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IDENTIFICATION AND ANALYSIS ON MEGA TRENDS IN ENERGY SECTORS REGARDING GLOBAL MEGA TRENDS AND THEIR INFLUENCES ON THE OIL INDUSTRY

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ABSTRACT

The world of energy is an infrastructure for all global activities having instantaneous changes. In this paper, global mega trends, especially in the field of technology have been reviewed and then identification and analysis mega trends in the energy field have been identified and analyzed. This field includes a vast basis for energy portfolio, including oil, gas, coal, wind, solar, water, and so on. Energy mega trends have widespread effects on energy policies. Hence, the effects of these mega trends on the oil industry and the related challenges have been investigated and some solutions have been proposed face with these challenges and changes. In the project of World International Organization, fifteen challenges regarding global mega trends have been introduced in the field of energy, related to supply and demands changes and cultural, social and economic issues, which all of them analyzed with consensus of distinguished experts and described in this paper.

Disciplinary: Multidisciplinary (Advancement in Technology, Energy Science, Energy and Environment).

1. INTRODUCTION

Today, development of science and technology and its vital role in human life are evident for everyone. Looking at ten future technologies of the world that will be mentioned below, the main role of energy is, directly and indirectly, obvious as an infrastructure in renewable energies for all of these technologies (IEA, 2017; C-Glenn, 2013). Reviewing 15 megatrends in the world monitored annually by the United Nations, the importance of energy and the environment is directly recognized while it is indirectly recognized in other trends. In this paper, the megatrends of energy sector, which are

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presented in various forms by scientific sources and reports of major energy companies activating in the field of energy, will be introduced in six megatrends. Also, the impact of mega trends of energy sector on the world oil and gas industry has been analyzed. In this regard, the importance of the oil and gas industry in both world and Iran has been investigated and solutions have been provided to confront the mega trends of this industry. All process of analyzing has been done by means of statistical trend, probable scenarios, and experts' opinion.

2. LITERATURE REVIEW

The mega trends of the emerging ten technologies in the world and its effects on energy sectors (Fincyte, 2018; Eagar et al., 2014). In addition, Tech Insider site has published a report on the status of technology development by 2050 (Neytchev, 2016). Based on this report, some of the technologies that will be attractive in the coming years include:

- High-rise buildings controlled by artificial intelligence;
- Providing heat through smart radiation and lightning;
- External cover (shield) for building workers;
- Performing dangerous activities by robots;
- Use of 3D technology for doing fast activities that play a key role in the technologies of oil industry. The use of such technologies in the oil industry is mentioned as follows.

2.1 EXPLAINING GLOBAL MEGA TRENDS AND THEIR CLASSIFICATIONS

Companies, governments, and non-governmental organizations express mega trends with different titles, but the most influential companies have organized their strategies in different ways, according to mega trends (PWC, 2016a; 2016b). In fact, a trend is an emerging pattern of changes that affect its own surroundings (activities and processes) (Neytchev, 2016) and probably it influences individuals, communities and governments, as well as it requires a reaction. Mega trends are global and sustainable forces (Sarwant, 2016), and at a macro level, they are long-term changes that affect business, economies, societies, cultures, and even personal life, and define the future world (Kosow & Gaßner, 2014; Khazaei, 2019; Sarwant, 2016; Khazaei et al., 2019).

The mega trends can be classified into four categories including:

Class 1: In the energy and environment fields, some major mega trends include: changes in energy composition, resource shortage, and climate change;

Class 2: In the field of science and technology development, some key mega trends include: bio-energy, technology advances in energy resource extraction, privacy and security issues, product delivery and e-services;

Class 3: In the field of economics and politics, some major mega trends are: changes in economic power, globalization, and the multi-polarization of the world and the society based on information and knowledge;

Class 4: In the social, cultural and health sectors, some of the major mega trends are population changes referring to changes in various aspects of population statistics, such as size, ethnic composition, birth rate, and mortality rate, geographical distribution, age, income, growth of urbanization.

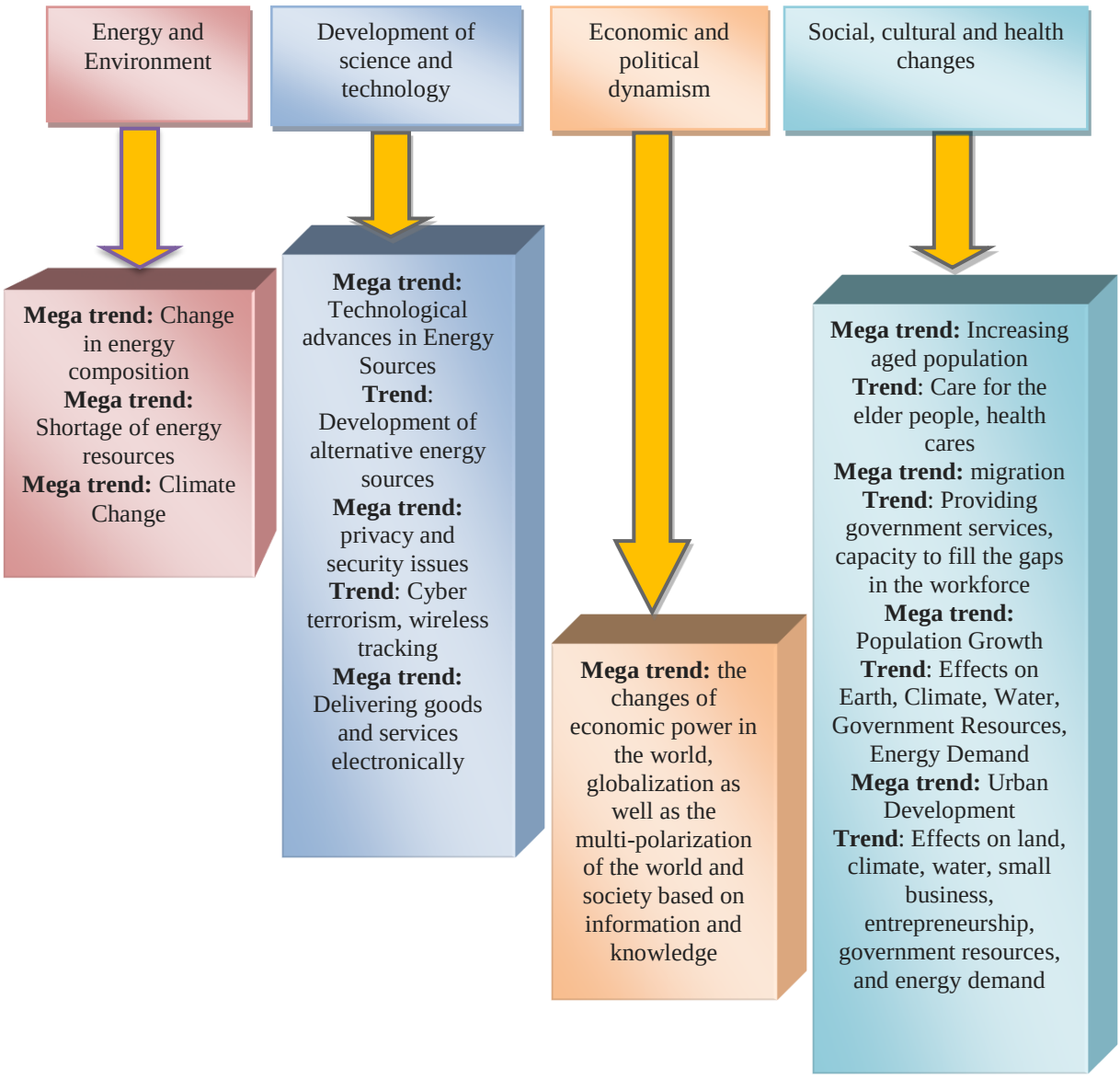

Figure 1: Classification of Mega Trends.

In the field of economics and politics, megatrends include changes of economic power, globalization and also the multi-polarization of the world that will affect through four mentioned driving paths. The economic power of emerging economies will allow markets to develop, the middle classes of the societies will improve and wealth will increase, too. Increasing demand for energy in emerging and developing regions requires the investment in infrastructure to produce more productions as well as it demands further transportation. Also, due to globalization, the economies of the world will be interconnected, economic convergence will emerge, and international trade agreements will be increased affecting supply and demand of oil and gas, as well as energy trade. Changes in economic power influence the relative balance of demand between current markets and developing markets.

3. RESEARCH METHODOLOGY

This research is applicable from the objective point of view and qualitative and quantitative method strategically and could have many usages in all industries. The aim of this research is to

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identify and analyzing mega trends by approaching world mega trends and their impact on energy sectors. To explore the effect of the most important mega trends, focusing on future research. In qualitative and quantitative research with exploring purposes, which identification of the nature and fundamental elements of phenomena is the core of study, we can use methods such as trend analysis, scenario writing a and exploiting expert opinions. This can be used for identification and "screening" of the most important indices of decision making. Using knowledge and bestowing expert specialized opinions is very important for making decisions about issues by quantitative nature. In summary, predicting methods as a research approach is defined as a means to reach consensus by using participants' opinions who are experts in the key areas of related issues. In predicting methods, surveying expert viewpoints, statistical methods, and data analysis are being used and its validity depends on the aim of the research, exports' viewpoints and the number of respondents. Tools for gathering data in this research are trend analysis. People who are knowledgeable in the field of related subjects are participated as the nominee to bestow their viewpoints. To validate the finding of the study, the research community selected among the RIPI Scientific Board, researcher, and manager who are aware of energy and its mega trends. The academicians believe that 10 to 20 expertise is enough as the validate research samples. The rest introduced by the experts at the beginning of stage of the interview. The interviews continued so enough to make sure no new date elicited from the respondents. At the final stage, the number of the samples reached 20 respondents. The demographic information of the participants shows in table 1 below:

Table 1: Demography of the experts' panel.

Variants	Group	Abundance	Percent
Gender	Male	14	70
	Female	6	30
Education	PhD	12	60
	Master of Science	8	40
Experience	Less than 10 years	5	25
	10 to 20 years	8	40
	Above 20 years	7	35
Position	Scientific board	11	55
	Researcher/manager	9	45
Total		20	100

Firstly, in the exploring stage, the world mega trends impacting on energy sectors identified from the interviews data analysis. Then for assurance of the mega trends to be valid, the semi-structured and in the second and third stages, structured questionnaires were used to synergize the consensus of expert viewpoints.In this research, concurrence of the expert's viewpoints occurred when the average of the viewpoints reached to 4 (an agreement). Kendal rate was used to control reliability of the results, which came 0.763, so is suitable. In addition, since members participated in the panel of experts was distinguished expertises, who were eligible representative of knowledgeable sector, hence the validity of the content guaranteed accordingly. Cronbach's alpha was used to evaluate the reliability of the questionnaire which summed up 0.77, showing reliable.

4. RESEARCH FINDING

4.1 QUALITATIVE STAGE (EXPERT MEETING)

In the first sage, the most important components of global mega trends impacting energy sectors elicited from the literature review were reviewed with the expert via open interview. Then the elicited

components, obtaining from theoretical studies, explained to the respondents via correspondent and asking them to nominate any ignored components. By receiving the responses and reviewing them, the same components merged and also unrelated components omitted from the research. In the first stage of expert meetings, by help of the experts' panel, groups of mega trends in the energy sectors were identified and analyzed. Finally, the questionnaire amended by the expert's viewpoints and then finalized after undergone two expert meeting stages. Then for determining the most impacting components, the final questionnaire by 10 mega trends given again to the participants to review and revise if necessary and give their reason for any non-consensus changes. At the end the consensus made on the six following mega trends and its model coming in Table 2 and Figure 2, receptively:

Table 2: Final result of the Delphi method for global mega trends impacting energy sectors.

Name of the macro trends	Average of the viewpoints	Kendall's coefficient	Rank
Energy Transition and Overcoming Fossil Energy	4.76	0.768	1
Oil supply	4.58	0.762	2
Gas supply	4.56	0.762	3
Renewable energy growth	4.44	0.760	17
Electrification	4.43	0.764	18
Changes in demand	4.43	0.750	19

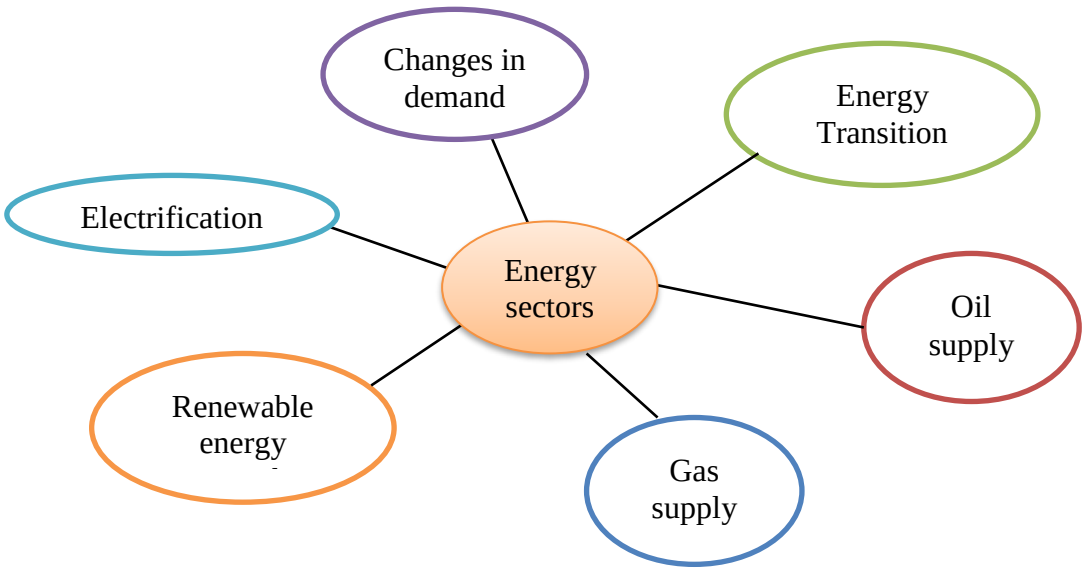

Figure 2: Final model of global mega trends impacting energy sectors obtained from this study.

5. CONCLUSION

Summary and Results of Global and Energy Mega Trends and their Influences on Oil Industry Mega trends are major economic and geostrategic forces that shape the world. On the other hand, they are the biggest challenges for societies that may create opportunities. These mega trends are divided into different classes. In this paper, examples of such classification were provided. In a sample, mega trends have been classified into four groups of economic and political, energy and environmental, social and health and development of science and technology categories and the impact of each mentioned in the ongoing section.

6. DATA AND MATERIAL AVAILABILITY

This study already includes all the information about this study.

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