2010).** Domestic Structures and the International Context: Toward Models of State-Scientists Interaction"; *Scientists and the State*, Etel Solingen (ed), Ann Arbor: US Department of Energy (DOE) (1999); Science Portfolio of the Office Of Science; University of Michigan Press, Washington, DC: DOE.
- Sumathipala A., Siribaddana S. and Patel V., (2004).** "Underrepresentation of developing countries in research literature: Ethical issues arising from a survey of five leading medical journal. *BMC Medical Ethics.* 5(5): 6.
- Tien F. F. (2007).** "Faculty research behavior and career incentive: The case of Taiwan", *International Journal of Educational Development.* *SSCI listed J.* 4-17.