Developing Expert Scenarios Facing Iran's Petroleum Industry

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Abstract

This research discusses future development of Iran's petroleum industry by using strategic management approaches relying on scenario-based planning models. The theoretical frame of this research is a normative paradigm in upper range documents advocate approach. Delphi methods, cross-impact analysis, and scenario-based planning have offered flexible and comprehensive planning combinations in proposing new styles in foresighting products development. In addition, Micmac software was employed to analyze dates. In this research, 235 influencing factors on a product development trend were selected using a PESTEL model and a Delphi approach, then the effects of these factors on each other were tested that eventually 22 key factors were selected. Among 22 key factors, 2 main factors including "political relations" and "the government's dependence on petroleum" were selected using a cross-impact analysis. After that, a 2×2 matrix was formed that contains four scenarios including a playful rabbit, a runaway snake, a noble horse, and a sleeping lion. This research can enhance decision making abilities of top managers through identifying key signals of how each scenario appear in future of Iran's petroleum industry. Results show that management team of petroleum products requires serious etiology and attitude rehabilitation.

Key words: Futurology; Scenario planning; Iran's petroleum products; Key factors; PESTEL model; Micmac software

INTRODUCTION

Energy is one of the major inputs for the economic development of any country. In case of developing countries, the energy sector assumes a critical importance in view of the ever-increasing energy needs requiring huge investments to meet them. Investment banking firms are intermediaries that can fund energy sectors. They advise firms, distribute securities, and take principal positions in a market[1].

Energy can be classified into several categories based on the following criteria:
- Primary and secondary energies
- Commercial and non-commercial energies
- Renewable and non-renewable energies

(1) Primary and Secondary Energy Sources

Primary energy sources are those that are either found or stored in nature. Common primary energy sources are coal, oil, natural gas, and biomass (such as wood). Other primary energy sources include nuclear energy from radioactive substances, thermal energy stored in earth's interior, and potential energy due to earth's gravity. The major primary and secondary energy sources are shown in Figure 1.

Primary energy sources are mostly converted into secondary energy sources in industrial utilities; for example coal, oil, or gas are converted into steam and electricity.

Primary energy can also be used directly. Some energy sources have non-energy uses, for example coal or natural gas can be used as a feedstock in fertilizer plants.

(2) Commercial Energy and Non-Commercial Energy

(a) Commercial Energy

The energy sources that are available in the market for a definite price are known as a commercial energy. By far the most important forms of a commercial energy are electricity, coal, and refined petroleum products.

(b) Non-Commercial Energy

The energy sources that are not available in the commercial market for a price are classified as a non-commercial energy. Non-commercial energy sources include fuels such as firewood, cattle dung, and agricultural wastes which are traditionally gathered and not bought at a price used especially in rural households. These are also called traditional fuels. A Non-commercial energy is often ignored in energy accounting.
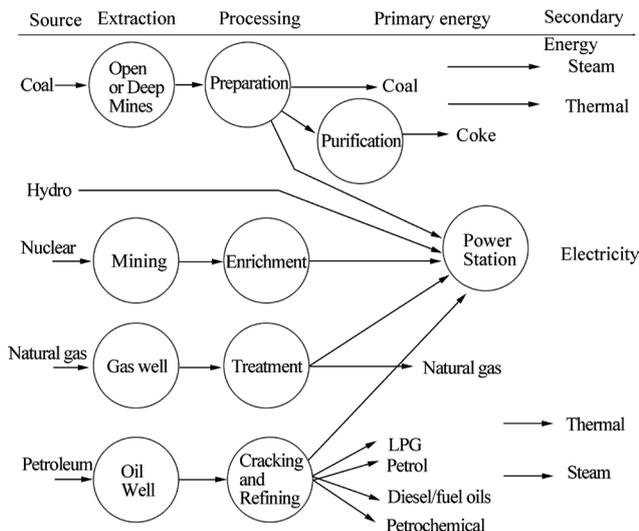

Figure 1
Major Primary and Secondary Sources

(3) Renewable and Non-Renewable Energy

Renewable energy is the energy obtained from sources that are essentially inexhaustible. Examples of renewable resources include wind power, solar power, geothermal energy, tidal power, and hydroelectric power (See Figure 2). The most important feature of renewable energy is that it can be harnessed without the release of harmful pollutants. Non-renewable energy is the conventional fossil fuels such as coal, oil, and gas, which are likely to deplete with time.
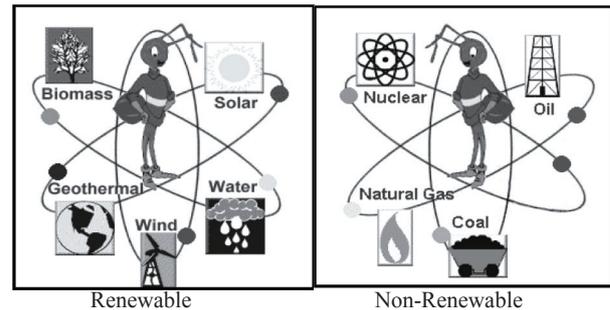

Figure 2
Renewable and Non-Renewable Energies

While several electronic systems including internet have changed the communication world and given particular opportunities to communication ways[10], oil products can be arranged in different categories according to their usage. Therefore, the research results can be used for Iranian petroleum top decision maker in order to lead future production of petroleum products.

One of the most reliable predictions[16] about oil and gas resources shows through the year 2030, that traditional fossil fuels will continue to supply the vast majority of energy needs. At the projected growth rates, both oil and gas will represent about 60% of total energy usage, which is near the share they act today. Nuclear, hydro power, wind, biomass, and other renewable fuels will grow in total at 1.6% annually. The following graphic in the ExxonMobil Outlook depicts its view of the demand for energy globally. (Figure 3 The Outlook's graphics are in color; the parenthetical caption appearing below the graphic as explanation has been rewritten for readers viewing this graphic in black and white copy.)
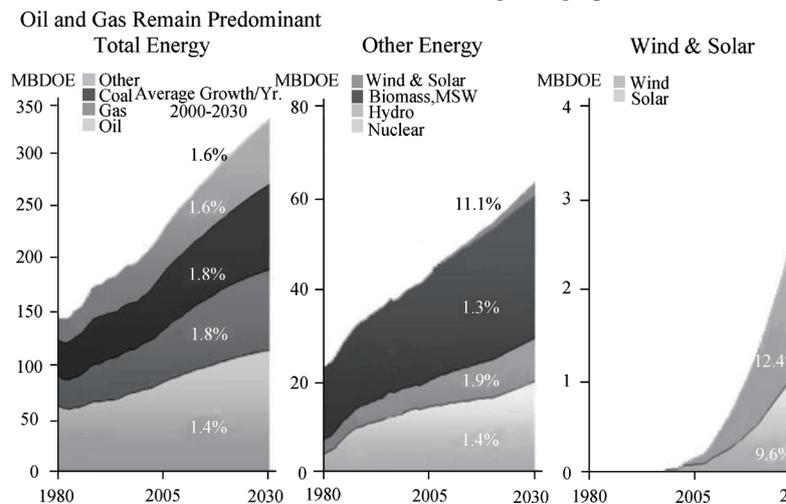

Figure 3
Oil and Gas Resources Until 2030

1. WHAT IS SCENARIO PLANNING: THE REASON TO USE THIS APPROACH

Scenario planning was formed in U.S. Army during the Second World War in order to deal with probable attacks of enemies. After the second World War, Pier Walk and Herman Cain used Scenario planning in Royal Dutch Company in order to influence the decision makers of the company which resulted in remarkable achievements[14]. Strategic planning is a suitable tool to reach organizational goals[15].

There are many different approaches to scenario planning, but most of those presented here are derived from the qualitative approach of Shell/SRI International and share many features[4, 5, 19, 20, 21, 23, 24, 25, 26].

These approaches differ in emphasis due to their variation in goals of the ones who have created them. The research approach to scenario planning is similar to these approaches while it is influenced by adaptive environmental assessment and management[11]. The fast-changing nature of the modern business environment means that planning should be a continuous[12]. In this complex and turbulent environment, relying solely on strategic planning cannot guarantee the success of businesses; rather businesses have to prepare themselves to react to a wide range of probable futures[9]. Scenario planning is considered as a mixture of six interacting stages. Scientists, managers, policymakers, and other stakeholders explore through series of workshops. It begins with identification of a focal issue or problem. This problem is then used as a focusing device in order to assess the system. The assessment is combined with the focal problem to identify key alternatives. Alternatives are then developed into actual scenarios which are tested in a variety of ways before being used in a screened policy. Although this overview presents scenario planning as a linear process, it is often more iterative: system assessment leads to redefinition of the central question, and testing can reveal blind spots that require more assessment[8].

Scenario Planning is a technique that allows for an effective assessment of uncertainty. Figure 4 illustrates the relative position of forecasting (F), and scenarios in terms of value compared to distance into the future[24]. On a short-term period, the environment is highly predictable and forecasting is expected to render high yields. In a very long-term period, uncertainty is so high that strategic planning will render smaller returns. In between, scenario planning provides value; allowing both certain uncertainty and still building upon predetermined knowledge. Next, a description is given of how scenario planning aids companies towards this "break-even-point".
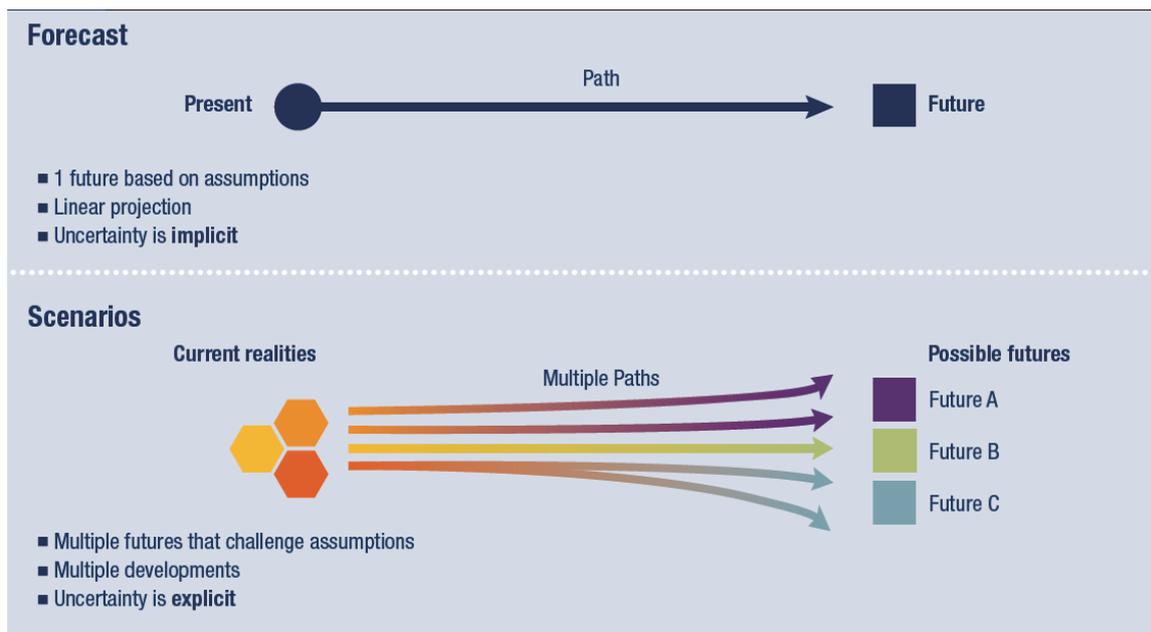

Figure 4
Forecasting Versus Scenario Planning Source: World Economic Forum

1.1 Scenario Planning-Certain Uncertainty

Over the last decades, a scenario planning method has gained popularity. As a business environment is becoming increasingly volatile, the "complexity view" emerged. The "complexity view" suggests that it is fundamentally impossible to predict aspects of the future[24]. Table 1 compares forecasting with scenario planning[7]. The major difference between these two approaches lies in the acceptance of uncertainty and the acting hereupon from a pluralistic ethic.

Table 1
Forecasting Versus Scenario Planning

Forecasting	Scenario planning
Focuses on certainties and disguises uncertainties	Focuses on and legitimizes recognition of uncertainties
Conceals risk	Clarifies risk
Results in single point projections	Results in adaptive understanding
More quantitative than qualitative	More qualitative than quantitative

Schoemaker[20] explains the difference between "traditional" techniques of exploring the future and scenario planning by climbing a mountain: "Suppose you are climbing a mountain. Previous planning would provide you a detailed map describing the constant elements of the terrain. Of course, this traditional planning tool is very valuable and, indeed, indispensable in this case. However, it is incomplete. First, it is a distorted representation (i.e. any two-dimensional map distorts the earth's surface). Second, it ignores the variable elements, such as water, landslides, animals and other hikers." The comparison of Schoemaker points out the value of adding a view that includes important variables to the discussion instead of ignoring them. When climbing mountains, after all, you would at least want to determine what to do when a storm strikes you, or when it starts to rain heavily. As Schwartz[22] states: "To act with confidence, one must be willing to look ahead and consider uncertainties: What challenges could the world present me with?" In relation to Figure 4, the detailed map provides the "predetermined", whilst the assessment of what to do in case of rain enables an assessment of relevant "uncertainties". Scenario planning offers companies the possibility to take charge and proactively deal with different plausible futures. As Ogilvy[25] states: "We need to go towards a way of viewing the world from multiple perspectives…." Since the environment changes, your business should evolve as well.

Without this effort, "there is a lack of understanding of how the wider environment is impacting customers, their needs, and value systems. One cannot stick to one business method of excellence and expect it to be "a winner" in all periods. "Winning means changing the way one plays over time". As important variables in the environment change, strategic plans should as well. For this reason, scenario planning is a continuous process – inducing constant adaptation and learning. Only when we keep learning, we keep looking ahead instead of looking backwards. Learning takes an important place in the scenario planning technique. Van der Heijden[24] considers: "In a world of constant and ever-increasing change, is it sufficient to learn reactively, or is it necessary to learn proactively?" The answer is: the latter. We must find a means to learn "proactively". "Learning is a process of adaptation to one's environment, a process of trial and error, a process of perpetual innovation (metaphorical mutation) followed by a selection of what is most fitting to a particular environmental niche, a process of testing the affordances of different niches and differentially

reproducing those innovations which the niche can best afford"[25]. The traditional learning method is one of "single-loop learning". Here, a strategy is predetermined and executed, without adaptations made along the way. "With double loop learning, operating procedures are changed in responsive to emerging situations"[24]. As a result, a company and its employees can effectively adapt to changes in the environment. In Figure 5, double-loop learning is graphically depicted. Double-loop learning enables an effective assessment of uncertainty instead of ignoring it. The underlying assumptions that lead to the strategy formulation are assessed with due regard to external (potential) developments, strategies are kept relevant and up-to-date. In the execution of double-loop-learning, "The key is for organizations to evaluate managers based on good decision processes rather than good outcomes"[24]. This way, assessing past strategies in new situations is stimulated.
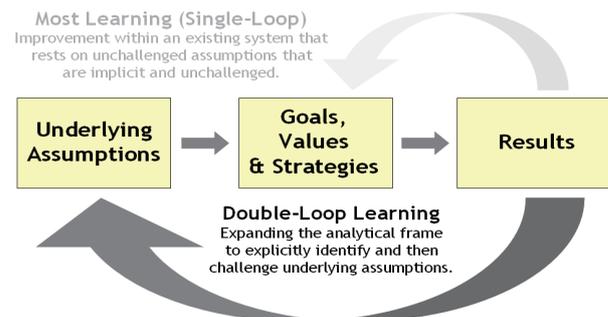

Figure 5
Single-Loop and Double-Loop Learning, Argyris C, Schön D.[3]

Van der Heijden[24] distinguishes the following specific benefits of scenario planning: "Enhanced perception, integration of corporate planning, making people think, structure for dealing with uncertainty, a communications tool, and finally a management tool. Although these concepts mostly speak for themselves, it is useful to develop a more thorough understanding of their meaning in business." First, "Scenarios are … the most powerful vehicles I know for challenging our "mental models" about the world, and lifting the "blinders" that limit our creativity and resourcefulness."[22]. Accordingly, our perception of the external environment and the potential of acting hereupon are enhanced. The knowledge gained, can then be used in a better integration of corporate planning. Evidently, scenario planning also serves as a means to making people think. When stimulated properly in a team

environment, people will be likely to actively engage in (strategic) discussion with each other. It is important to: "Make explicit our own tacit understandings and our own cultural insensitivities at the most basic level"[24]. Last, scenario planning is both a good communication tool; for instance to warn people about potential changes, and a good management tool; as a basis for strategic decision making. Here, "a scenario is a tool for ordering one's perceptions about alternative future environments in which one's decision may be played out"[22].

2. OUTCOMES OF SCENARIO PLANNING

Many of the definitions here do not explicitly state the outcome variables of scenario planning; they rather indicate that some authors are unsure about the aims of their definitions. This also suggests that scenario planning professionals are just beginning to consider the importance of defining what they do and explicitly stating what they intend to achieve by doing it. Table 2 shows that almost half of the available definitions date from 1997 to the present. Such a surge of publication activity related to scenario planning suggests a recent increased use of this strategic tool. The first available definition of scenario planning is offered in 1985, yet the process has been applied in practice since the 1960s. The increase in a recent scholarly literature around scenario planning suggests that the process is developing and maturing with the help of professionals. These professionals state that scenario planning does not suffer the same inadequacies and criticisms which have been leveled against general strategic planning processes.

Table 2
Scenario Planning Definitions and Outcome Variables

Author	Date	Definition	Dependent variables
Porter	1985	"An internally consistent view of what the future might turn out to be not a forecast, but one possible future outcome" (pp.63)	A view of one possible future outcome
Schwartz	1991	"A tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out" (pp.45)	Ordered perceptions about alternative future decision making environments
Simpson	1992	"The process of constructing alternate futures of a business' external environment" (pp.10)	Constructed alternate futures
Bloom and Menefee	1994	"A description of a possible or probable future" (pp.223)	A described possible or probable future
Collyns	1994	"An imaginative leap into the future" (pp.275)	An imagined future
Thomas	1994	"Scenario planning is inherently a learning process that challenges the comfortable conventional wisdoms of the organization by focusing attention on how the future may be different from the present" (pp.6)	Challenged comfortable conventional wisdoms about the future
Schoemak er	1995	"A disciplined methodology for imagining possible futures in which organizational decisions may be played out" (pp.25)	Imagined possible decision-making futures
Van der Heijden	1997	(1) External scenarios are "internally consistent and challenging descriptions of possible futures"; (2) an internal scenario is "a causal line of argument, linking an action option with a goal," or "one path through a person's cognitive map" (pp.5)	Descriptions of possible futures; explicit cognitive Maps
De Geus	1997	"Tools for foresight-discussions and documents whose purpose is not a prediction or a plan, but a change in the mind-set of the people who use them" (pp.46)	Changed mind-sets
Ringland	1998	"That part of strategic planning which relates to the tools and technologies for managing the uncertainties of the future" (pp.83)	Managed future uncertainties
Bawden	1998	"Scenario planning is one of a number of foresighting techniques used in the strategic development of organizations, which exploit the remarkable capacity of humans to both imagine and to learn from what is imagined"	Human imagination and learning made explicit
Fahey and Randall	1998	"Scenarios are descriptive narratives of plausible alternative projections of a specific part of the future" (pp.6)	Plausible alternative projections of a specific part of the future
Alexander and Serfass	1998	"Scenario planning is an effective futuring tool that enables planners to examine what is likely and what is unlikely to happen, knowing well that unlikely elements in an organization are those that can determine its relative success" (pp.35)	Examined future likelihoods and unlikelihood
Tucker	1999	"Creating stories of equally plausible futures and planning as though any one could move forward" (pp.70)	Stories of equally plausible futures that inform planning
Kahane	1999	"A series of imaginative but plausible and well-focused stories of the future" (pp.511)	Plausible stories of the future
Kloss	1999	"Scenarios are literally stories about the future that are plausible and based on analysis of the interaction of a number of environmental variables" (pp.73)	Informed, plausible stories about the future
Wilson	2000	"Scenarios are a management tool used to improve the quality of executive decision making and help executives make better, more resilient strategic decisions" (pp.24)	Improved executive strategic decision making
Godet	2001	"A scenario is simply a means to represent a future reality in order to shed light on current action in view of possible and desirable futures" (pp.63)	A represented future reality

3. THE METHODOLOGY AND MODEL

The main purpose of this research is to create scenarios facing Iran petroleum products' development. To do this, as it is shown in Figure 6, basic data on petroleum products were gathered from internal and external resources using a PESTEL framework of Porter. Then a questionnaire was designed with 22 factors and Delphi method was used to collect the required data. After that, following a scenario development model and Micmac software, 4 scenarios were developed.
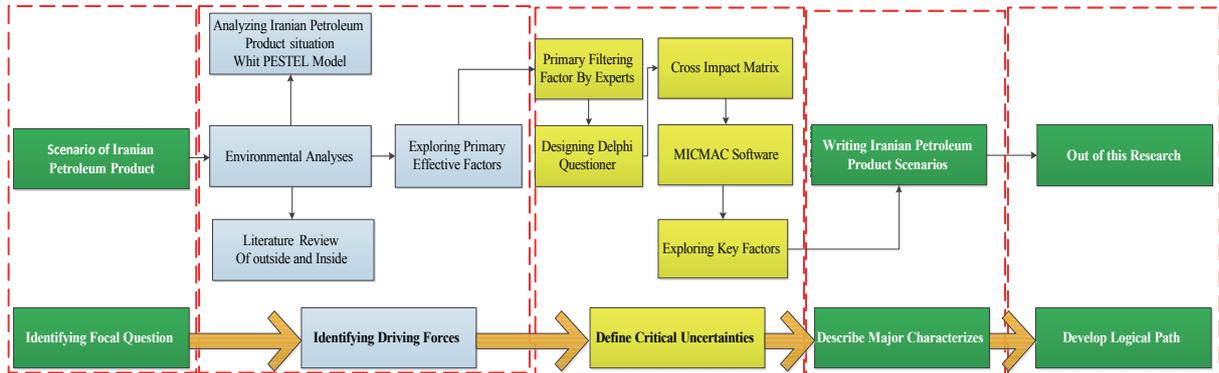

Figure 6
The Research Process

4. THE SCENARIO PLANNING PROCESS

One of the best scenario planning models, which is illustrated as Figure 7, is used to advance the process of this research[2]. This model involves the following steps:

(1) Clarifying the focus of the scenarios (a focal problem)

(2) Identifying future changes and their driving forces
(3) Identifying the critical uncertainties which could lead to distinctly different futures
(4) Fleshing out the major characteristics and development stories for each scenario
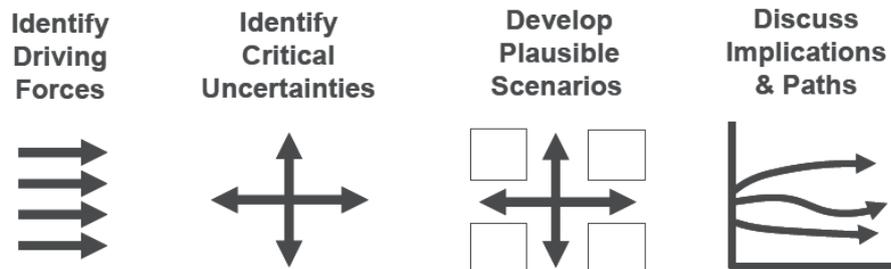(5) Identifying the major implications of scenarios on the organization

Figure 7
The Scenario Development Process

Developed scenarios provide a context for examining the risks and opportunities associated with different strategic choices or policy options. They become a tool to examine the future consequences of decisions which are made today.

5. BUILDING SCENARIOS

5.1 Step 1: The Focal Problem

Scenario planning begins by identifying a strategic issue. There are an infinite number of stories about the future. The challenge is to focus on those stories that are important. The first step in the process is to agree on the strategic issue we want to address, typically in the form of a "focal" problem. The focal problem ensures that the scenarios are relevant to the strategic issue at hand or to the strategic decision under consideration. Often, the focal problem is informed by interviews at the onset of a project.

5.2 Step 2: Driving Forces

The second step in the scenario planning process is to identify the driving forces of future changes. The scenarios will ultimately be stories describing how different sets of interrelated forces lead to different future outcomes. Identifying the driving forces of the focal problem might involve simply constructing a list. An alternative approach is to pose a question about change.

5.3 Step 3: Critical Uncertainties

The third step in the process is to identify critical uncertainties. Our purpose in building scenarios is to explore the boundaries of uncertainties and to look for a broad range of future outcomes. The emphasis is on divergence not convergence. Some driving forces are more important than others and some are more uncertain than others. Driving forces that have a narrow range of future outcomes are defined as "pre-determined". We need to include them in all the scenarios, but they do not lead to different scenarios.

5.4 Step 4: Scenario Framework, Characteristics, and Storylines

The critical uncertainties may be interpreted as continuums and represented as orthogonal dimensions as shown in Figure 8. Each quadrant represents a unique combination of the critical uncertainties - a 2×2 matrix of possible future outcomes. In today's economic climate, there is an increasing emphasis on cost reduction and increased efficiency[13]. For example, the upper right quadrant defines a future of high carbon costs and the development of disruptive technologies. The scenario question becomes: How does that future come about? What developments need to occur for that future to emerge? What are the major characteristics that would describe this scenario? We have named this scenario Technology Forced. In this way, the logic for 4 distinct

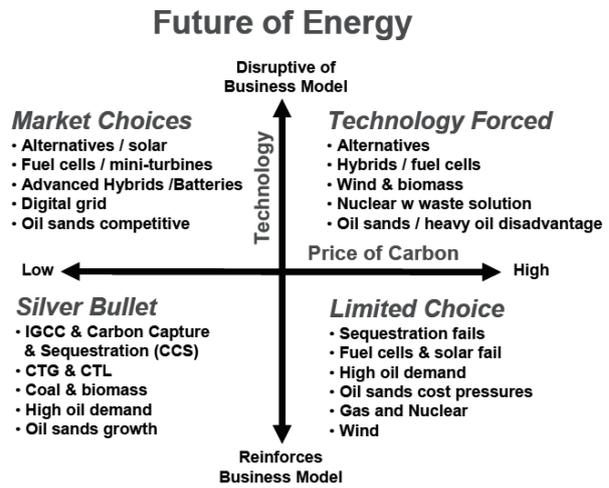but plausible scenarios is established - and the real fun of fleshing out the future begins.

Future of Energy

Figure 8
A 2×2 Matrix of Scenario Planning

Having defined a logical framework, involves identifying major characteristics and building a storyline for each scenario. Characteristics are generated in a creative brainstorming session to describe the future end state. The list of driving forces provides a basis for defining the initial set of characteristics. A storyline is then constructed outlining the path from the present to the future. In this way, scenarios are fleshed out into plausible stories of the future. The intent is not to tell "true" stories of the future. The "real" future will likely contain elements of all four scenarios. The goal is to learn from the scenarios, to gain insights on what could change, why it could change and what this knowledge might mean for strategic decisions.

5.5 Step 5: Monitoring the Future

Having developed the scenarios and having made strategic decisions, it is valuable to monitor ongoing change. The scenarios provide a basis for defining signposts for each scenario. Scenario signposts serve as early warning system that signals that a particular scenario is emerging. Watching for these signals allows an organization to make sense of change on an ongoing basis and to react more quickly than competitors to significant changes in the business environment.

6. RESEARCH RESULTS

6.1 Step 1: The Focal Question

The purpose of this step is to determine the focal problem of the research. Utilizing viewpoints of professors and experts of petroleum products scenarios, the problem was appropriately identified. Data and resources used to identify the focal problem were

Iran's perspective document, development plans, and local and international research on petroleum industry, petrochemical industry, and the related industries. The tools of data collection were open interviews and library studies. The output of this step is identifying the focal problem with its important ambiguity, complexity, and significance for the country.

6.2 Step 2: Driving Forces

The purpose of this step is to identify the key factors for creating petroleum products scenarios. Data and resources used to identify the key factors were Iran's perspective document, development plans, and local and international research on petroleum industry, petrochemical industry, and the related industries. The tools of data collection in this step include a Delphi approach, viewpoints of experts, benchmarking, and PESTEL model. Results of this step include an identification of 235 factors in economical areas, political areas, social areas, legal areas, environmental areas, and technological areas that eventually resulted in selecting 22 factors and eventually by expert opinions 2 factors of "political relations" and "the government's dependence on petroleum" were selected for creating scenarios in a 2×2 matrix. These 22 factors are illustrated as Table 3.

Table 3
The Selected Key Factors

No	Areas	Key factors
1		Dependence of the government's budget on petroleum
2		government non-oil revenues
3	Economical	Global demand for oil
4		Discovering new resources
5		using alternative fuels
6		Government economic policies
7		Sanctions and international pressures
8		Adventure of oil producer countries
9	Political	Regional crises
10		Iran's position in the OPEC
11		Iran's foreign policies
12		Local Labor Market conditions
13	Social	Consumption patterns
14		Culture of oil companies
15		Investment in technological areas
16	Technological	Technological complexity
17		Ability of local researchers
18		Environmental pollutions
19	Environmental	Decrease in energy sources
20		The government laws directly related to the oil field
21	Legal	The government laws indirectly related to the oil field
22		International law

6.2.1 Key Factors Influencing the Development of Petroleum Products

As mentioned before, 22 factors were identified as key factors influencing the development of Iran's petroleum products. MicMac software was used to identify these key factors. The cross impact matrix was analyzed in 6 steps using MicMac Software. These steps are as the following respectively:

(1) Systematic perception and observation of the system's stability or lack of stability.
(2) Identifying direct and indirect influences of variables which have the high degree of effectiveness.
(3) Identifying the main factors and using them in scenario planning.
(4) Perception of the whole system and abstinence from trivial analysis.
(5) Identifying the factors that cause instability of the system (factors that should be managed).
(6) **Identifying the environment through impact assessment.**

Extracting 22 factors, a 22×22 matrix was formed in MicMac Software. The matrix degree of filling was 94/42 percent (Table 4), this shows that the selected factors have high and diffused influence on each other and the system is instable. From 457 assessable relations in this matrix, 27 relations were zero (5%); this means that the factors do not have any influence on each other. Based on the statistical indexes with two data rotation, the matrix has 100% desirability and optimality that shows the high reliability of the questionnaire and the responses.

Table 4
Characteristic of Factors

Indicators	Value
Matrix size	22
Number of iterations	2
Number of zeros	27
Number of ones	68
Number of twos	274
Number of threes	115
Total	457
Fill rate	94.42149%

6.3 Step 3: Critical Uncertainties

In a cross impact matrix, sum of the numbers in rows of each variable shows its influence and sum of the numbers in columns of each variable shows its dependence from other variables. According to the analytical results of this matrix, "political relations" and "the government's dependence on petroleum" have the highest degree of influence and are selected as critical uncertainties factors. Direct, indirect, and potential maps are illustrated in Figures 9 to 13.
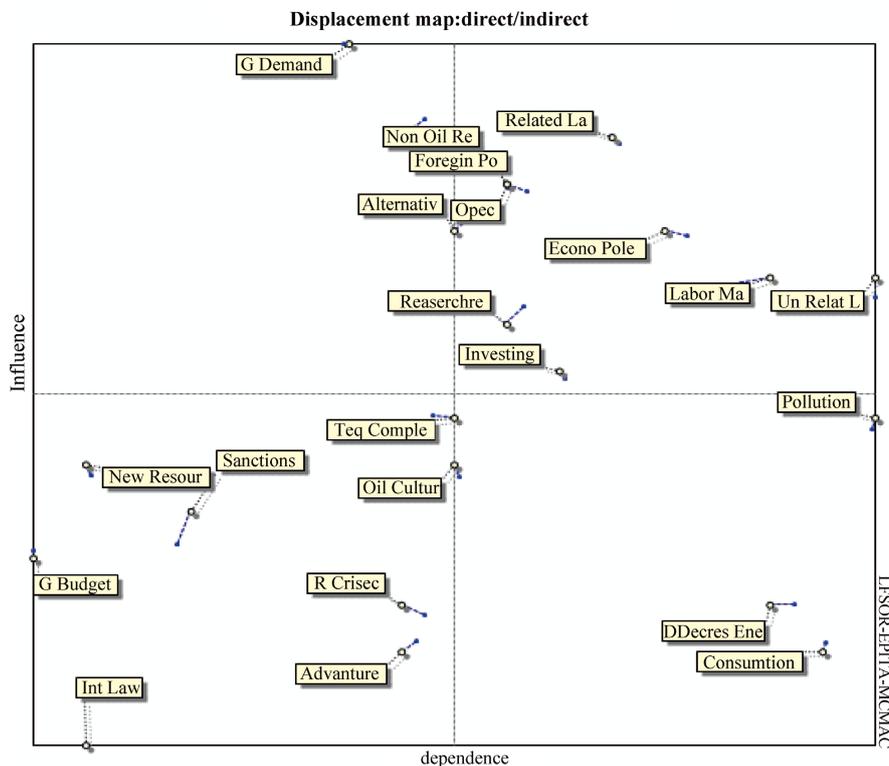
Displacement map:direct/indirect

Figure 9
Displacement Map

Table 5
Areas, Key Factors, and Their Abbreviations

No	Areas	Key factors	Abbreviation
1		Dependence of the government's budget on petroleum	DGBP
2		government non-oil revenues	GNOR
3	Economical	Global demand for oil	GDO
4		Discovering new resources	DNR
5		using alternative fuels	UAF
6		Government economic policies	GEP
7		Sanctions and international pressures	SIP
8		Adventure of oil producer countries	AOPC
9	Political	Regional crises	RC
10		Iran's position in the OPEC	IPO
11		Iran's foreign policies	IFP
12		Local Labor Market conditions	LLMC
13	Social	Consumption patterns	CP
14		Culture of oil companies	COC
15		Investment in technological areas	ITA
16	Technological	Technological complexity	TC
17		Ability of local researchers	ALR
18	Environmental	Environmental pollutions	EP
19		Decrease in energy sources	DES
20		The government laws directly related to the oil field	DLDROF
21	Legal	The government laws indirectly related to the oil field	DLIROF
22		International law	IL

Direct influence graph
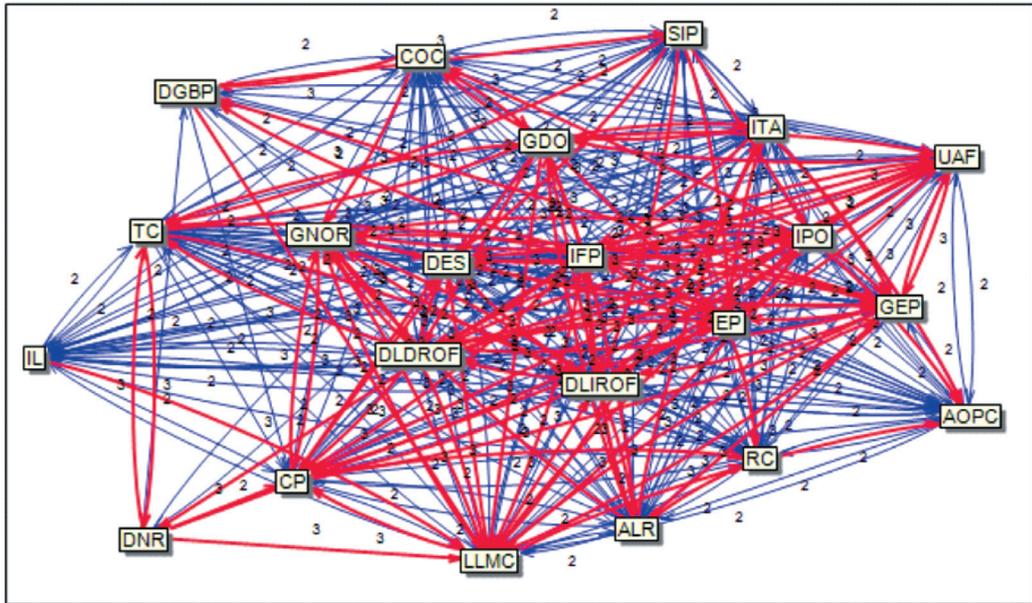
Weakestinfluences
Weak influences
Moderate influences
Relatively strong influences
Strongestinfluences

Direct influence graph

Weakestinfluences
Weakinfluences
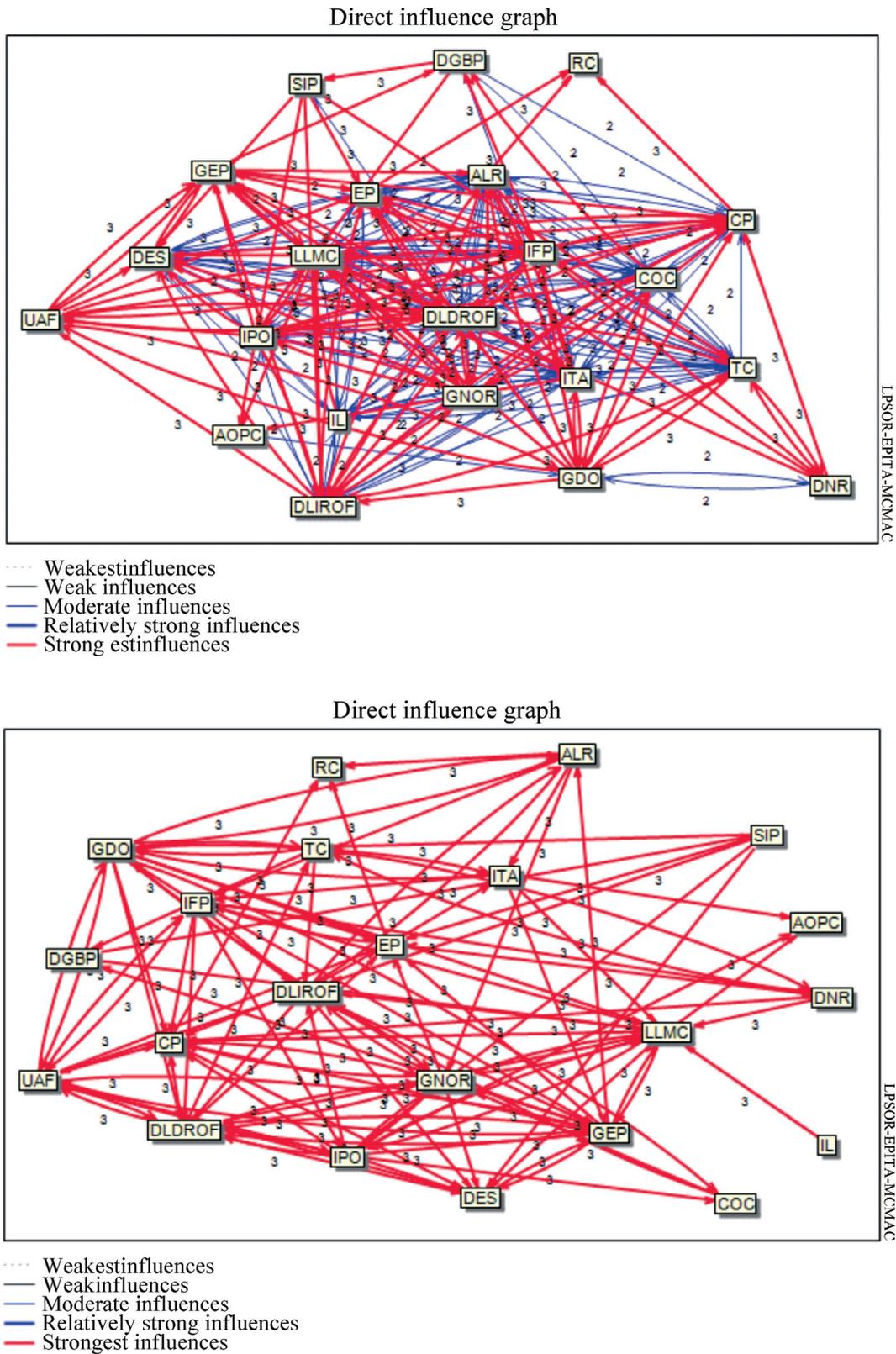Moderate influences
Relatively strong influences
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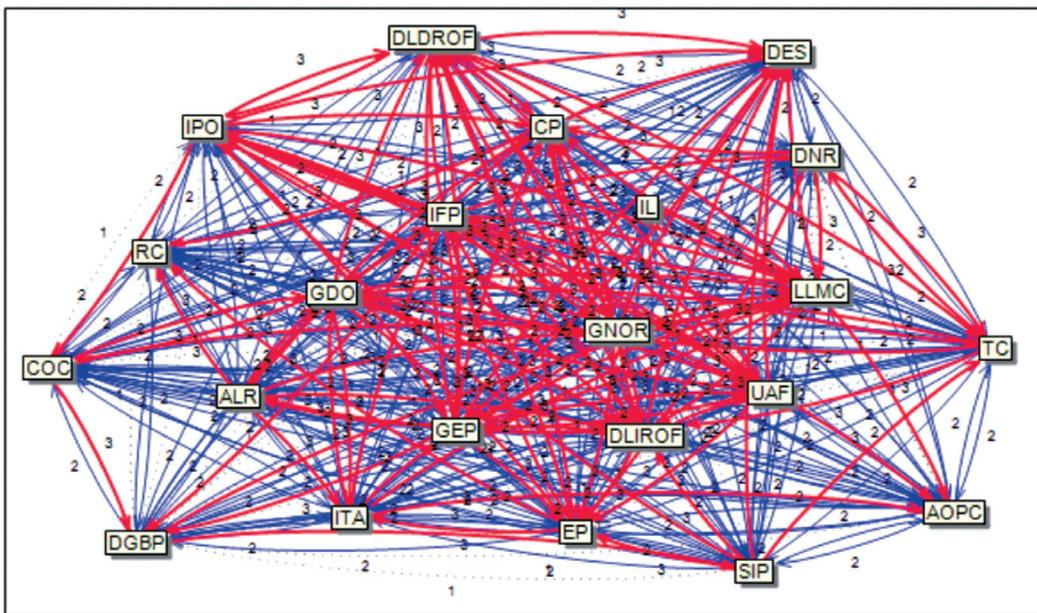
Direct influence graph

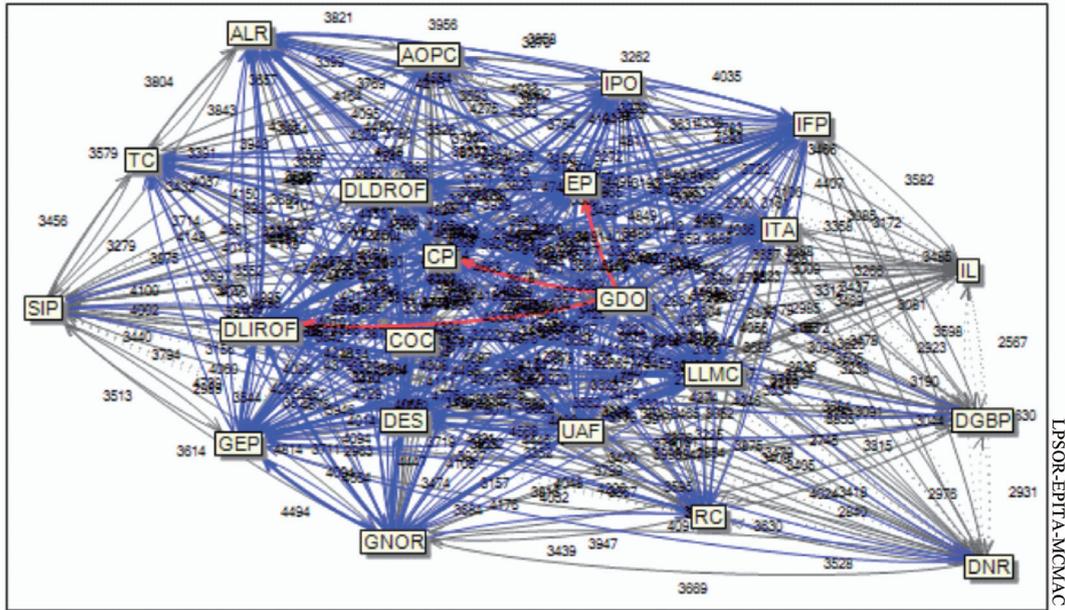

Direct influence graph

Figure 10
Direct Influence Graphs with Different Influences

Indirect influence graph

Weakest influences
Weak influences
Moderate influences
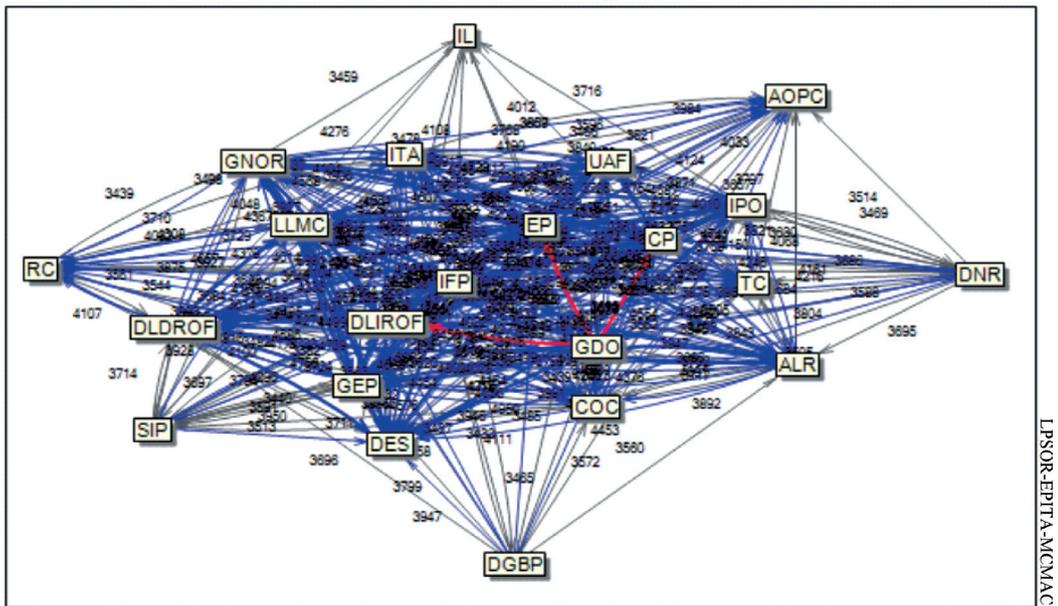Relatively strong influences
Strongest influences

Indirect influence graph

Weakest influences
Weak influences
Moderate influences
Relatively strong influences
Strongestinfluences

Indirect influence graph

Weakestinfluences
Weakinfluences
Moderate influences
Relatively strong influences
Strongest influences

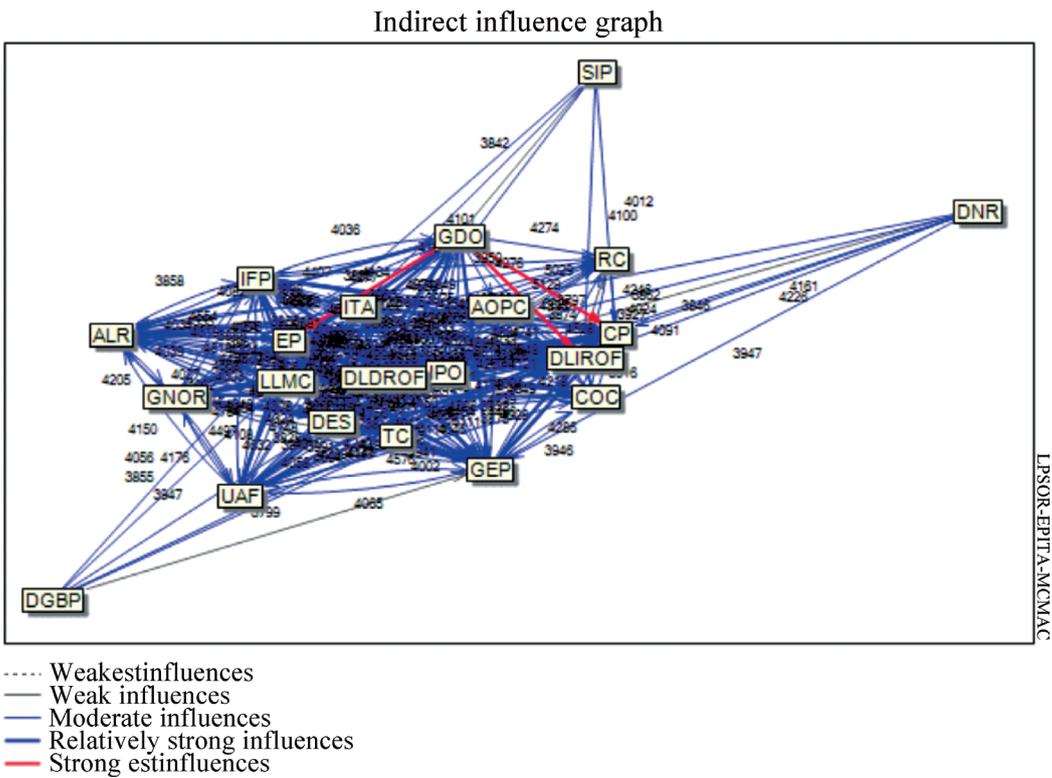## Indirect influence graph

Weakestinfluences
Weak influences
Moderate influences
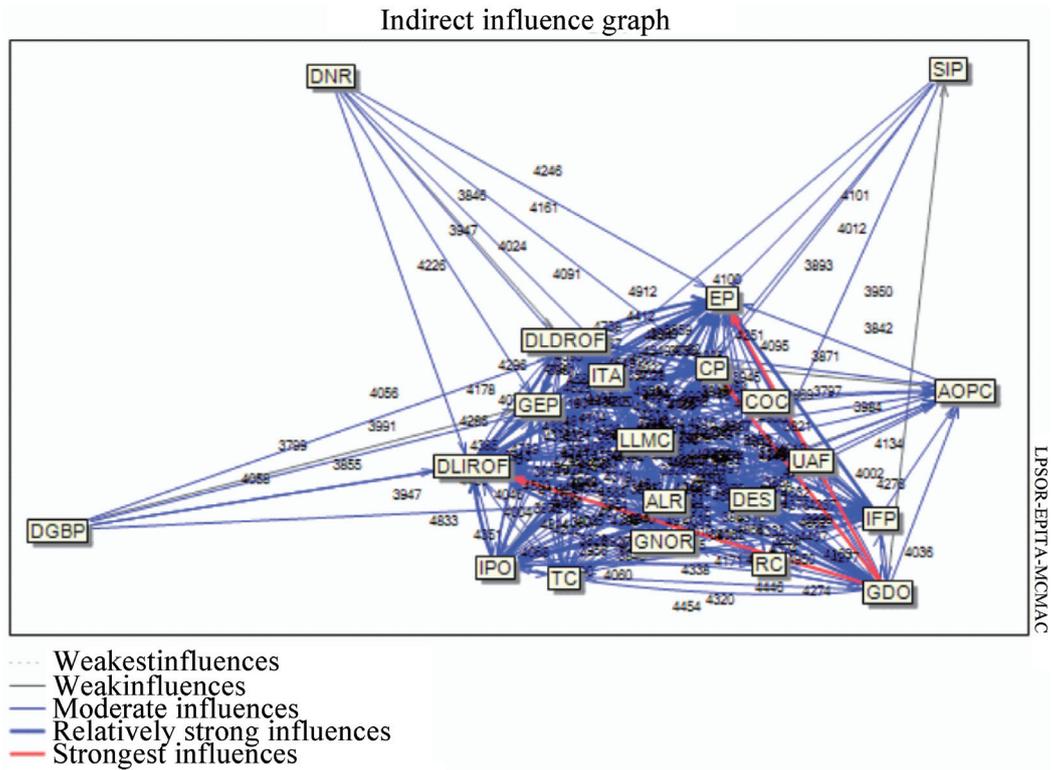Relatively strong influences
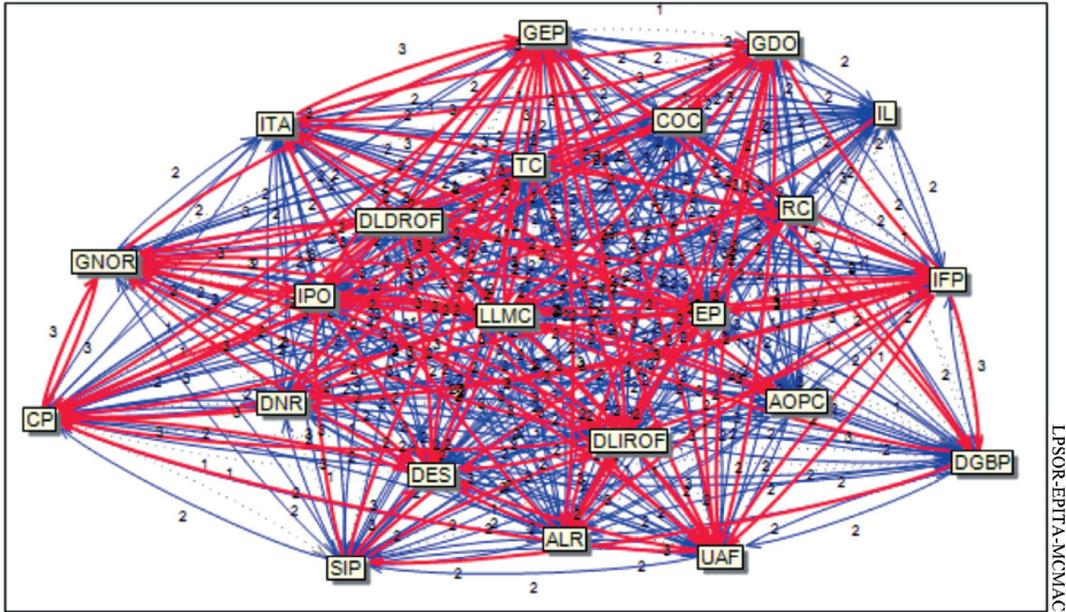Strong estinfluences

Figure 11
Indirect Influence Graphs with Different Influences

Potential direct influence graph

Weakest influences
Weak influences
Moderate influences
Relatively strong influences
Strongest influences

Potential direct influence graph

Weakest influences
Weak influences
Moderate influences
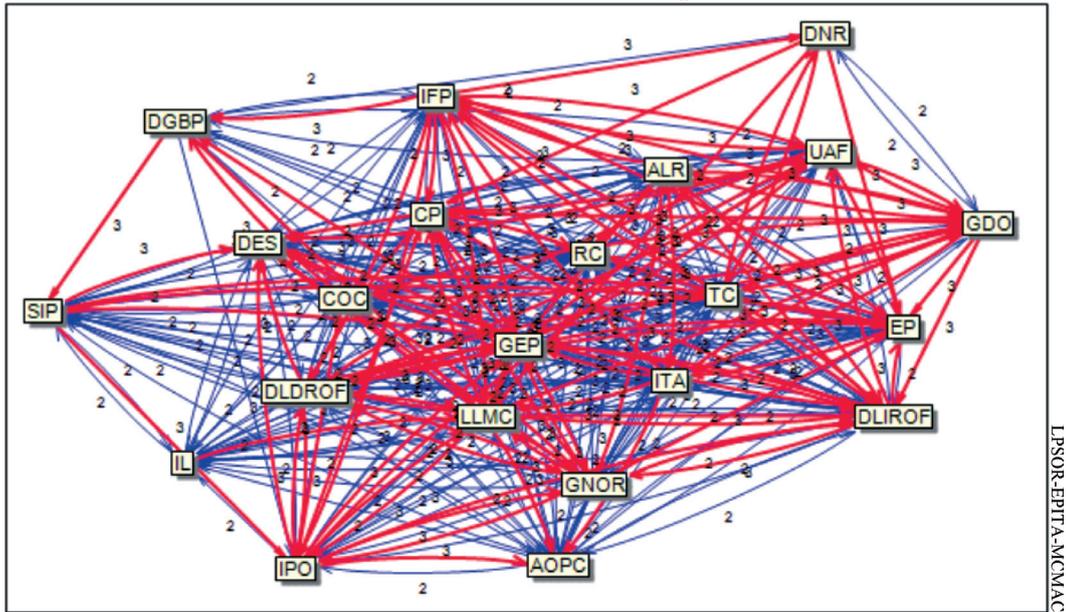Relatively strong influences
Strongest influences

Potential direct influence graph

- ···· Weakest influences
- —— Weak influences
- —— Moderate influences
- —— Relatively strong influences
- —— Strongest influences

Potential direct influence graph

- ···· Weakest influences
- —— Weak influences
- —— Moderate influences
- —— Relatively strong influences
- —— Strongest influences

Figure 12
Potential Direct Influence Graphs with Different Influences

Potential indirect influence graph

Weakest influences
Weak influences
Moderate influences
Relatively strong influences
Strongest influences

Potential indirect influence graph

Weakest influences
Weak influences
Moderate influences
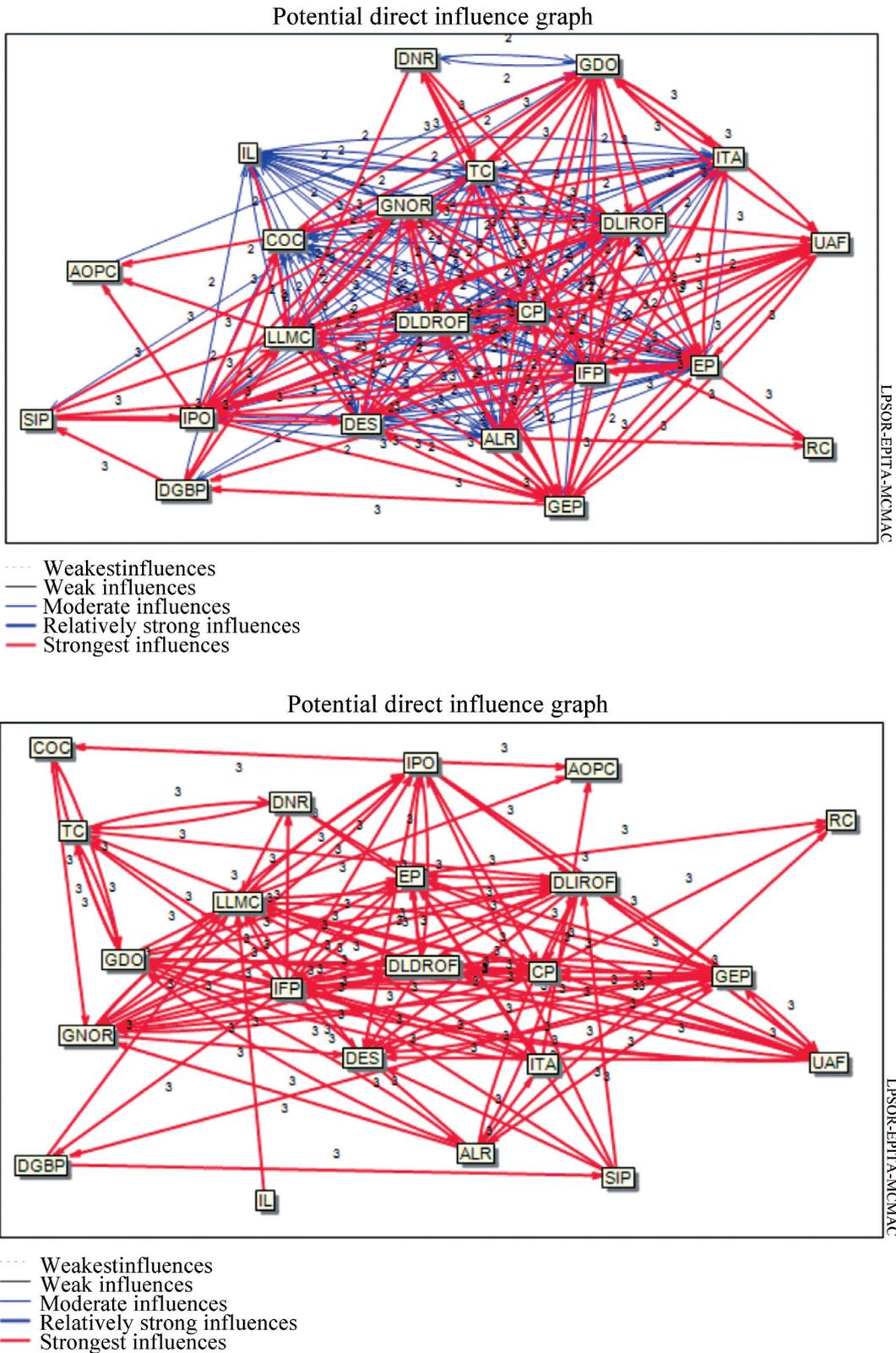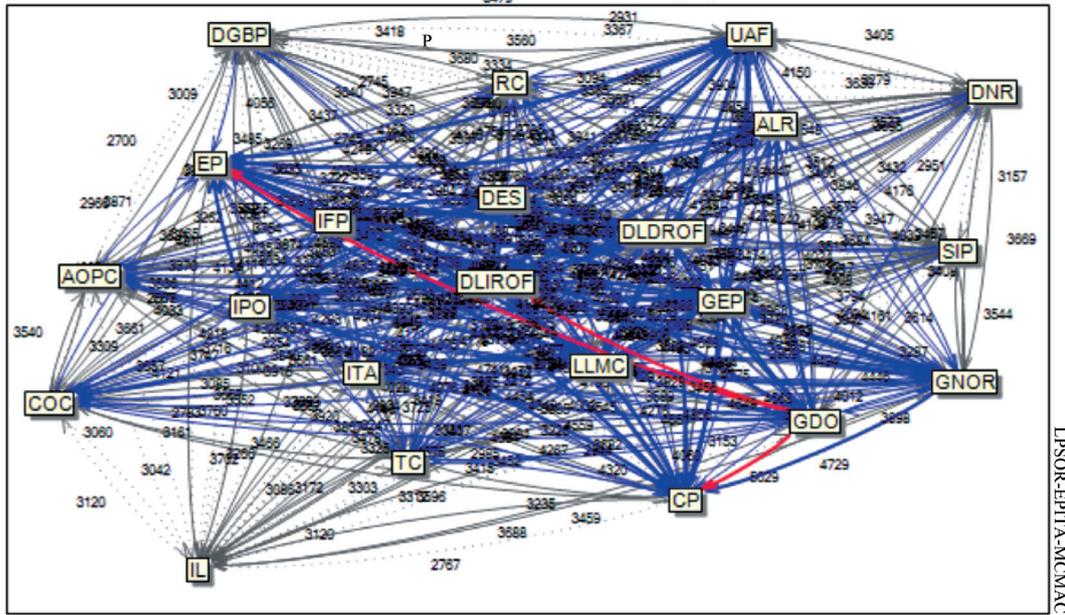Relatively strong influences
Strongest influences

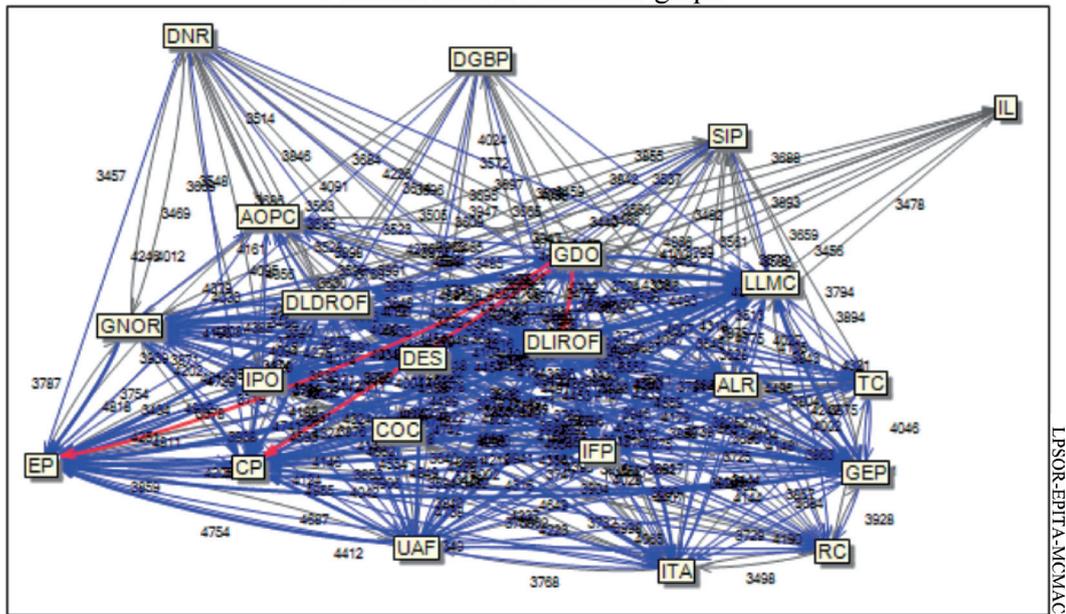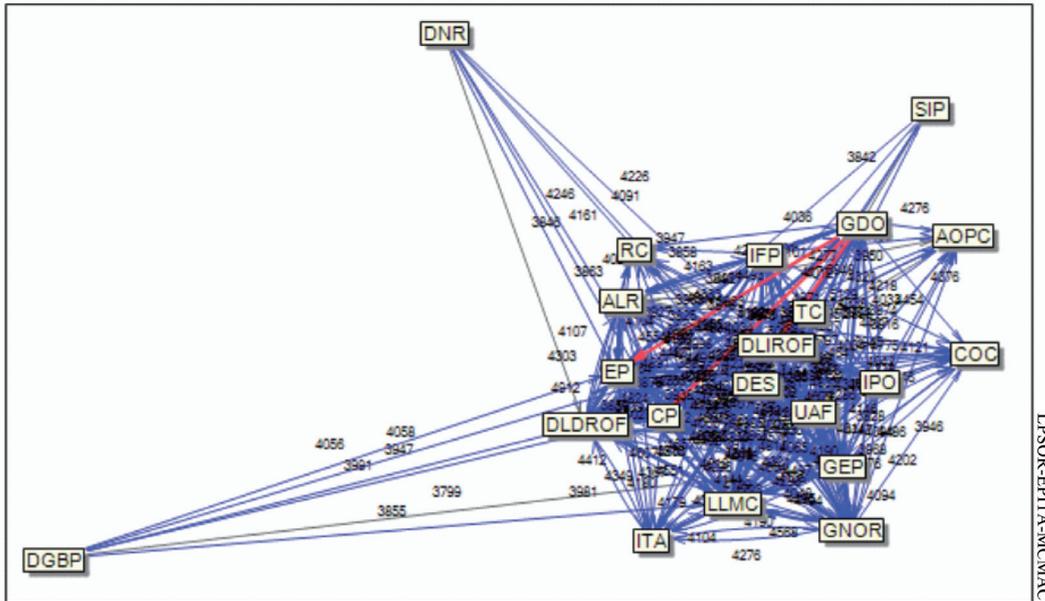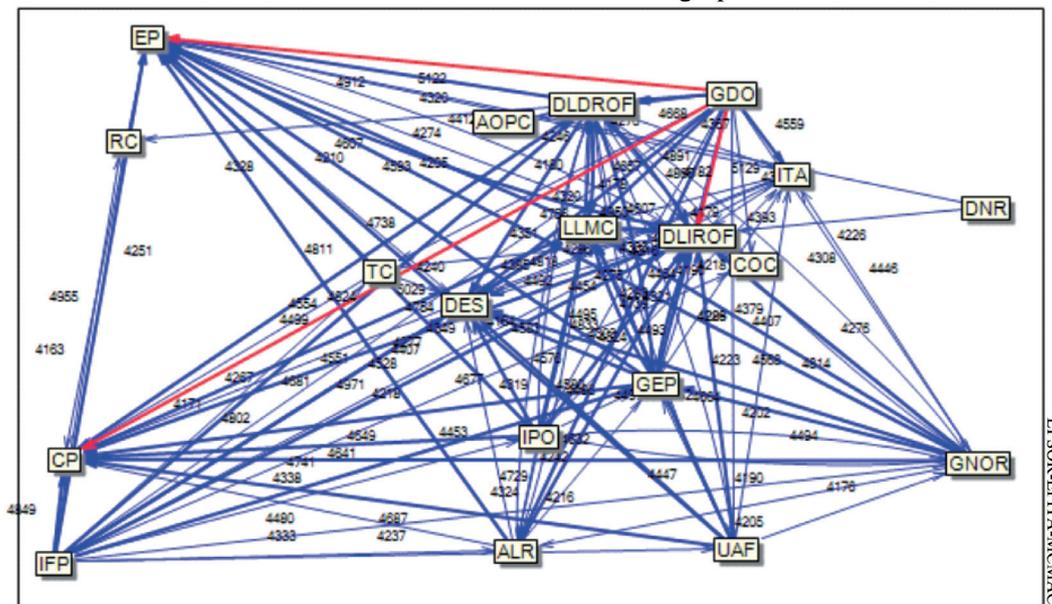Potential indirect influence graph

Potential indirect influence graph

Figure 13
Potential Indirect Influence Graphs with Different Influences

6.4 Step 4: Scenario Framework, Characteristics, and Storylines

Using the identified key factors in previous steps, the purpose of this step is to create scenarios related to petroleum products. In this step, data and resources used to create scenarios are the identified key factors and the upstream documents related to the research area. The tool of data collection is Micmac Software which is used to classify and rank the key factors. According to Table 6, the "political relations" and "the government's dependence on petroleum" Factors have the highest degree of influence. Since the selected factors are general and contain many other factors inside, the accuracy of their selection is confirmed. With regard to classification of factors in the matrix, interaction analysis, and viewpoints of experts and senior managers, political relations and the government's dependence on petroleum forces were selected as key factors for describing scenarios.

Table 6
List of Variables Sorted by Their Influence and Dependence

Classify variables according to their influences				Classement par depéndance		
Rank	Variable	Variable		Rank	Variable	Variable
1	3-G Demand	3-G Demand		1	18-Pollution	21-Un Relat L
2	11-Foregin Po	11-Foregin Po		2	21-Un Relat L	18-Pollution
3	20-Non Oil Re	20-Related La		3	13-Consumtion	13-Consumtion
4	2-Non Oil Re	10-Opec		4	12-Labor Ma	19-Decres Ene
5	10-Opec	2-Non Oil Re		5	19-Decres Ene	12-Labor Ma
6	5-Alternativ	5-Altermiv		6	6-Econo Pole	6-Econo Pole
7	6-Econo Pole	6-Econo Pole		7	20-Related La	20-Related La
8	12-Labor Ma	12-Labor Ma		8	15-Investing	15-Investing
9	21-Un Relat L	21-Un Relat L		9	2-Non Oil Re	2-Non Oil Re
10	17-Reaserchre	17-Reaserchre		10	10-Opec	17-Reaserchre
11	15-Investing	15-Investing		11	17-Reaserchre	10-Opec
12	16-Teq Comple	16-Teq Comple		12	5-Alternativ	5-Alternativ
13	18-Pollution	18-Pollution		13	14-Oil Cultur	14-Oil Cultur
14	4-New Resour	4-New Resour		14	16-Teq Comple	16-Teq Conple
15	14-Oil Cultur	14-Oil Cultur		15	8-Advanture	11-Foregin Po
16	7-Sanctions	7-Sanctions		16	9-R Crisec	9-R Crisec
17	1-G Budget	1-G Budget		17	11-Foregin Po	8-Advanture
18	9-R Crisec	19-Decres Ene		18	3-G Demand	3-G Demand
19	19-Decres Ene	9-R Crisec		19	7-Sanctions	7-Sanctions
20	8-Advanture	8-Advanture		20	7-Sanctions	4-New Resour
21	13-Consumtion	13-Consumtion		21	22-Int Law	22-Int Law
22	22-Int Law	22-Ilnt Law		22	1-G Budget	1-G Budget

LPSOR-EPITA-MICMAC

Political relations and the government's dependence on petroleum will be exposed to a range of political tensions and irenic political relations whit dependence on petroleum states and independence governments of petroleum (Figure 14).
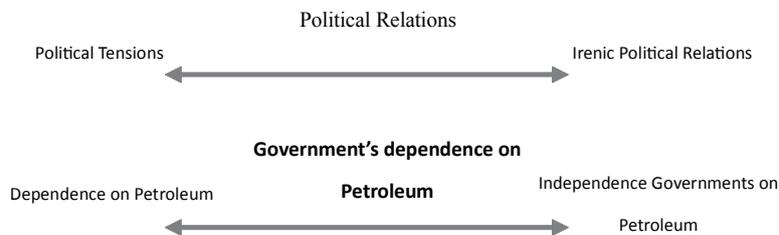

Political Relations

Political Tensions ⟷ Irenic Political Relations

Government's dependence on **Petroleum**

Dependence on Petroleum ⟶ Independence Governments on Petroleum

Figure 14
Key Forces Forming a 2×2 Matrix

The role of "political relations" and "the government's dependence on petroleum" forces are shown in Figure 15. As shown in this figure, in the next 40 years (2052), Iran's petroleum product will face 4 scenarios.

After identifying the key factors, a 2×2 matrix was formed as Figure 15, each area of matrix was named, and four scenarios facing Iran's petroleum product was specified. Accordingly, the Figure 15 four scenarios are named as a playful rabbit, a runaway snake, a noble horse, and a sleeping lion.
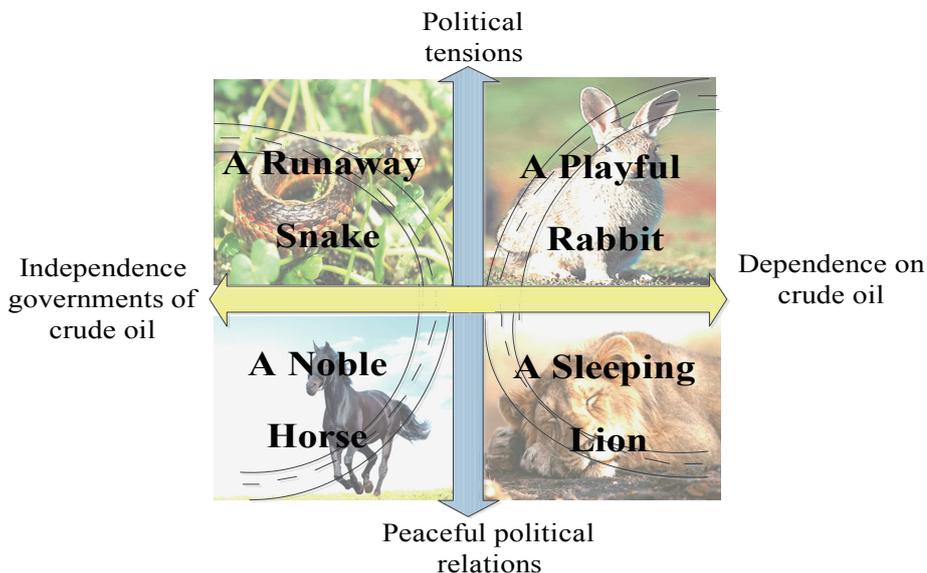
Figure 15
2×2 Matrix of Iran's Petroleum Product Scenarios

7. RESULTS

With regard to the 5-step model, future scenarios for Iran's petroleum Industry are as the following:

7.1 Scenario 1: A Playful Rabbit

In this scenario, there are lots of tensions in Iran's political relations in which governments and the world's major economies severely need the primary sources of petroleum energy in order to reach superpower countries such as China and Russia. As it has rich petroleum resources, benefits from good geographical positions, and dominates the key communication ways, Iran will cooperate strategically with the countries that require its resources and stand against the opposing superpowers. As Iran needs to maintain the support of the allies, it cannot have considerable investments on its petroleum products and should actually act as a resource to nourish these allies. Due to the increased sanctions, international pressures, and decreased exports and non-oil revenues, the government's budget will be severely dependent on selling petroleum products while opposing oil producer countries will increase their predetermined petroleum production in order to decrease Iran's power in OPEC. As a result, Iran would not have any chance to invest in technological areas and will become a sole consumer.

The key factors in occurrence of this scenario are:
(1) High tensions in political relations
(2) High competition to takeover petroleum
(3) An increase in petroleum prices
(4) Low investment in petroleum products
(5) High demand of petroleum in industrial areas and transportation
(6) High dependence of the government's budget on petroleum

7.2 Scenario 2: A Runaway Snake

In this scenario, there are severe tensions among Iran and other countries. As a result of improvements in technological areas, the petroleum demand of these countries will be decreased. Other signs of occurrence of this scenario include technology growth and improvements in environmental pollutions. In this atmosphere, as Iran is not able to attract supports of some countries for the sole purpose of supplying them with petroleum, it will be exposed to a great risk. This is actually an alarming scenario and Iran must invest on its technologies and try to become a power to supply petroleum products. On the other hand, US will do its best to maintain its power and superiority in the current century.

The key factors in occurrence of this scenario are:
(1) High tensions in political relations
(2) The rapid growth of using alternative fuels
(3) The rapid growth of technology
(4) Decrease in oil prices
(5) High demand of petroleum in industrial areas and transportation
(6) Reduced dependence of the government's budget on oil

7.3 Scenario 3: A Noble Horse

In this scenario, Iran's political relations with superpowers are irenic. In this atmosphere, Iran has access to pioneer technologies and is able to guaranty a safe investment in the country. In addition, Iran can decrease its dependence on oil by increasing its non oil-dependent revenues and become one of the main producers of petroleum products.

The key factors in occurrence of this scenario are:
(1) Good political relations
(2) The rapid growth of using alternative fuels

(3) The rapid growth of technology
(4) Decrease in oil prices
(5) High demand of petroleum in business and agriculture
(6) Reduced dependence of the government's budget on oil

7.4 Scenario 4: A Sleeping Lion

This is the best scenario for Iran. The reason is that Iran has the support and dependence of other superpowers on itself. In addition, due to its suitable relations with other countries, Iran is able to access pioneer technologies and attract local and international investors to invest largely on technological areas.

The key factors in occurrence of this scenario are:
(1) Good political relations
(2) Rise in oil prices
(3) High demand of petroleum in business and agriculture
(4) Reduced dependence of the government's budget on oil
(5) High ability to attract capitals and investments
(6) The rapid growth of technology
(7) Increase in non-oil revenues

DISCUSSION

Scenario planning is a process that stimulates imaginative, creative thinking to better prepare an organization for the future. Unlike traditional strategic planning, which assumes that there is usually one best answer to a strategic question, scenario planning entertains multiple possibilities. Unlike contingency planning, which normally focuses on a single uncertainty, scenario planning investigates several uncertainties simultaneously. And unlike simulation modeling, which is heavily numbers-driven, scenario planning involves subjective interpretation as well as objective analysis. For these reasons, we used this technique to create a useful decision making tool, for managing future of Iran's petroleum product which has strategic role in Iran's industry. Although the growth and development of petrochemical industry has been significant and petrochemical production has been doubled after the war between Iran and Iraq, Iran is not on its proper place for petrochemical production now. It should also be mentioned that Iran's share of petrochemical production is less than 0.5 percent in the world and is around 10 percent in the Middle East. If we optimally use available experiences and instruments, plan well in utilizing raw materials, and organize expert human resource under a strong and a dynamic management, it will be possible to promote production levels of petrochemical materials and provide the infrastructure of industrializing the country. According to the results of this research, however, reaching these goals seems to be very difficult. With regard to the analyses as well as the created

scenarios, some solutions are provided in order to reach the mentioned goals, Considering that a high volume of fossil fuels are used both in producing petroleum and transportation, it is necessary to pay attention to the alternative energies during the improvement of petroleum products, It is necessary to plan well in reaching Iran's perspectives in petroleum products, Decreasing the production technologies' dependence on other countries and paying attention to limitations and sanction scenarios, Converging the organizations and decision makers of economic and political areas in reaching Iran's perspective and Promoting international credibility and brand.

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