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Research Article

THE ROLE OF MEDIA IN PUBLIC CULTURE OF SCIENCE AND TECHNOLOGY IN THE WORLD (A COMPARATIVE STUDY OF DEVELOPED AND DEVELOPING COUNTRIES)

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ABSTRACT
This paper first briefly reviews the theoretical studies in the field of public culture of science and technology. In this study the two theoretical models of deficit and engagement are represented. These models have different geographical origins and this issue has led to different investigations and surveys in different nations. Then a detailed report of the developed countries and some developing countries in the fields of scientific and technological public culture are reviewed. Then using a comparative study between USA, Brazil, Malaysia, Turkey, UK, France and Germany based on the reports provided by these countries, a graphical plot will be depicted which determines the rank of each country in the field of public culture of science and technology. Finally, a criterion is found for the assessment of other countries which other states can use to evaluate themselves.

Keywords*: deficit model, engagement model, public awareness of science and technology, public attitudes toward science and technology*

INTRODUCTION
Science and technology have been tied to community in several ways. On the one hand, following the creation of ideas and technology, the society suffers numerous challenges and using assessment of the social impact assessment of technology (SIA), the sociologists inform people about the positive consequences of technology and warn them about its negative impacts. On the other hand the society is the birthplace of innovation and technology. Therefore, the community must have the ability to create the intended technology. In either case, the public approach to technology as an "issue" could assist the policy makers and managers and planners in the field of sustainable development. For a while, the states are using field surveys in order to determine the capabilities of their citizens, so they can measure the growth level of public awareness and understanding of science and technology. Given the significant role of the media in promoting the public participation in science, the surveys seek to increase the public awareness. In this paper, first an overview of the theoretical literature will be presented on the basis of which the survey will be conducted. Then a comparison between developed countries and developing countries is presented in statistical tables and finally a diagram is shown for comparison between them

Countries seeking to conduct surveys to measure public awareness and participation through media use two theoretical methods as the basis of their works. These theoretical methods are deficit model and engagement model .

The deficit model :
This model is based on a top-down direction. According to this model, the flow of knowledge between science and the public is a unilateral flow and the public as an unknown and homogeneous entity shall

acquire the genuine knowledge generated by the scientific community somehow separately. By simplification of information, the media has the role of dissemination and publicizing scientific processes and discoveries. This model began from "scientific literacy" in conceptualization and reached to "Public Understanding of Science."

Scientific literacy: Based on previous work by the U.S. National Science Foundation in 1978 for measuring the public understanding of science and technology for using in periodic reports, John D. Miller and Kenneth Prewitt designed scientific and engineering indicators. Their definition of "scientific literacy" was comprised of the following four components :

a) Knowledge of scientific facts of the basic textbooks
b) Understanding scientific methods, such as probable reasoning (inference) or designing experiments
c) Positive perception of science and technology
d) Rejecting superstitious beliefs such as fortune-telling or the belief in numbers

As in a democracy in which the votes and voices of people can only be effective when the people are aware of political process and its related entities, the people's ideas can also be important in policy makings of science and technology only when they are familiar enough with the scientific facts and processes. The idea of scientific literacy attributes to the general population -who are not educated enough- a lack (deficiency) of knowledge and puts the general public education on its agenda.

Public understanding of science: since the second half of the 1980s, the concept of "public understanding of cience" replaced the "scientific literacy" concept. In addition to knowledge, the public understanding of science also covers the attitudes of people. By the announcement of a report by Bodmer, a concern was raised that the lack of trust and interest of people toward science is due to the lack of proper understanding of them. The current versions used in assessing public understanding of science also investigate the people's attitudes including their concerns, preoccupations and hopes toward the science and technology and the people's evaluation of social and ethical implications of science and technology. For example, Japan has used them since 1980 s and Brazil has used variables such as the images associated with the scientific ideas. Malaysia and India have tried to adapt the models measuring public understanding of science in accordance with their cultural requirements and localize the methods of measurement .

Engagement Model:

The deficit model and its two related concepts i.e. scientific literacy and public understanding of science have met with much criticism by researchers. The fatherly approach lied in these two concepts leads to the feeling of loneliness, distrust and even growing opposition of general public toward science .

Researchers of science and society proposed the "engagement model". In this model, the deficits are attributed to the parties of the relationship between science and the general public, ranging from lack of knowledge, attitudes, confidence of general public, the lack of institutions and experts in science and technology. In this model, also known as dialogue model or engagement model, the engagement, dialogue and interaction of all parties involved in science (including scientists, investors, the general public, scientific media agents, managers, policy makers, etc.) are included on the agenda. This model especially emphasizes on empowerment of people and thus increasing the confidence in policy-making in science and technology as a set of activities. The model of engagement in science is resulted by the commitment to democratization of science (i.e., decreased exclusive control of science by politicians and scientists) and increasing the participation of community groups and public actors through the expansion of some forms of empowerment and public involvement. Of Europe in the 71s, in addition to cognition, interest and attitude variables of science and technology, the variables of engagement and involvement in science including the role of youth and women in science, the notion of actors involved in science and technology, decision-making process in science and technology, and finally evaluation of the impact of ethics on science and technology in the future have also been considered (Ghaneirad and Morshedi, 2011)

COMPARATIVE STUDY

The study of some developed countries:

European Union: Europe is the origin of the engagement model and all the research has been designed and implemented in this model. In Europe two series of investigations are carried out simultaneously. The first series called "public approaches" is about the role of the media in scientific culture and the second series pays attention to "assessment of public culture of science" on certain issues such as environmental issues, stem cells, nanotechnology, transgenic plants, etc. Here we have examined both of these investigations.

a) The effect of media on scientific culture of 27 European countries:

The main findings of the study are as follows; the majority of the population of the European Union is interested in scientific research. European Union citizens have a positive overview of the representation of scientific research in the media. However, there should be improvements in the ease of understanding. Television is a major medium in all aspects covered by this investigation. Citizens of European Union consider the scientific research as a serious and important issue. Since they consider broadcasting scientific programs -especially documentaries- as essential issues, they give them the highest priority in the days of the week. In addition, the studies show that the Europeans prefer the "scientists" to report on science in the media more than the media agents (such as journalists), because they think that the scientists are more reliable and more accurate. (Report of the European Commission, 2007)

b) Accessing the public culture of science: Eurobarometer

This is the survey report about social perceptions of Biological Sciences and Biotechnology. The latest European survey in Bioscience and Biotechnology is based on a sampling of thirty-two European countries in February 2010 which indicates that a new era has emerged in the relationship between science and society. In 2010, this research had focused more on the technologies, themselves. Are they safe? Are they useful? Can technolite be replaced by more acceptable moral -emotional concepts? Europeans are increasingly concerned about energy and sustainable development. There is no incentive for innovation in people.

USA: USA is the country of origin of deficit model. So, all the surveys of the country have been conducted based on the deficit model. Two series of investigations are also being done in USA:

The overview of public attitudes and knowledge towards science and technology in USA is dependent on three types of "standard judgments."

First, comparison of the knowledge and attitudes of Americans with residents of other countries. When the US data are compared with the data from other countries, the United States has relatively a good condition.

Secondly, comparison of the knowledge and attitudes of today Americans with their own pasts. Survey data of later periods do not show acceptable progress in the Americans public understanding compared to their own pasts. In addition, the documents also show a minor decrease in the knowledge they represent.

Thirdly, comparing the USA with an advanced technological utopian society (today or in the future). What does an ideal society need to take the lead in global economic competition and have active citizens to make scientific advances in their lives. In this standard, the distance to the destination is greater. At this stage, most of the common misconceptions can be found regarding the emerging technologies. People believe that a rather great distrustfulness has surrounded the world which has changed the global atmosphere (Science and technology, 2004)

b) Technology literacy survey: based on the definition of technological literacy as "One's ability to use, manage, assess, and understand technology", most Americans are not technologically literate. They have little understanding of the relationships between science, technology and engineering. They do not know what the engineers do and they don't clearly know about the cooperation between scientists and engineers to create technology. Americans are using technology with a minimal understanding of how or why the technology works, what its consequences are or even where the technology comes from. Americans have

a poor understanding about "the basic features of technology", and questions like "How does technology affect the society?" and "How can people influence the development"?

STUDYING SOM DEVELOPING COUNTRIES

Malaysia: In Malaysia, the basis of field research is deficit model. Trend analysis of the report for the years 1998-2008 shows that the people's attitudes towards science and technology have generally improved over these years. The public informative resources in the field of science and technology are still TV (82.4%) and newspapers (62.1%)

Brazil: A part of the standard development project in Latin America is related to the index of social perception, scientific culture and civic participation in science and technology. Quantitative analysis has produced interesting findings and has created some wonders equally. The first thing to note is that the social inequalities are actually the main causes of vast differences in the responses of different groups at all levels of analysis. On the one hand, the mean attitude towards science and technology and towards the role and credibility of scientists in society is significantly positive for all social and economic classes. On the other hand, this interest is clearly correlated with continuous access to information, consumption habits of the scientific information and actual knowledge arising from research institutions. Categorizing the variable of scientific and technological information consumption into social, economic or educational categories shows that inequality of access to information is much more important than being an assisting factor for filling this gap. This survey shows that a large proportion of the population do not democratically have access to scientific and technological spaces. This investigation showed that there is no direct connection between the infrastructures of science and technology, and information concerning the interest towards region-based science and technology .

Generally, the concept of science and technology is quiet positive, optimistic, and supportive for science and technology. However, there are profound differences in access to information and information consumption habits, all of which have important influences on attitudes, values and behavior.

PRESENTATION OF THE RESEARCH RESULTS:

In this section, the mentioned countries of the world will be studied in a comparative analysis. Note that the data pertaining to USA, Brazil and Malaysia have been reported for different periods. But the data pertaining to Germany, UK, France and Turkey have been extracted among the reports by the European Union.

Table 1 presents the role of media in scientific and technological culture. For comparison, the international atmosphere forms the vertical column (UK, Germany, France, USA, Brazil, Turkey and Malaysia) and four variables form the horizontal row (level of public awareness of science and technology, people's attitudes toward science and technology, the rate of public engagement in science and technology and people's participation in science and technology). Each variable has been divided into several indicators that are among the subsets of variables.

Table 2 exclusively shows the public approach towards the impact of media on presenting the reports of science and technology. In the horizontal line, the proportions of positive responses of respondents and

Journalists have been presented and in the vertical columns, the public atmosphere of countries has been reported separately.

Table 3 is devoted to the spectral classification of factor levels. In this table, classification levels have been determined. The minimum and maximum percentages of responses have been determined. Lower than the minimum is the poor condition with the score of zero and higher than the maximum is the very good condition with the score of 3. Then the average of the minimum and maximum distances is calculated the lower of which is the average state and above that is regarded as desirable condition.

Table 1 - The role of media in public scientific culture

Scientific involvement			Scientific engagement			Scientific attitude		Scientific awaerness	International atmosphere
Normalization and evaluating the impacts of ethics on the future of science and technology	Confidence in science and technology decision maker policymakers		Empowerment of citizens in access and consumption of information	Actors involved in the public culture of science and technology		Recognition of Science and Technology Concepts from the media	remembering the concepts of science and technology from the media	Watching the facts of science and technology in the media	
	Scientific community	Politicians		joernalist	Scholars				
19%	26%	9%	61%	12%	61%	35%	30.5%	79%	France 2007
16%	20%	6%	70%	19%	49%	68%	68%	57%	German y 2007
-	-	-	-	-	-	73.8%	-	45.1%	Malaysia 2008
8.8%	-	-	-	-	-	32.5%	-	25.3%	Turkey 2010
-	-	-	-	-	-	-	49.2%	45.4%	Brazil 2010
-	-	-	-	-	-	45%	93%	50%	USA 2001
25%	23%	13%	65%	15%	59%	61%	60%	60%	UK 2007

Table 2 the approach of people to the impact of media in reporting on science and technology

appropriate hours of broadcasting news reports		Priorities of media devices in scientific news reporting					The method of presentation of scientific news		Important factor in providing scientific reports			Being satisfied from the media in the field of information	International atmosphere
22-18 Holidays	22-18 Non-holiday days	Magazines	Internet	Newspapers	Radio	TV	Occasional and profound	Short and regular	Entertainer ment	the public concern about in formation	Ease of reporting		
16%	39%	28%	25%	49%	28%	52%	35%	51%	6%	18%	38%	59%	France 2007
19%	42%	22%	19%	50%	19%	76%	41%	36%	12%	15%	47%	68%	Germany 2007
-	-	22.1%	24.8%	62.1%	32.1%	824%	-	-	-	-	-	-	Malaysia 2008
-	-	-	-	-	-	-	-	-	-	-	-	-	Turkey 2010
-	-	36%	36%	36%	36%	36%	-	-	-	-	-	-	Brazil 2010
-	-	-	35%	6%	2%	34%	-	-	-	-	-	-	USA 2001
11%	45%	12%	26%	27%	39%	65%	27%	51%	7%	14%	27%	58%	UK 2007

Appropriate format for presentation of Scientific news

Training programs	Entertainment (shows, contests and Fun)	Scientific debates	Animation	Scientific presentations	TV Series	Documentaries
7%	4%	13%	1%	8%	7%	55%
5%	7%	8%	1%	4%	5%	53%
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
10%	2%	4%		4%	5%	60%

Table 3 Classification of the levels of factors

Normalization and evaluating the impacts of ethics on the future of science and technology	Confidence in science and technology decision maker policymakers		Empowerment of citizens in access and consumption of information	Actors involved in the public culture of science and technology		Recognition of Science and Technology Concepts from the media	emembering the concepts of science and technology from the media	Watching the facts of science and technology in the media	
	Scientific community	Politicians		journalists	Scholars				
8.8%	20%	< 6%	61%	12%	49%	32.5%	30.5%	25.3%	0 weak
- 8.8% 16.9%	- 20% 23%	- 6% 9.5%	- 61% 65.75%	- 12% 15.5%	- 49% 53%	- 32.5% 53.15%	- 30.5% 61.75%	- 25.3% 52.15%	1 average
- 16.91% 24.9	- 23.01% 25.99	- 9.51% 12.99	- 65.76% 69.99	- 15.5% 18.99	- 53% 60.99	- 53.15% 73.79%	- 61.76% 92.99%	- 52.16% 78.99%	2 desired
≥ 25%	≥ 26%	≥ 13%	≥ 70%	≥ 19%	≥ 70%	≥ 73.8%	≥ 93%	≥ 79%	3 very good

Table 4 the factors ratings On this basis, cut-off points were determined for each index. (Table 3) and countries were scored on this basis (Table 4)

Total cash	Normalization and evaluating the impacts of ethics on the future of science and technology	Confidence in science and technology decision maker policymakers		Empowerment of citizens in access and consumption of information	Actors involved in the public culture of science and technology		Recognition of Science and Technology Concepts from the	remembering the concepts of science and technology from the media	Watching the facts of science and technology in the media	
		Scientific community	Politicians		Scientific journalists	Scholars				
16 out of 27	2	3	1	1	1	3	1	1	3	France 59%
16 out of 27	1	1	1	3	3	1	2	2	2	Germany 59%
4 out of 9	-	-	-	-	-	-	3	-	1	Malaysia 44%
2 out of 9	-	-	-	-	-	-	1	-	1	Turkey 22%
2 out of 9	-	-	-	-	-	-	-	1	1	Brazil 22%
2 out of 9	-	-	-	-	-	-	1	3	1	USA 55%
17 out of 27	3	1	3	2	1	2	2	1	2	UK 63%

Table 4 is the factors rating table. At first it is necessary to be reminded that the empty cells of the table are due to different theoretical basis of countries. Thus the countries with a deficit model only have the factors of knowledge and public attitudes toward the science. While the countries with the engagement model have also investigated the involvement variable and public engagement in science, in addition to the two previous variables. So the cells of the first group are empty of engagement variables. However, the countries with deficit model have been investigated with a ratio of nine (each house has three points with a total of 9 points) and the countries with engagement model will be presented (each house three points, the total)

Figure 1 compares the results. The country level is presented as a bar and a standard is determined for all countries so that every society can place itself at this scale and find its place.

Comparative study of above indices for developed and developing countries shows that the distance between the minimum and maximum values of these quantities is divided into a tertile and the value less than the minimum amount for developing countries is considered as the weak index level and the values of the 3 above sections are categorized as average, favorable or very favorable levels and a value between zero and three points was assigned for each level.

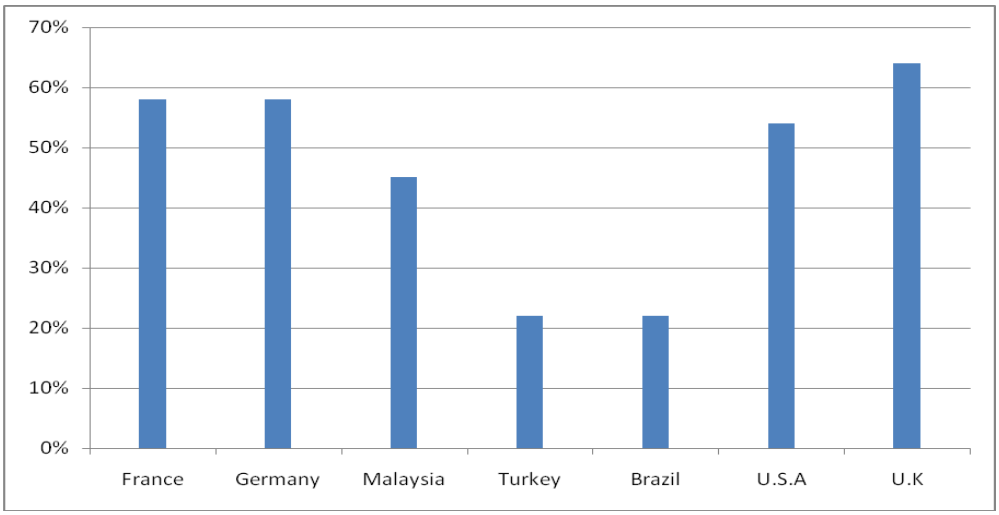

Figure 1 Total Points earned by the selected countries
(The impact of media on the public culture of science and technology)

The research findings show that the developed countries have 44% to 63% of the general culture of science and technology while the very percentage of developing countries is 22% to 44%. If the country scores lower than 22%, then the country is rated among poor countries in this field. Countries scoring higher than 63%, have gained a good position in the field of general culture of science and technology.

METHODOLOGY

A quantitative method was used in this paper. First of all, all the developed and developing countries were listed (statistical population). Then among them, the countries with accessible reports in the global medium of Internet were considered. Among them, some developed countries and developing countries were selected. They were compared with a ranking method. Finally the rankings of countries were determined on a chart separately. The result of the chart is determining a scale for rating other countries .

DISCUSSION AND CONCLUSION

The obtained scores (ratings table and scores table and column chart) show that the scoring of these indicators is well able to distinguish between developed countries and developing countries and is a complete separator in terms of points distribution. The analysis of charts and tables indicates that 7

underlying axes have resulted in development in the field of science and technology culture by media. The reason of this growth is developing suitable media programs in line with the objectives of cultural policy makers that demonstrate innovative measures taken by developed and the developing countries. The above tables show that the developing countries by investing in the 7 above axes which have led to improvement of the general culture of science and technology in developed countries, have attempted for investment in their own countries.

Moreover, the communication infrastructures and international requirements such as International organizations have led to greater convergence between developing countries and developed countries for acquiring the experience and training that has ultimately provided the chance for the growth of these countries. In Iran, due to the political and managerial problems, the above infrastructure and international requirements still have not been fully implemented.

The purpose of this study was a comparative analysis, finding the quantities for comparison and providing solution for the lack of ability of Iran in the fields of public culture of science and technology and the necessity to use infrastructures required for growth in this area like Malaysia, Turkey and Brazil which has lead to their growth in the field of public culture of science and technology according to the documentations. It is worth noting that creating infrastructures is not necessarily the cause of imitating the Western countries for development. Solely, the concentration on these infrastructures can become the growth context like what the western countries have experienced. In fact with the approach of considering the infrastructures, Malaysia, Turkey and Brazil have become able to find a strong presence in the realm of public culture of science and technology.

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