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Reckoning the Impacts of Cognitive Biases on Decisions Made About Development of Iran's Oil and Gas Resources

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Abstract

In today's world, political economics of petroleum has been an increasingly important aspect of diplomacy and political economics. The huge weight of economics and petroleum politics make it imperative part of parcel of any study to review the dynamic due as well as the influencing factors on how authorities derive to certain decisions and what are the basis of their overall considerations. This paper is examination of the complex individual influences central to the way in which decision-making is pursued, most notably from the point of view of the cognitive, normative, and psychological perspectives. The aim is by utilizing qualitative and quantitative data analysis to outline the likelihood influence of cognitive biases in decision processes as well as examine the relationships of these biases on outcomes of decision made about development of Caspian Sea oil & gas joint deposits. Subsequently, depict how to avoid the adverse impacts and risks (economic, political and social risks) in future. The ultimate aims are to derive to a series of lessons learned, which becomes an input to improve the decision making process in future development of Caspian Sea joint field of oil and gas deposits and its resolutions. It also addresses many hidden issues behind many decisions made by Iranian decision makers regarding the development of joint fields of Caspian

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Sea oil and gas resources and as to how and why the political – economic related reasons for government actions usually camouflaged and rarely discussed publicly by politicians or media.

Keywords

Cognitive Biases, Decision Makers, Oil, Gas, Shared Fields, Governance

I. Introductions

Oil is one of the world's most important commodity and its political effects are pervasive in every aspects of life. Historical studies of key petroleum geopolitics indicate that the task is complex, they are multi-dimensional and each dimension needs a thorough review. Understanding the underlying reasons and comprehensive analysis of historical data related to oil and gas initiatives and strategic directions has a direct bearing to bigger framework of international affair and political economics mapping of world. However, the focus of this paper is to review the internal factors and analyze the influencing factors and parameters that have led to decisions taken by Iranian authorities. Exploring how those authorities involved in relevant decision-making formed their decisions, preferences and intentions in regard to development of joint Caspian Sea oil and gas deposits is the focal review of this paper. By doing so attempt to bring to attention the adverse impacts of not having clear analytical strategic directions on future social economic aspects of development of joint deposits of oil and gas resources. Needless to mention that the complexity surrounding the Caspian Sea oil & gas resources is enormous in comparison with Persian Gulf oil & gas resources, which was discovered since early twenty-century with characteristic of relative ease of access to the resources.

Considering that the development of joint fields is of special significance for Iran. The task becomes even more important when Iran is actually sharing more than twenty hydrocarbon fields with its neighbors. On the other hand, shared fields have special economic, technical, legal and political dimensions

and challenges due to several separate states' joint share and governance over them. By reducing the level of errors in decision-making process, the aim is to spare Iran of the irreparable economic and political losses.

Common problems with decisions are that they are formulated before all the facts are available, to narrowly based and unable to withstand the scrutiny of an audit. Accordingly, as most situations are unique, it is crucial to understand context and nature of the surrounding circumstances before arriving at any particular decision and analyze the importance of cognitive biases on decision-making. Through diagnosing these factors we may be able to avoid repeating the same in future and improving the process.

Mainly this paper is a short summery of the master thesis regarding the analysis of the impact of cognitive biases on decisions made about Iran's oil and gas joint fields development. Overall analysis aims to give hints of how to improve the decision making process and set clear strategic directions so that it will safeguard all stakeholders of Caspian Sea oil and gas resources. It is crucial to understand the context and ramifications of a far-reaching decision before implementing the resultant. Decision making for complex situations can be burdened with pitfalls if a logical and consultative framework and evaluation of options is not used. The unilateral decision of National Iranian Oil Company and lack of sound consultations with other organizations in regard to identifications of negative impacts on financial, political and risks for Iran's interests indicates that mainly stem from rash decision-making, and lacked any financial, technical or others rational approaches. (Examples of rash decisions: selling Iranian overseas assets).

Decision makers are known to rely on a few judgmental rules, or heuristics, to simplify complex decision situations. These few judgmental rules may seem very necessary in a simple situation, but because it lacks accurate information and is not reliable for complex situation, they introduce cognitive biases that can lead to severe and systematic errors in decision-making. Thus, cognitive

biases can be viewed as a negative consequence of adopting heuristics approach. Biases entice decision makers away from making optimal decisions in terms of utility maximization.

II. Data Analysis Approach

This paper is supported with a wealth of qualitative and quantitative data. Qualitative data derived from interviews with 30 major decision makers from all involved organizations, institute and private entities in Persian Gulf, Oman Sea and Caspian Sea oil and gas resources development, (such as National Iranian Oil Company, Ministry of oil, Iran's Foreign Ministry officials, university professors and subject matter experts.

Qualitative Analysis

The Delphi method has been used in interview's techniques. (The Delphi method or technique is a structured communication technique or method, originally developed as a systematic, interactive forecasting method, which relies on a panel of experts. The technique can also be adapted for use in face-to-face meetings, and is then called Mini-Delphi or Estimate-Talk-Estimate). A set of 28 questions was submitted to interviewees. The answers were recorded, categorized based on predefined set of parameters and send back to participants to offer a revision on their judgment. The second revision consolidated with feedback from other participants and validated by quantitative data analysis.

The main reason to adept to Delphi technique for conducting interviews was based on four following factors:

- Consolidate the replies and analyze the collective answers with allowing participants to review and present their inputs as second revision
- Potentially quicker responses by giving the participants enough time at their own discrete time

- Encourage the participants to revise their earlier answers in light of other participant's replies
- Confidentiality of responses, which by combining the responses will shield the individual responses.

In the first round of Delphi technique 30 participants were selected to answer 28 questions in 5 categories of Likert by selecting the most important factors. The 28 questions were formulated on mainly identifying what factors contributed to shaping and affecting decisions regarding negotiation, discussions of development of joint fields of Caspian Sea oil and gas deposits. The questionnaire designed to let the interviewees have unlimited time and space to response to each questions. This approach is unique in the sense that not many Iranian authorities are willing to be interviewed. Finally, upon achievement of consensus, agreed on the results, the concise summery of which became the feed for quantitative data analysis.

Quantitative data analysis

The consolidated replies analyzed by five categories that deviated from the norm (very low impact, low impact, moderate impact, high impact, very high impact). The high impact result categorized as important factor to shape the individual judgments and how cognitive biases influenced decisions by disrupting objective judgments.

Statistics Analysis

Sample number	28
Kenndal Technique	0/798
Kaido Technique	403/468
Free Range	27
Meaningful Range	0/000

The data analysis was based on three categories a) open coding; the textual data were broken up into discrete parts, b) axial coding and c) selective coding.

A. Open coding: open coding aimed to create a unique collection of codes, definitions and events;
B. Axial coding draw connections between codes, and
C. Selective coding, one central category that connects all the codes from analysis and captures the essence of analysis

The data processing model created by compliance with four categories of how individual cognitive process function within any given environment:

a) Too much information
b) Not enough meaning
c) Need to act fast
d) What should we remember?

The management of data observed with addressing the following questions:

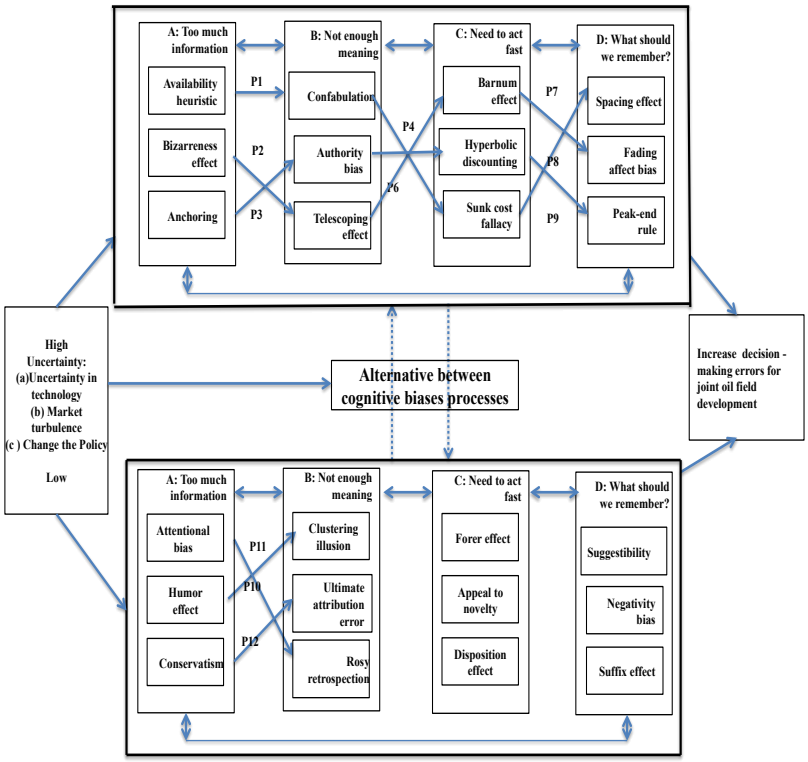
- What is the subject of data?
- These incidents are related to what outcomes?
- What kind of situation is represented by the data?
- What are key complications that participants are faced in their replies?
- What are the solutions that will respond well to those complications?

The above questions were main focal points of quantitative analysis and adhered to address those questions. The sensitivity analysis of the questions and answer centered on issues that no one paid any consideration to them in academic circle so far. That is to recognize the effect and impacts of cognitive biases that led to occurrence of errors in decision-makings and consequently deprived Iran of adequate and efficient access to extractions of shared fields and this inadequacy and inefficiency is not simply due to lack of financial resources. Submitting questionnaires and obtaining interviews with authorities involved in joint fields development as well as relevant experts differentiate this analysis in its data gathering approach. Analyzing the first hand responses of individuals with review of the impact of cognitive biases on the way the

decision made is unique parameters of this analysis and findings of this paper.

Each question formulated for specific situation and the responses were categorized, coded and analyzed so that it is possible to measure the deviation from the norm (expected/desired outcomes) that directly stem from the specific decision made on the subject matter.

The model below created to illustrate the connectivity of decisions with cognitive biases (amalgamated result of qualitative & quantitative analysis).



Both analyses indicated to the better understanding of how unconscious mind influences the outcomes and common biases that can stand in the way of achieving better outcomes.

The factors, environment and situation that effected cognitive biases are framed by subjective validation, (Barnum Effect also called Forer Effect, in psychology, the phenomenon that occurs when individuals believe that personality descriptions apply specifically to them - more so than to other people), by which it may have been influenced by statement or another piece of information that deemed to be correct superficially.

The cognitive biases are the salient factors contributing to errors in judgment by decision makers and were integral part of an ever-present ingredient of decision-making process. The analysis of qualitative and quantitative demonstrates a better understanding of how biases influenced decisions made by the relevant authorities in the decision making process of development of joint deposits of Caspian Sea.

The importance of cognitive biases in decision-making processes and its integration with various modes of decision-making is the attempt to find the weakness of decision-makers with regard to oil and gas resources and to identify these biases in decision-making and consequently solution formulation. Cognitive biases are strong tendencies that were present in various situations.

The deductions of analysis led to identifying that a list of cognitive biases were the major contributing factors on individuality approach in the process of decision making and thereby this approach inflicted enormous risks to securing Iran's interests in regard to development of joint fields of oil and gas resources.

The list of cognitive biases that has been found in the qualitative and quantitative are described below briefly:

- Actor-observer- bias: This relate to the bias that the actors (decision makers) are explaining their own decisions as being affected by situational influences and have a very limited control in bearing responsibilities and it was situational force rather their own misjudgment, contrary to observe (previous/other) decision makers subject to their personality flaws and personal errors; (An actor-observer bias in attribution was originally

proposed by Edward Jones and Richard Nisbett, when they claimed that "actors tend to attribute the causes of their behavior to stimuli inherent in the situation, while observers tend to attribute behavior to stable dispositions of the actor");

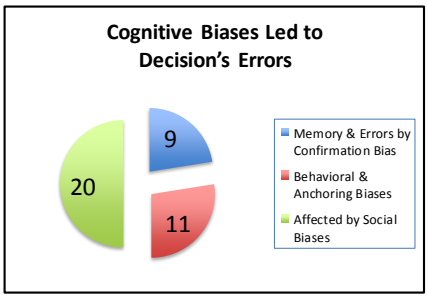
- Overconfidence (illusory superiority - The Dunning–Kruger effect is a cognitive bias hypothesis that people with low ability at a task overestimate their ability), overestimate abilities and underestimate risk;
- Optimism bias: Cognitive bias that causes someone to believe that they themselves are less likely to experience a negative event; decision-makers form overly optimistic estimates. They do not accept the fact that a fair amount of risk is inherent in any decision situation;
- Barnum Effect also called Forer Effect: this phenomenon occurs when individuals believe that personality descriptions apply specifically to them (more so than to other people), despite the fact that the description is actually filled with information that applies to everyone. Personal validation effect is a cognitive bias by which people will consider a statement or another piece of information to be correct if it has any personal meaning or significance to them. Forer effect and subjective validation are closely related. Decision is affected by subjective validation will perceive two unrelated events (i.e., a coincidence) to be related because their personal beliefs demand that they be related. Even though the statements are such generalizations, they could apply to almost anyone. The effect is consistently found when the assessment statements are vague. People are able to read their own meaning into the statements they receive, and thus the statement becomes "personal" to them. Keeping statements vague in this manner ensures observing the Forer effects;
- Risk compensation theory: Behavioral adaptation indicates in response to perceived levels of risk, safety measures are taken, whether compensatory or not. Risk compensation is a theory, which suggests that people typically

adjust their behaviors in response to perceived levels of risk, becoming more careful where they sense greater risk and less careful if they feel more protected. Although usually small in comparison to the fundamental benefits of safety interventions, it may result in a lower net benefit than expected;

- Self-serving bias: indicates that people choose explanations in a strategic way so as to make themselves appear in a more positive light. The self-serving bias is often formulated as a complete reversal in actors' and observers' explanation tendencies as a function of positive vs. negative events;
- Unrealistic situational leadership, (Hersey and Blanchard's situational leadership model, is a model developed in 1969 as "life cycle theory of leadership" generally addresses relationship-oriented type of leadership. It bases a leader's directives on the readiness and ability of his followers);
- Defend-ability theory: Economic defend-ability states that defense of a resource has costs, such as energy expenditure or risk of injury, as well as benefits of priority access to the resource. Territorial behavior arises when benefits are greater than the costs;
- Organizational behavior: Decision makers think that decision outcomes are subject to their control. Forecasting certain outcomes without analysis, this can lead to mistakenly believe predictability what will happen with outcomes;
- Memory problems; decision makers tend to make judgments based on an initial assessment as anchor, but fail to make sufficient adjustments later on;
- Exposure to limited alternatives; insensitivity to outcome probabilities: illusion of manageability;
- Aversion to loss: approach becomes more conservative after negative impacts, and missing out on exploring the same opportunities;

- Self-serving approach within the organization: the level of influence of a person is often tied to his or her position within the organization, however, is not solely associated to a person's rank, or job title. It is also influenced by business relationship, reputation, knowledge or level of experience, or successes within the organization. It can serve as a motivator as much as it can serve to distract or deter others to render their optimum services;
- Statistical errors and selection bias is the phenomenon of selecting data for analysis in such a way that proper randomization is not achieved, ultimately resulting in a sample that is not representative of the population, bias input data;
- Anchoring: rely too heavily on specific information when making decisions;
- Heuristic: A "shortcut" method of problem solving that makes assumptions based on past experiences. Examples when decision makers apply their experience of something having happened a certain way enough times that it's likely to continue happening that way. It is not guaranteed to be accurate every single time, but it cuts out-processing time by avoiding detailed analysis of every particular situation.

Table below illustrate three category of cognitive biases identified in quantitative analysis. There are many forms of cognitive biases, but they can be separated into a few groups:



- Memory biases influence how we remember and recall certain information. An example is hindsight bias ("I knew it all along"), which can affect judgment reviews.
- Behavioral biases influence how we form our beliefs. An example is the illusion of controlling something that we cannot influence. Another example is our tendency to seek information even when it cannot affect the outcomes.
- Social biases are related to how our socialization affects our judgment and the impact of social group we are belonging to how can influence our decisions.

The salient findings of analysis of cognitive biases influenced the relevant decision makers are as follows:

- ❖ Decisions were made on silos, plus lack of experts' inputs (legal, technical and financial) as well as absent of any decisions' criteria that the participants in the discussion, negotiations should adhere to, which ultimately resulted to very poor decisions.
- ❖ The other contributing factor to the poor outcomes were lack of clear regulations/directives and having specific governance bodies to act as a oversight for all the affairs of decision making related to oil and gas resources, which led to liaise faire approach by National Iranian Oil Company's in regard to their decisions made about the Caspian Sea oil and gas resources. Failure to have a structured framework followed by external pressures on Iran's ability to maneuver led to reduction of level of engagements in tackling the issues in hand and consequently led to low rate of output in their oil and gas resources as well.
- ❖ Need to act fast (crisis situation), time pressure can distort decision - making processes and individual judgment and make them less objective and more influenced by their cognitive biases. The analysis indicated that when Iranian decision makers felt assured of their strength vis a vis the

other party, they were leaning toward zero sum attitude, contrary to the time they were under time pressure (crisis) and or other external threats, and then they were forced to have a much more conciliatory or compromising approach.

- Failing to produce accurate up-to-date information that could be readily available to all decision makers at the right time. The resources allocated for this task was poor and needs attention. All parties involved in preparation and ultimately involving in the decision making process were not equally or adequately equipped with accurate up-to-date information. The ever-increasing level of accuracy of relevant information will result in occurrence of fewer errors in decision-making.
- More importantly was that the decision makers were focusing on one dimension and failing to foresee the other important factors, (example of which is the justification of doing nothing in development of joint oil and gas resources because of its financial needs and the level of investment), this is only one dimension and parameter of whole equitation, there are other parameters such as governance and other political aspects, which have far more ramification, were totally ignored.

Table below is the summary of analyzed of responses:

Indicators/Consolidated Replies	Norm	Deviation from Norm	T sampling	Meaningful Range
Complexity of decisions regarding the investment for development of joint oil & gas deposits	3/70	0/87	4/37	0/000
Risk averse attitude of decision makers in dealing with shared oil and gas fields with neighboring countries	5	0	--	0/000
The effectiveness rate of foreign ministry in engagement in decision	4/50	0/508	16/15	0/000

Indicators/Consolidated Replies	Norm	Deviation from Norm	T sampling	Meaningful Range
making process during discussions /negotiations of joint fields of oil and gas deposits				
The level of losses inflicted by weak approach of National Iranian oil company in handling the joint fields of oil and gas deposits	4/90	0/305	34/11	0/000
The level of losses inflicted by very limited engagement of Iran's foreign ministry in handling the joint fields of oil and gas deposits	5	0	-	0/000
The impacts of sanction on securing investments for development of oil & gas resources	4/17	0/37	16/85	0/000
Effectiveness rate of innovation and creativity by Iranian authorities in their negotiation regarding the development of joint fields of oil and gas deposits	4/23	0/43	15/71	0/000
Effects of Innovative ways regarding securing investment for joint fields of oil and gas deposits	4/70	0/46	19/97	0/000
Effects of market uncertainty (oil price, outputs and sanction) in funding of investment for development of joint fields of oil and gas deposits	4/83	0/37	26/49	0/000
Effects of preferences on return of investment rate/period in development vs. non development of joint fields oil and gas deposits	4/67	0/47	19/03	0/000
Effects of opportunity losses in terms of suspended decisions vis-à-vis costs already burdened by Iran	4/36	0/49	15/27	0/000

Indicators/Consolidated Replies	Norm	Deviation from Norm	T sampling	Meaningful Range
Impacts of disparity of information regarding development of joint deposits (planning, schedule and outcome) on their strategic decisions and engagement	4/70	0/46	19/97	0/000
Effects of prevailing concept of "zero sum" approach in development of joint fields of oil and gas deposits	5	0	-	0/000
Effects of foreign ministry limited accessibility to updated information in their engagement for development of joint fields of oil and gas deposits	4/80	0/41	23/24	0/000

Need for Improvement

The diagnosis of weakness of decision makers in working on best solutions was the focus of the paper so far, yet there are plenty of tools and technique to improve the decision making processes. The importance of analytical decision-making process and adapting to set of decision criteria that are opted in achieving the best outcomes as well as consideration of factors that heavily influences those decisions can eliminate errors by setting an appropriate range or level of pre-defined decision criteria. Through this not only we tackling the errors, but also offering a better transparent and justifiable decision-making based on best line of practice.

The analysis of outcomes indicates a strong need for balanced solutions through consideration of several performance metrics that relate to the categories of a) business/economics aspects, b) operation/technical aspects and c) social/political and environment aspects.

All these parameter effects the situation and explicitly facilitate the optimal construction of preferences. This seems most appropriate when choice depends

on ability to understand and represent probabilities and outcomes. For each technique, aimed to describe the background provide a case study, and discuss strength and weaknesses of each contributing factors.

The decision-making requires cognizance of the following range of interrelated considerations by observing all three aspects of:

Business/economics aspects,

a. Operation/technical aspects and
b. Social/political and environment aspects

The purpose of this approach is to make sure of meeting the pre-defined performances (minimum acceptance performance level) for all aspects (a b. and c).

It is necessary to set up the criteria parameters prior to decision-making process also needs a high level of accuracy of information as well. By improving review processes, particularly in the case of multi-criteria decision-making, it is quite possible to improve quality of critical decisions.

Example of Weighting Factors – Decision Briefing Phase

Rating (example), and scoring

G	Y	O	R

- From 95% or more = Green (Meets all requirements)
- Between 90% - 95% = Yellow (Meet Most requirements)
- Between 85% - 89% - Orange (Fails some/minor requirements, medium level of comprising objectives)
- Between 85% or less = Red (Fails most requirements, high level of comprising objectives)

Setting the level of performance/rates is different in every phase/situations, depending upon the definition of the required performances that can satisfy the expected/planned outcomes. It is utmost necessity to define each performance category (a. b. and c) separately and as comprehensive as possible.

Example of Performance Criteria (defining required performance and accepted level)

Category	Criteria	Description of Performance Requirements
A	Business/economics aspects	Scoring
a-1	Ensures return on investment (What figure (or %) and by when will return on investment meets the needs)	G Y O R
a-2	Capital cost per unit (barrel)	
a-3	Creates platform for future revenue growth	
B	Operation/technical aspects	
b-1	Avoids over complexity	
b-2	Ensure flexibility	
b-3	Best use of assets	
C	Social/political and environmental aspects	
c-1	Maintain governance	
c-2	Reduce adverse environmental impacts	
c-3	Create jobs & improve growth of service sectors	

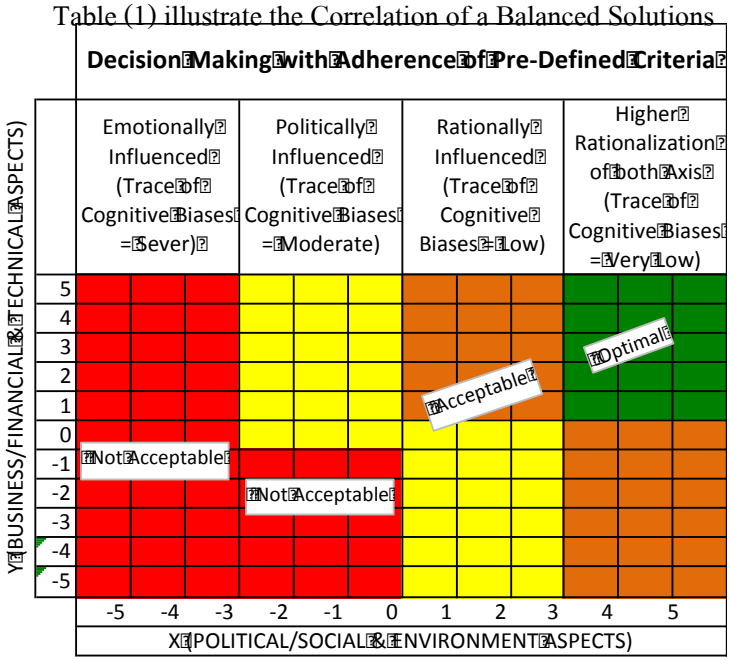
Assessment of the degree of compliance of each performance needs to be conducted against each criterion. Prior to that there should be an agreed rating scales with related descriptors, so that each rating formed from a consistent basis. The use of assessment criteria ensures that all viewpoints are represented in briefing phase of decisions.

Different technique can be used to review the impacts of each decision/judgement from individual experts to group of experts. A consultation workflow includes interviewing of experts, comparing subjective expert judgment with results of objective data analysis. For example, the impact of outcomes of decisions needs to be reviewed in every aspect such as social,

economical and political as well as in relation to geological uncertainty, performing reality checks. Proper use of consultation techniques together with objective data analysis will lead to significantly better decisions related to joint field oil and gas development.

The aims are to depict that there may be multiple objectives and preferences to be aligned for a variety of stakeholder groups (internal/external). As well, each entity (ies) may have different attitudes toward the key decision criteria.

Table (1) illustrate the Correlation of a Balanced Solutions



The above table illustrates a balanced solution of rational decision-making mode that strongly reduces the effects of cognitive biases on decision-making and the pattern of deviation from norm and/or rationality in judgment. Although according to T.K. Das and Bing-Sheng Teng, rational decision making approach can still be affected by prior hypotheses and inevitably prone to cognitive biases. However, with balanced solution and setting a pre-defined multi-criteria and adherence to (minimum, maximum level) it will be less

affected by those biases, because of development of rational alternative which are presented to decision makers as information regarding the resolution of the matter.

The balanced solution comprises of activities that make it imperative to have initial appreciation or diagnosis of the subject matter, in order to define the acceptance of solution by setting criteria for each aspects (business/economics, operation/technical, and social/political and environment) as well as setting the performance levels. A rational process should be equipped with all possible options; decision makers should have access to reasonably broad alternatives.

A proper framework for rational approach is to systematically develop and consider alternative options base on securing a balanced solution for any complex decision-making. Systematic evaluation of alternatives is important in the rational approach. The value of possible consequences of each alternative is tested by pre-defined criteria of all relevant aspects (i.e. business/economics, operation/technical and social/political and environment), based on the initial appreciation/diagnosis.

As a result, accurate estimates of outcome probabilities become the prerequisite for the evaluation process. In this process the accuracy of information and estimation are bearing high weight.

After gathering information, developing and evaluating alternatives, decision makers presented with more accurate information and thereby the sphere of cognitive biases plays a very little role.

The decision modes of rational, emotional and political needs to be reviewed by elaboration of what are the salient factors in forming the decision and what are the issues that decision makers are responding to.

❖ Rational:

- What are the benefit-cost?
- What are the risks and rewards?

- The duration and timetable?
- Will it work realistically and what are the rates of success?

❖ Emotional:

- What is in it for organization/entities?
- Will it advance our sphere of power play?

❖ Political

- Will my superiors like it (corporation, government agencies or any immediate power mechanism?
- Will the staff/workforce or other stakeholders like it?
- Can I ever gain more support through this?

The decision-making process relies on objective data analysis as well on subjective judgment of experts. Expert judgment often considered to be less and accurate than objective data analysis. Nevertheless, it is still one of the most common ways in which decisions are made in the development of oil & gas resources in Iran.

In order to maximize the economic and political interests of the country and avoid adhering to few judgmental rule the following points needs due considerations:

1. Review of disparity, quantity of oil and gas deposits and, level of financial investment required and identification of ratio of accessibility of shared deposits in Caspian Sea region. The tasks require a careful study of economic and political impacts and setting up criteria and performances that must be complied prior to any decision made by Iranian decision makers.
2. Providing up-to date information about the current as well as future plan regarding development of shared joint fields (including neighboring courtiers).
3. Review of Iran's legal territorial right of access to these resources as well as each of the neighboring countries legal rights and means to ensure compliance with those right and its governance.
4. Identify the Caspian Sea characteristics, scope and complexity of work.

5. Identify the best tools, means and method for decision-making processes to initiate plan and develop the tasks for future discussion of joint deposits.
6. Diagnosing the errors made in the decisions and strategic directions in the past and provides clear recommendations to avoid repeating the same.
7. Providing an improved decision making model based on lessons learned from previous errors and assurance of omitting the same in the future.
8. Last but not least is provision of accurate information and distributions among all internal stakeholders as well as having an integrated approach for future development with predefined decision criteria.

Conclusion

This paper has examined ways of improving decision-making processes and how to eliminate or lower the level of losses in future decision making in regard to development of joint oil and gas deposits. Using both quantitative and qualitative methods addressees why and how realistic strategic direction did not prevail over individuality approach by tracing the cognitive biases in decision-making of relevant authorities. It is also highlighting the lack of coordination and integrated approach of all organizations involved in the process of decision making, more importantly what was the effects of disparity of decision making and absent of up-to-date information available to all entities involved in Iran's oil and gas resources decision making process which led to negative outcomes for Iran's interests.

Upon analysis, one thing became clear that the contingent engagements certainly do force decision maker into a more rigorous evaluation of various scenarios and alternative options and a more objective assessment of the options they bring to their process. Decision makers owes it to themselves to ask if they are rejecting contingent engagements because of the risks involved or if they are simply uncertain about demonstrating the actual outcomes they can deliver?

Finally, it is necessary to bring to attention the relationship of internal and external factors and the effect of reviewing these two in forming and shaping the decisions for development of joint deposits of Caspian Sea oil & gas. The multi-faceted puzzle in the world of petroleum economics and fit them together with use of historical data related to cognitive biases by demonstrating statistical evidences. Understanding the underlying reasons and comprehensive analysis of historical data related to oil and gas initiatives and strategic directions has direct bearing to bigger framework of international affair and political economics mapping of world.

It should be noted that the proposed balanced solution framework and consideration of all three aspects (a. business/economics b. operation/technical and c. social/political and environment) by rational mode cannot be achieved without weighting the external factors and other possible risks as well. As such, the balanced solutions is not an end in itself and care must be taken to finalize and review what would be best outcomes by developing several alternatives and scenarios that complied with pre-set criteria within optimal approach. By doing so we can avoid issues resulted from decision-maker's cognitive biases and reduce the risks incurred thereby.

Recognition of building consensus among all countries involved in the joint fields development is necessary and in order to accomplish consensus, decision makers ought to shy away from any cognitive biases that flaws the process, whether is quite serious, deep-routed or is a combination of external and internal problems both needs diagnosing and then introducing an effective change through accepting a systematic approach to decision making process.

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