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# Long-Term Economic Forecasting with Structured Analogies and Interaction Groups<sup>1</sup>

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## Abstract

In this study, we employ judgmental forecasting techniques, Structured Analogies and Interaction groups for long-term forecasting. The aim of the paper is not to evaluate forecasting accuracy per se but to highlight the potential of such techniques in this so complex and challenging task. The case study is about Saudi Arabia and its aim to adopt a diversification strategy to reduce its dependency on the oil sector, where oil revenue consists 90% of its budget currently. The study has four phases: Unaided Judgment, Structured Analogies, and Interaction Groups with Structured Analogies - all three using disguised data – before finally working on the undisguised case study under review over a significant amount of time. Adopting judgmental methods are attributed to three main reasons: in an attempt to derive long-term economic forecasts about Saudi Arabia's ability to diversify its investments, to discover the impact of different factors on financial and economic outlooks, and to explore the main reasons for deviating the accuracy of financial and economic forecasts.

**Keywords:** Foresight; Economic Forecasting; Gross Domestic Product ; Structured Analogies; Interaction Groups

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## *1.0 Introduction:*

The puzzle of determining the accuracy of long-term forecasts of economic and financial outcomes lies in the characteristics of economic science and the forecasting methodology applied. Explicitly, economic science interacts with endogenous and exogenous factors, and responds to their implications. The majority of long-term economic forecasts are derived through observations, which occurred in the past because of many factors. These observations periodically change and can be numerically observed in the short term, and are thus known as time series variables. Forecasters often prefer to deal with numerical variables when deriving forecasts because they can be observed in the short term, and can shed light on the future impact of these variables on economic activities. Endogenous and exogenous factors play a significant role in the forecasts of financial and economic outcomes. Economic science is adopted by many spheres and today it is common to encounter disciplines such as geo-economics, socio-economics, and bio-economics. Political, social and environmental factors are classified as exogenous factors that have an impact on economic outcomes and forecasts. Some exogenous factors cannot be numerically observed, and these are referred to as soft factors such as strategies, social values, and policies. Soft factors can have long-term impacts on economic growth, but observing and estimating such impacts in order to derive long-term forecasts can be problematic. It is difficult to forecast financial and economic outcomes for a current strategy with long-term objectives, through looking at only past or current data. Meanwhile, economic factors are considered endogenous factors that can be numerically observed in the short- and mid-term, and are known as hard factors (observations). Hard factors have short-term impacts that can be observed in the short term by policymakers and forecasters who tend to interact with these factors and are able to forecast the financial and economic outcomes caused by these factors. It is human nature to interact more rapidly with tangible factors compared to intangible factors. In addition, it is also human nature to forecast economic outcomes in the short term because short-term forecasts reflect the impacts of the tangible factors that can mostly be numerically observed. For instance, the impact of a change in the average household income rate on the sales of commodities can be observed faster than the impact of changing customer preferences. Often, companies interact with household income changes rapidly as they can forecast the impacts of such changes on purchasing power in the short term.

The relationship between soft and hard factors can be seen as a relationship between causes and effects, where each has an impact on the other, but the impact of these factors is different in terms of their power. In the short term, hard factors have a greater impact and can be observed. Policymakers tend to revise their strategies based on forecasting the impact of hard factors on economic outcomes in the short term. In the long term, soft factors have more impact although these factors cannot be observed in the short term. The impact of soft factors appears gradually through changing patterns of variables and data in the long term. Meanwhile, the impact of hard factors is seen through frequent changing of strategies in the short term. In the long term, the impacts of soft factors overwhelm the impacts of hard factors, while soft factors are considered as causes of changes to hard factors. In contrast, the impacts of hard factors overwhelm the impacts of soft factors in the short term, and hard factors are considered as causes of changes to soft factors (see Table 1). Overall, deriving long-term forecasts for economic outcomes based on hard factors but ignoring the impact of soft factors is the main reason behind economic shocks and deviation in the accuracy of long-term forecasts.

Table 1: The Relationship of Hard and Soft Factors

<i>Long-term Impact</i>		<i>Short-term Impact</i>	
<i>Causes</i>	<i>Effects</i>	<i>Causes</i>	<i>Effects</i>
Soft Factors	Hard Factors	Hard Factors	Soft Factors

. The ambiguity of soft factors is observable in the long term as their impact takes a long time to show on the surface. Accordingly, soft factors are often described as non-measurable factors, which have a permanent impact. Mostly, they are represented by exogenous and intangible factors, which are hidden causes of changes in the long-term forecasts path (see Table 2).

Table 2: Specifications of Hard and Soft Factors

<i>Hard (Tangible)</i>	<i>Soft (Intangible)</i>
Endogenous (affecting the economy directly) Numerical data (variables) Short-term impact Measurable Observable in the short-term Examples: prices, inflation, unemployment rate, growth rate	Exogenous (affecting the economy indirectly) Contextual information Long-term impact Non-measurable Observable in the long-term Examples: strategies, policies, habits, governance

### *1.1 Judgmental Methods in Economic Forecasts:*

Long-term forecasts are an essential step when making a strategic decision taking into account various surrounding factors and explanatory variables (Hyndman & Athanasopoulos, 2014). Moreover, long-term forecasting is a complex task, where the influence of non-measurable factors weighs heavier than the influence of historical variables. From economic and financial perspectives, forecasts are worthless if they cannot help in developing economic and strategic decisions (Elliott & Timmermann, 2008). Forecasting economic outcomes and making strategic decisions can be extracted by comparing the outcomes of previous situations with the target situation (Green & Armstrong, 2007). The structured analogy method is a type of judgmental method that can be used under the given conditions. Armstrong & Green (2005) describe the structured-analogies method as a formal type of forecasting that aims to overcome bias through using information from analogous situations efficiently. The widespread consensus among many forecasters is that the adoption of pure judgmental methods in forecasting leads to bias due to human behaviour, which can affect the accuracy of outcomes. Noticeably, the econometrics models are considered prevalent when it comes to deriving forecasts among economists due to the abundance of explanatory variables, and their ability to notice the impact of these variables. Judgmental adjustments have an influence on the outcomes of forecasts, especially when there is a significant quantity of contextual information relevant to a core issue (Lee, Goodwin, Fildes, Nikolopoulos & Lawrence, 2007). Some studies have been conducted to investigate the role of judgmental methods in macroeconomic forecasting (Stekler, 2007). When forecasting the impact of a new policy, the impact power of past variables on future outcomes will steeply diminish (Savio & Nikolopoulos, 2009). The influence of historical variables in economic forecasting declines gradually under certain circumstances. In 2008, the global financial crisis, which resulted in steep recessions due to meltdowns in some financial entities (banks, insurance companies), represented a setback for forecasters especially those who had relied on historical variables and ignored current factors such as government policies and banks' strategies (Nikolopoulos, Litsa, Petropoulos, Bougioukos & Khammash, 2015). Economists rarely pursue the exclusive adoption of judgmental methods in dealing with economic and financial issues.

Makridakis (2004), in describing the role of foresight in a knowledge-based economy, claimed this to be a window to the future for governments to understand the implications of changes made in technology and societal behaviours. Some countries rely on suggestions and

forecasts made by financial and economic organisations in order to make strategic decisions and to estimate the financial outcomes of their current strategies. The variance of interests among forecasters and policymakers often encourages forecasters to use complex methods. In addition, some forecasts by economic institutions are prone to bias due to their own interests such as profitability (Batchelor 2007; Graefe, Armstrong, Jones & Cuzan, 2011). Judgmental methods can be used for making crucial decisions, such as in the hiring of a CEO for a company or in selecting an appropriate path of economic reform (Armstrong, Green & Graefe, 2015).

### *1.2 Literature Review:*

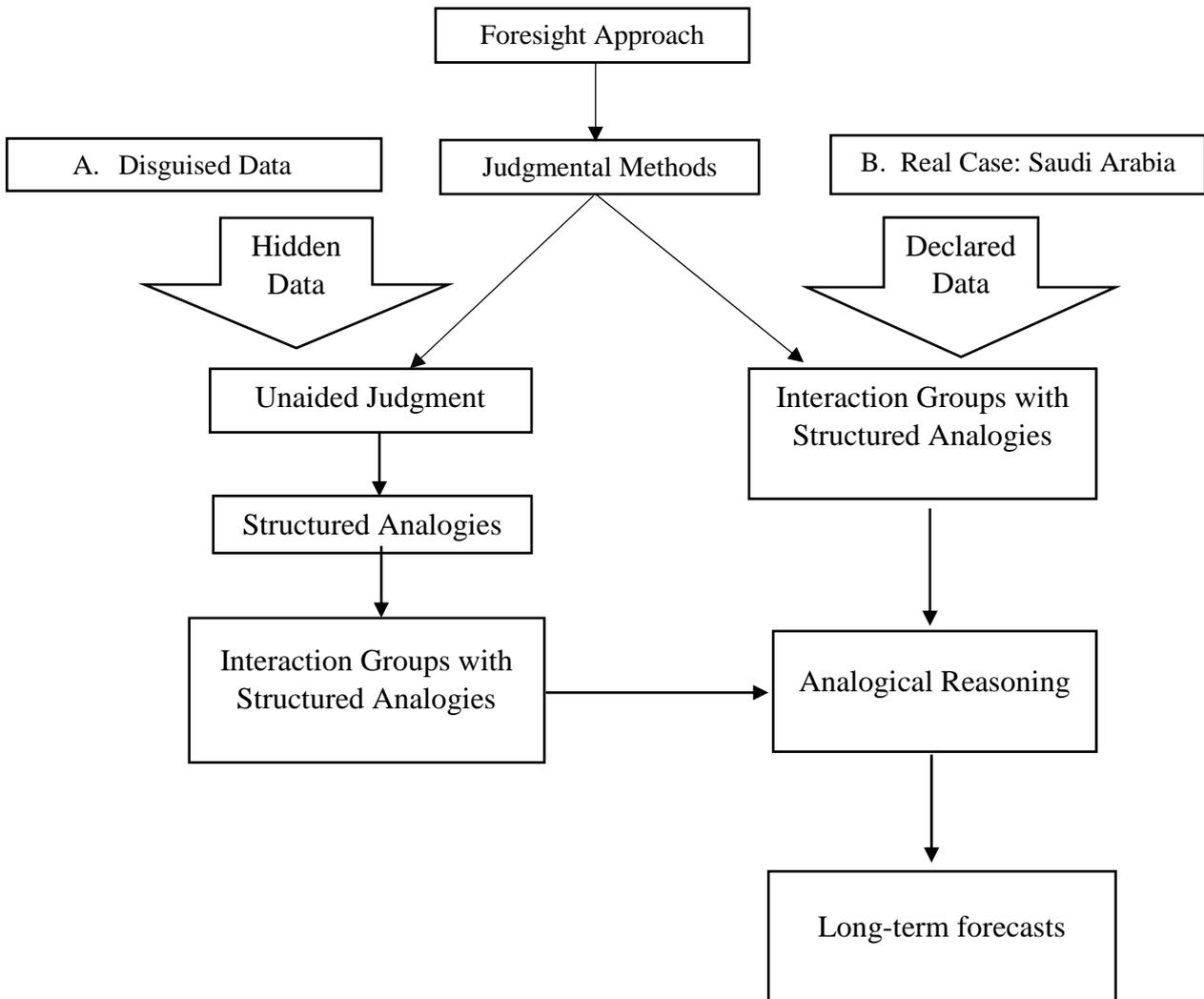
Forecasting methods are categorised based on three main frameworks: qualitative, quantitative, and semi-quantitative (Georghiou & Keenan, 2008). Recently, technology has been adopted to complement the forecasting process, and to facilitate the implementation process. Typically, the selection of the forecasting method is determined by various factors such as objectives, targeted time, and available data and information. Forecasters sometimes use statistical methods in cases of numerical data where the dataset has a strong correlation with the target situation, and when the objective is to forecast the short and medium term. Furthermore, besides the relevance of historical data, using an econometrics model requires setting a time horizon for the used data, validating the data and analysing the prospective outcomes objectively. Meanwhile, the judgmental methods reflect human insights and convey opinions about future outcomes and causal factors. Judgmental methods follow several models such as surveys, conferences/workshops, structured analogies and the Delphi method, the latter of which often entails a panel of experts (Popper, 2008). Forecasters often adopt these methods under appropriate conditions such as where there is insufficiency in the numerical data, when the available information is strongly relevant to the target situation, and when the objective is long-term forecasting. Noticeably, some forecasters tend to use judgmental methods in the second stage to adjust the results of statistical methods, because they believe judgmental methods inherently represent human expectations based on their knowledge and experience and a lack of sufficient evidence about the accuracy thereof. Compared to statistical methods, judgmental methods are more prone to bias (Armstrong, 2001). However, the deliverables of judgmental methods can generate more accurate outcomes in certain situations. For instance, judgmental methods can be used to forecast long-term economic outcomes for a currently adopted strategy.

Another approach entails combining the above methods, an approach which is often implemented under specific conditions such as when dealing with complex and sensitive issues. It should be noted that the combined method has boosted the accuracy of certain forecasts (Batchelor and Dua, 1995; Armstrong, 2006).

Armstrong (2001) emphasises the importance of applying certain steps in the forecasting process to boost the accuracy of forecasts. The first step involves formulating the problem and setting objectives. The second step entails checking the observations to determine if the available observations provide numerical or informative data. The third step is to select an appropriate method, which should be determined according to the objectives, type of data, and the targeted time. With structured procedures in place for the forecasting process the likelihood of errors and/or bias decreases.

However, the pervasive thinking among many forecasters is that complex issues need to be addressed using complex methods regardless of the high rate of variance and errors in the outcomes. Green & Armstrong (2015) investigated why complexity in forecasting is attractive for forecasters despite the theoretical and empirical objections and attributed this preference to the forecasters' own interests. For instance, in academic institutions, researchers often aim to have their papers published in high-impact journals and in the pursuit of this goal they use methods that are more complex, and they pay less attention to the accuracy of outcomes. Moreover, forecasters and economic consultants who represent organisations often aim to increase both client loyalty and the rate of client visits in order to gain more profit, and they believe that using methods that are more complex will impress and attract clients.

### 1.3 Applying Structured Judgmental Methods:



#### 1.3.1 Judgmental Forecasting Methods:

Recently, judgmental methods have been considered a controversial subject in forecasting research, with some authors claiming that well-structured procedures can be created to limit the drawbacks of judgmental methods. According to a survey in the U.S., 60% of the 240 corporations assessed use judgmental forecasting to adjust software outcomes, where adjustments represent their own understanding of the main issue (Sanders & Manrodt, 2003). Lawrence et al. (2006) indicated that the blending method combines time series data and valuable information to deliver useful outcomes. Armstrong (1983) noticed that one of the worst practices leading to reduced accuracy of forecasts is when economists and

businesspersons intentionally adjust sales forecasts, which have been produced via objective methods.

Specifically, the three judgmental methods adopted in this paper are unaided judgment, structured analogies, and interaction groups with structured analogies. The selected participants will perform experiments through using the judgmental methods in two parts to boost the objectivity of the forecasting process. The first part is called disguised data, where the participants perform experiments using the judgmental methods, hiding minor data and information about the target situation, such as the name of the intended country, in order to derive different insights, and to recall analogous situations, which support participants' insights. In the first part, I aim to focus on the main issue by omitting the name of the intended country to limit cognitive bias. In the first stage, the adopted method is unaided judgment, presenting participants' insights about the best five sectors in which to invest for the future. Thereafter, the structured analogies method is used to support the accuracy of participants' insights through recalling countries which match their insights. Thereafter, the interaction group method is applied to reach a consensus about the best five sectors in which to invest for the future, and about the countries considered analogous to participants' insights. The second part concerns a real case in Saudi Arabia, where the participants use interaction groups with structured analogies to estimate the ability to transfer and apply the participants' insights about the best sectors in which to invest for Saudi Arabia. Initially, the participants will forecast investment returns from the five selected sectors on Saudi Arabia's GDP based on their knowledge and experience. The conditional sum of all expected returns of investments equates to 100% of Saudi income. The rate of analogy here refers to the rate of similarity between Saudi Arabia and other countries in terms of political, social, economic, technological and environmental factors. These factors are all soft factors that have an impact on the determinants of economic growth and long-term GDP growth. The analogical reasoning embodies Saudi Arabia's ability to apply and transfer participants' forecasts in Saudi Arabia. Participants' insights plus the rate of analogy are indicators of Saudi Arabia's ability to adopt a diversification strategy, and these indicate the level of impact this strategy is likely to have on the country's long-term GDP growth. Interaction groups with structured analogies is the best method to explore the impact of soft factors and to forecast long-term financial and economic outcomes. The aim of this procedure is to reach a high level of objectivity by using the judgmental methods, which might lead to a reduction in the impact of bias and the derivation of accurate long-term forecasts.

Participants are selected according to their knowledge and experience, where the sample will be derived from two populations: academic institutions and fieldwork. The sample size (n) is 110 participants within three groups: novices (undergraduate students), semi-experts (MBA students), and experts (fieldworkers). Each group participates in four phases. In the first, the participants use unaided judgment to generate insights and then structured analogies in order to recall analogous situations to support their insights. Thereafter, interaction groups with structured analogies will be implemented to reach a consensus about the best five sectors in which to invest, and identifying analogous situations from other countries. A description of the case and the questions are written clearly on one page. In the first three phases of the experiments, Saudi Arabia's identity is masked and instead referred to as 'X country' to induce creativity and thinking on the main issue regardless of the country under review, and to assure that the insights reflect the participants' views. The question about the case is simple and straightforward. In the unaided judgment phase, the following questions are asked: what are the best five sectors to invest in for the future and why? In structured analogies, what are the most analogous situations in other countries according to participants' insights for investing in some sectors and why? Participants are also asked to recall analogous situations for each selected sector. In the interaction groups with structured analogies, the same questions will be asked again to reach a consensus in terms of insights and analogies. In the real case, the question asked is as follows: What are the expected returns and the percentage contribution of investments in the selected five sectors on Saudi Arabia's GDP growth and why? In addition, participants are also asked to compare the cited countries, which have been recalled to support their insights with Saudi Arabia, and then ascertain the extent to which they are analogous (see experiments components in appendix 1).

### ***1.3.2 First Phase: Unaided Judgment Method:***

Understanding the target situation profoundly and then forecasting the outcomes based on participants' knowledge without evidence is a type of judgmental method known as unstructured judgment or unaided judgment. In contrast, structured judgment methods are more organised and often produce more accurate results (Armstrong, 2006). The method of unaided judgment is widely used and known among researchers in several fields, including economics and business (Armstrong, 2002). In addition, unaided judgment is commonly used to forecast decisions regarding conflicts (Green, 2005). The value of the participants and their knowledge, intelligence and experience, is reflected in their ability to assess a situation and advise

administrators when forecasting economic outcomes in the future (Armstrong, 1980). Clearly, to clarify the purpose and objectives of this process it is important to describe Saudi Arabia's situation to participants.

The participants are asked to name the five best sectors to invest in and to explain why. The simplicity of the questions and the method in general is likely to enhance the accuracy of the outcomes. The outcomes of unaided judgment express the cumulative knowledge and insights of participants about the sectors in which to invest in the future. Unaided judgment requires participants to take part individually, as any cooperation among participants may induce some compromise in their stances and insights. Green & Armstrong (2007) emphasised the impact of human nature on the accuracy rate of decisions where collaboration between participants might lead to bias. The unaided judgment outcomes will be used as a benchmark standard without overconfidence in some decisions or abolishing others (Green & Armstrong, 2007a; Nikolopoulos, Litsa, Petropoulos, Bougioukos & Khammash, 2015).

### ***1.3.3 Second Phase: Structured Analogies Method:***

The structured judgmental method is used to support participants' insights, where analogous situations present evidence supporting the accuracy of participants' forecasts. Mentioning analogous situations to participants is considered a means of deriving more accurate long-term forecasts. The participants' insights about the five best sectors in which to invest for the future should be supported by the recalling of analogous situations. Armstrong, Green & Graefe (2010) pointed out that 60% of structured judgment forecasts are considered accurate, while only 32% of unaided judgment forecasts were deemed accurate. The analogous situations in this part concern countries that have succeeded in investing in a specific sector. Each participant has to identify at least five analogies, and then explain why these have been chosen. Then, participants are required to justify their selection of these countries. Armstrong (2006) pointed to the ability of participants to support administrators in obtaining useful information and empowering them to derive forecasts through using structured judgment.

### ***1.3.4 Third Phase: Interaction Groups & Structured Analogies:***

Seeking a consensus among the views of the group members motivates us to apply group thinking. The third phase of judgmental methods involves interaction groups with structured analogies, a process used in many fields such as business and military. Interaction groups consist of a set of procedures and activities that are organised by the administrators and

executed by the participant groups. The administrators stimulate debate and discussion among participants to derive forecasts and then make decisions (Nikolopoulos, Litsa, Petropoulos, Bougioukos & Khammash, 2015). The participants interact with one another, and exchange ideas about what they consider the best sectors in which to invest in the future and supporting analogies.

### ***1.3.5 Fourth Phase: Interaction Group & Structured Analogies for a Real Case (Saudi Arabia):***

In this phase, the name of the relevant country is revealed in the case description to allow participants to narrow their insights to relate to the real case of Saudi Arabia. Here, participants forecast returns on investments for Saudi Arabia from their five selected sectors. The expected returns are presented in percentage form, and the sum of all expected returns should equal 100% of Saudi Arabia's income. The participants' predictions are filtered by using a simple statistical method to derive the average predictions of the undergraduate students, MBA students, and experts. Then, the participants compare the countries cited by participants as analogous situations with Saudi Arabia to derive the rate of analogy. The comparison between Saudi Arabia and the selected countries is based on political, economic, social, technological, and environmental factors all of which have long-term impacts on the determinants of economic growth. Therefore, participants will derive a rate of analogy between Saudi Arabia and each of the other cited countries, and then justify this rate. For instance, countries that are most similar score 10 out of 10, while the lowest score 1 out of 10. The rate of analogy helps to use analogical reasoning to forecast Saudi Arabia's ability to adopt a diversification strategy, and to then forecast the impact of this strategy on Saudi Arabia's long-term GDP growth.

### ***1.4 Outcomes Analysis & Accuracy Measurement:***

Estimating the accuracy of forecasts for the participants is significant when assessing the outcomes, and identifying the extent to which these can be generalised. Often, forecasters use different techniques to measure the accuracy of a forecast depending on many factors, such as the type of data, for instance whether they are time series or cross sectional, and whether the available data are numerical or contextual. A simple technique to measure forecast errors is to subtract the actual outcomes from the forecast outcomes; if the result is positive, that means the errors are classified as under-forecast and vice versa,  $E_t = A_t - F_t$ . The common rule here is a mean absolute deviation (MAD), which is used to measure the total error  $MAD =$

$\frac{\sum |Actual - Forecast|}{n}$  where  $n$  denotes the number of forecasters. Finally, the last estimator is a mean square error (MSE), which is used to measure the average deviation of errors  $MSE = \frac{\sum (Actual - Forecast)^2}{n}$ . Nikolopoulos, Litsa, Petropoulos, Bougioukos & Khammash, (2015) measured the accuracy of the forecasting processes of different judgmental methods for some special events by adopting the mean absolute percentage error (MAPE) estimator, where  $MAPE = \frac{1}{n} \sum_{t=1}^n \frac{|A_t - F_t|}{|A_t|}$ ,  $A_t$  is actual outcomes,  $F_t$  denotes forecasting outcomes and  $A_t$  &  $F_t \neq$  zero. Estimating the accuracy of long-term forecasts for economic outcomes is one of the challenges facing forecasters and economists especially when using judgmental methods. In the disguised data stage, selecting the best five sectors in which to invest and the presentation of analogous situations is based on the most common insights among participants (novices, semi-experts, and experts). The five selected sectors and the analogies are the outcomes of the first stage. For the real case of Saudi Arabia, analysis of participants' insights is done through taking the average score for their insights into expected returns on investments in the selected sectors, whereby the aggregate of expected returns should equal 100% of Saudi Arabia's income. Meanwhile, the rate of analogy is derived according to the average score of the participants' insights and the rate of similarity between Saudi Arabia and the cited countries. Forecasts are derived as follows: if the aggregate of investments constitutes less than 40% of Saudi Arabia's income this represents a low impact of the diversification strategy on Saudi Arabia's GDP growth in the long term; if the aggregate of investments makes up 40-60% of Saudi Arabia's income, this represents partial success and a medium impact; and if the aggregate of investments constitutes more than 60% of Saudi Arabia's income, this means absolute success and thus a high impact.

Estimating the accuracy of long-term forecasts of judgmental methods can be achieved through estimating the participants' ability to derive accurate forecasts. Novices, semi-experts, and experts differ in terms of their ability to derive accurate forecasts due to the variance in their knowledge, motivation, experience, background, intelligence and foresight. That does not always mean that the insights of experts or semi-experts yield more accurate forecasts than novices, and to assume that this is the case would lead to bias. The accuracy of the forecasts of each group is estimated by giving participants a specific case as a mock case. The mock case is a real example of something that occurred in the past, so its outcomes are to some extent already known. Assessing and estimating participants' ability to derive accurate forecasts is based on their forecasts for this case. Thereafter, based on the participants' ability to derive

accurate forecasts, we estimate the forecast accuracy for the target situation using analogical reasoning with consideration given to the weight of each group in the sample. The mock case concerns the Scottish independence referendum in 2014, when the population of Scotland voted to stay within the United Kingdom. We described the case to participants, hiding the names of the countries involved. In addition, we asked participants forecasting the country name and the result of the referendum (see estimating accuracy in appendix 1).

### *1.5 Data Collection & Analysis:*

#### *1.5.1 Disguised Data (Insights & Analogies):*

This stage presents participants' insights and forecasts about prospective solutions for the main issue without taking into account the name of the relevant country and some other minor information. Disguised data stimulates participants to think more broadly, which might reflect positively on their insights and suggestions. Besides insights and forecasts, participants are required to recall analogous situations as evidence to support their forecasts. Moreover, participants' insights include their selection of the five best sectors in which to invest for the future. The aim of hiding the name of the relevant country and some other minor information is to prevent bias and any influences such as conservatism, optimism, overconfidence and belongingness, and to trigger in participants' minds analogous situations from other countries. Such countries should have achieved notable progress in investing in selected sectors. Analogical reasoning boosts the ability to discover influential factors and policies, which have a long-term impact on investment outcomes and economic growth.

#### *1.5.2 Real Case: Saudi Arabia (Comparing and Analogical Reasoning):*

The previous stage presented various forecasts and insights about the best sectors in which to invest for the future generally. The main sectors, which were selected by most participants in this regard, were energy and mining, tourism, industry, and FDI. The participants felt that the returns from investments in these sectors could make up for a dip in oil returns in the future. In addition, the participants referred to several analogous situations in other countries that had succeeded in adopting a diversification strategy through investing in some or all of these sectors. Such examples are intended to substantiate the insights and suggestions offered by participants. The countries most cited by participants were Norway, India, the UAE, Singapore and South Korea. However, generalisation here is difficult because each country has distinct

features and is affected differently by different factors. Thus, at this stage I aim to use analogical reasoning to infer the ability to transfer and apply these insights to Saudi Arabia, which financially and economically has started to suffer from its dependency on the oil sector. As mentioned before, Saudi Arabian policymakers recently decided to try and adopt a diversification strategy again after several failed attempts, and launched a new vision called '2030 Saudi Vision.'

The rate of analogy is derived through comparing the cited countries and Saudi Arabia in several aspects including the sources of factors that have a long-term impact on the determinants of its economic growth. These factors can be divided into political, social, economic and environmental factors all of which have a varying impact on financial and economic stability in the long term. Typically, analogical reasoning means rating the ability to transfer insights to another place through rating the similarities and/or differences between previously applied cases and the target situation. The high level of variation in political, social and environmental factors between Saudi Arabia and the cited countries, which are considered benchmarks for others in certain sectors, may also lead to high variation in the expected outcomes. The participants were required to re-read the case description, and to become suitably informed about Saudi Arabia. Then, the participants were required to forecast and identify the potential percentage returns of investments in the selected five sectors with regard to Saudi Arabia's long-term GDP growth, where the sum of all five sectors' contributions should equal 100% of Saudi Arabia's income (see equation 2). Thereafter, the participants were required to rate the similarities and differences between Saudi Arabia and five cited countries. In the final step, forecasts were derived based on participants' insights and the rate of analogy in a structured manner with a high rate of objectivity.

$$100 \% \text{ of Saudi Income} = \alpha \text{ Sector}1 + \mu \text{ Sector}2 + \theta \text{ Sector} 3 + \dots \dots \dots t \text{ Sector} n$$

$$\text{Sector } n = \text{Different and Specific Sector} \quad , \quad \text{where } n = 5$$

$$a, \mu, \theta, \dots t = \text{Percentage value} \quad , \text{where } a + \mu + \theta + \dots t = 100\%$$

$$t \text{ Sector } n = \text{Expected return of specific sector } \% \quad \quad \quad (\text{Equation 2})$$

## *A2. Interaction Groups (Novices):*

Table 3: Novices' Insights and Forecasts

<i>Sectors</i>	<i>Expected Return on Saudi Arabia's Income %</i>
<i>Energy &amp; Mining</i>	30%
<i>Tourism</i>	25%
<i>Industry</i>	20%
<i>Services (Shipping and Aviation)</i>	10%
<i>FDI</i>	15%
<b>Total</b>	100%

## *B2. Interaction Groups (Semi-Experts):*

Table 4: Semi-Experts' Insights and Forecasts

<i>Sectors</i>	<i>Expected Return on Saudi Arabia's Income %</i>
<i>Energy &amp; Mining</i>	40%
<i>Tourism</i>	20%
<i>Industry</i>	15%
<i>Services (Shipping and Aviation)</i>	15%
<i>FDI</i>	10%
<b>Total</b>	100%

## *C2. Interaction Groups (Experts):*

Table 5: Experts' Insights and Forecasts

<i>Sectors</i>	<i>Expected Return on Saudi Income %</i>
<i>Energy &amp; Mining</i>	40%
<i>Tourism</i>	25%
<i>Industry</i>	10%
<i>Services (Shipping and Aviation)</i>	15%
<i>FDI</i>	10%
<b>Total</b>	100%

## *D2. Interaction Groups with Structured Analogies (Novices, Semi-Experts and Experts):*

In this stage, we aim to gather and filter all of the participants' insights in one pool, in order to compare Saudi Arabia and the cited countries. The overall rate of analogy reflects the

average rating given by participants. The participants rated the similarities between Norway and Saudi Arabia at 2.2/10, meaning that the differences between them significantly outweigh the similarities. The participants justified this rating by referring to different factors. The most important differences were found in the education system, political strategies, and societal values. The participants pointed to the high quality of education in Norway, which leads to it having a skilled labour force. A summary of the participants' insights and suggestions regarding sectors, which should be invested in by public and private sectors along with rates of analogy, are presented below:

- **Energy & Mining:** The participants referred to the example of Norway, whose government is directly responsible for investment in energy resources. The aim of this policy is to achieve energy efficiency and keep resources sustainable for future generations. On average, participants rated the similarity between Saudi Arabia and Norway at 2.2/10. The Norwegian economy is regarded as a balanced economy, where the public and private sectors each play a vital role in making investments, albeit the major investments are generally made under private sector control. Table 8 illustrates the factors that have led to such a high disparity between Saudi Arabia and Norway, as well as the participants' suggestions on how to narrow this gap (see Table 7 and Table 8).

Table 6: Investment in Energy & Mining Sector

<i>Participants' Insights</i>	<i>Expected Return</i>	<i>Rate of Analogy</i>
	<i>% of Saudi Income</i>	<i>Saudi Arabia &amp; Norway</i>
<i>Novices</i>	30%	0.30
<i>Semi-Experts</i>	40%	0.25
<i>Experts</i>	40%	0.10
<b>Average</b>	37%	0.22

Table 7: Comparison - Saudi Arabia vs Norway

<i>Insight on Investment</i>	<i>Analogy</i>	<i>Similarities &amp; Differences</i>	<i>Rating</i>	<i>Suggestions</i>
		<i>(Analogy vs. Saudi Arabia)</i>		
<i>Energy &amp; Mining Sector</i>	Norway	<p><b>Similarities:</b></p> <ul style="list-style-type: none"> <li>- Oil resources.</li> <li>- Wealth.</li> </ul> <p><b>Differences:</b></p> <ul style="list-style-type: none"> <li>- Education system.</li> <li>- Societal values and culture.</li> <li>- Geographic location and environment.</li> <li>- Workforce quality.</li> <li>- Political regime.</li> </ul>	2.2/10	<ul style="list-style-type: none"> <li>- Improving education.</li> <li>- Activating the role of females.</li> <li>- Abolishing the agencies system to boost free trade.</li> <li>- Updating regulations.</li> <li>- Changing policies.</li> <li>- Enhancing transparency.</li> </ul>

- FDI: For this suggested sector for investment, participants pointed to the example of India as a successful analogy. Investment in FDI can remedy the weaknesses of a workforce through attracting foreign experts, improving the quality of training and developing new skills. The attraction of FDI relies on the availability of skilled and inexpensive labour as well as suitable technology, all of which the Indian market provides. On average, the participants rated the level of similarity between Saudi Arabia and India at 2.5/10. Indian society is more flexible in dealing with foreigners, while its work regulations are less strict. On the other hand, Saudi Arabian society is considered conservative and its investment regulations are far tighter than those of most of its global competitors. Moreover, the participants pointed out many obstacles, which may hinder the ability to replicate the example of India’s attraction of FDI in Saudi Arabia because of the disparity in terms of quality of technology, R&D and workforce. The participants emphasised the necessity to reform investment regulations and to allow investors to own investment properties in Saudi Arabia. In addition, they pointed to the importance of stimulating investments in technology, and boosting the role of research institutions through attracting technology companies, and allocating a portion of its budget to research in innovation. Saudi Arabia and India have limited similarities with regard to political, social, and environmental factors. Thus, the impact of these factors on the determinants of economic growth is also different for each country. This leads

to variance in the outcomes between them and in the decisions of policymakers to invest in the FDI sector or not. Assuming that India is a pioneering case with regards to investing in the FDI sector, then the surrounding factors in the FDI sector in India will have an imperatively positive impact on the outcomes. This also means that the impact of these factors would be negative in Saudi Arabia due to the high variance between Saudi Arabia and India. In turn, the idea of Saudi Arabia investing in the FDI sector will not be realised unless these factors are treated accordingly. Below, the similarities and differences between Saudi Arabia and India are indicated (see Table 9 and Table 10).

Table 8: Investment in FDI Sector

<i>Participants' Insights</i>	<i>Expected Return</i>	<i>Rate of Analogy</i>
	<i>% of Saudi Income</i>	<i>Saudi Arabia &amp; India</i>
<i>Novices</i>	15%	0.35
<i>Semi-Experts</i>	10%	0.20
<i>Experts</i>	10%	0.20
<b>Average</b>	12%	0.25

Table 9: Comparison - Saudi Arabia vs India

<i>Insights on Investment</i>	<i>Analogy</i>	<i>Similarities &amp; Differences</i>	<i>Rating</i>	<i>Suggestions</i>
		<i>(Analogy vs. Saudi Arabia)</i>		
<i>FDI Sector</i>	India	<p><b>Similarities:</b></p> <ul style="list-style-type: none"> <li>- Developing countries.</li> <li>- Emerging markets.</li> </ul> <p><b>Differences:</b></p> <ul style="list-style-type: none"> <li>- Workforce quality.</li> <li>- Societal values.</li> <li>- Investment regulations.</li> <li>- Education system.</li> <li>- Technological progress.</li> <li>- Political regime.</li> <li>- Demographics.</li> </ul>	2.5/10	<ul style="list-style-type: none"> <li>- Improving the workforce.</li> <li>- Updating investment regulations.</li> <li>- Increasing the spending in R&amp;D.</li> <li>- Improving the education.</li> </ul>

- Tourism: Referring to an analogous situation the participants identified the UAE, which has invested heavily in its tourism sector. The participants claimed it was necessary for Saudi Arabian policymakers to invest in its tourism sector. Saudi Arabia could invest in religious tourism, particularly as millions of Muslims from across the world visit its holy sites every year. Saudi Arabia also has many other historical sites, which could be invested in accordingly. Attracting foreign investors and allowing international hotels to open branches in Saudi Arabia could also boost the country's GDP growth. The participants noted some similarities between Saudi Arabia and the UAE in terms of culture, location and living standards, giving an average rate of analogy of 7.3/10. The determinants of economic growth in the UAE and Saudi Arabia are similar. Therefore, repeating the UAE experience in Saudi Arabia could lead to similarly positive outcomes (see Table 11 and Table 12).

Table 10: Investment in Tourism Sector

<i>Participants' Insights</i>	<i>Expected Return</i>	<i>Rate of Analogy</i>
	<i>% of Saudi Income</i>	<i>Saudi Arabia &amp; UAE</i>
<i>Novices</i>	25%	0.80
<i>Semi-Experts</i>	20%	0.80
<i>Experts</i>	25%	0.60
<b>Average</b>	23%	0.73

Table 11: Comparison - Saudi Arabia vs UAE

<i>Insights on Investment</i>	<i>Analogy</i>	<i>Similarities &amp; Differences</i>	<i>Rating</i>	<i>Suggestions</i>
		<i>(Analogy vs. Saudi Arabia)</i>		
<i>Tourism Sector</i>	UAE	<p><b>A. Similarities:</b></p> <ul style="list-style-type: none"> <li>- Culture.</li> <li>- Geographic location and environment.</li> <li>- Living standards.</li> <li>- Investment regulations.</li> <li>- Political regime.</li> <li>- Workforce quality.</li> <li>- Education system.</li> </ul> <p><b>B. Differences:</b></p> <ul style="list-style-type: none"> <li>- Saudi Arabia is more religious.</li> </ul>	7.3/10	<ul style="list-style-type: none"> <li>- Attracting foreign investors.</li> <li>- Enhancing airport infrastructure.</li> <li>- Monitoring hotels' services.</li> <li>- Delivering high quality of services.</li> <li>- Focusing on religious sites.</li> </ul>

		- Saudi Arabia is bigger than UAE. - UAE has better infrastructure.		
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- Industry: The participants referred to several countries that have made significant progress in their industrial sectors such as South Korea. On average, participants rated the level of similarity between South Korea and Saudi Arabia at 2.2/10. The participants pointed out significant variances to the political, social and geographical factors between the two nations. Moreover, the impact of soft factors on the determinants of economic growth in South Korea is not consistent with the impact of soft factors affecting the Saudi Arabian economy (see Table 13 and Table 14).

Table 12: Investment in the Industrial Sector

<i>Participants' Insights</i>	<i>Expected Return</i>	<i>Rate of Analogy</i>
	<i>% of Saudi Income</i>	<i>Saudi Arabia &amp; South Korea</i>
<i>Novices</i>	20%	0.25
<i>Semi-Experts</i>	15%	0.30
<i>Experts</i>	10%	0.10
<b>Average</b>	15%	0.22

Table 13: Comparison - Saudi Arabia vs South Korea

<i>Insights on Investment</i>	<i>Analogy</i>	<i>Similarities &amp; Differences</i>	<i>Rating</i>	<i>Suggestions</i>
		<i>(Analogy vs. Saudi Arabia)</i>		
<i>Industrial Sector</i>	South Korea	<b>Differences:</b> - Culture. - Geographic location and environment. - Investment regulations. - Political regime. - Workforce. - Education system. - Technological progress.	2.2/10	- Improving the workforce. - Updating the investment regulations. - Increasing the spending in R&D. - Improving the education.

- **Shipping and Aviation:** The participants pointed out the potential for Saudi Arabia to exploit its geographical location by investing in shipping and aviation. The participants referred to Singapore as a successful analogy for investing in the shipping sector. Saudi Arabia enjoys an advantageous strategic position with long coastlines on both sides of the country, east and west, while it is also the biggest country in the Middle East. Its location could also be exploited as a means of connecting trade between East Asia and Africa. On average, participants rated the similarity between Singapore and Saudi Arabia at 1.8/10 (see Table 15 and Table 16).

Table 14: Investment in Shipping and Aviation Sector

<i>Participants' Insights</i>	<i>Expected Return</i>	<i>Rate of Analogy</i>
	<i>% of Saudi Income</i>	<i>Saudi Arabia &amp; Singapore</i>
<i>Novices</i>	10%	0.20
<i>Semi-Experts</i>	15%	0.25
<i>Experts</i>	15%	0.10
<b>Average</b>	13%	0.18

Table 15: Comparison - Saudi Arabia vs Singapore

<i>Insights on Investment</i>	<i>Analogy</i>	<i>Similarities &amp; Differences</i>	<i>Rating</i>	<i>Suggestions</i>
		<i>(Analogy vs. Saudi Arabia)</i>		
<i>Shipping and Aviation Sector</i>	Singapore	<b>Differences:</b> - Infrastructure. - Culture. - Geographic location and environment. - Investment regulations. - Political regime. - Workforce quality. - Education system. - Technological progress.	1.8/10	- Improving infrastructure. - Improving the workforce. - Updating the investment regulations. - Increasing spending in R&D. - Improving education.

The high level of variation between the countries cited as analogies to support the participants' insights and their applicability for Saudi Arabia implies a lack of substance in the participants' forecasts. The impact of soft factors on the determinants of economic growth vary from country to country. For instance, in China and India the impact of labour force is slightly more significant than the impact of progress in technology on the economies of each of these countries. In contrast, in the U.S. and Germany, progress in technology has had a positive impact on their economies, more so than their respective labour forces. As explained above, India's labour force has made a more substantial contribution to its economy than the German labour force has made to the German economy. That does not mean that the Indian labour force is more skilled than its German counterpart though. Demographics and its large population have had a significant bearing on the contribution made by the Indian labour force as well as on Indian government policy. Indian policymakers have seen and taken an opportunity to exploit its massive population and the diversity of societal values to boost its economy in the long term through making the most of its human resources.

Comparing successful examples of investment in some countries allows for the making of a probable inference of the success or failure of another country. Analogical inference clarifies the differences and similarities between countries, and identifies the factors, which lead to varying investment returns in the same sectors. Moreover, analogical reasoning helps policymakers to explore the impact of unnoticeable factors and assists forecasters in forecasting the long-term impact of soft factors. The rate of analogy represents the percentage of similarity

between the target situation and selected analogies. In other words, the rate of analogy refers to the probable inference of transferring a previous experiment from one country to another. The average forecast for investment in the FDI sector was 12% of Saudi Arabia's income according to the participants' insights. They cited the experience of India as analogous, and presented India as a successful example of deciding to invest in the FDI sector. This presented India as a benchmark for successful investment in the FDI sector for other countries. On average, the participants rated the analogy between Saudi Arabia and India at 2.5/10, which means the percentage of similarity equals 25% and the percentage of variance equals 75% (see equation 3).

$$\text{Rate of Analogy} = \text{Percentage of Similarity} = \frac{\text{Saudi Arabia}}{\text{India}} = \frac{2.5}{10} = 25\%$$

$$\text{so, Percentage of Variance} = 1 - 25\% = 75\% \quad (\text{Equation 3})$$

Equation 3 illustrates significant variances between Saudi Arabia and India in many factors such as quality of workforce, education system, culture, government policy, and legislation (trading laws). Based on the participants' insights and forecasts, the long-term returns of investment in the FDI sector could contribute 12% of Saudi Arabia's budget. But, having referred to analogous situations in other countries, which empowers the participants to derive a rate of analogy, the forecast of investment returns from the FDI sector dropped to only 3% of Saudi Arabia's income (see equation 4).

$$\begin{aligned} \text{Forecasted Contribution of FDI\%} &= \text{Rate of Analogy (Expected Return)} \\ &= .25 * 12\% = 3\% \text{ of Saudi income} \quad (\text{Equation 4}) \end{aligned}$$

Equation 4 illustrates the forecasts of Saudi Arabia's ability to transfer and apply the experience of India, taking into account the current factors in Saudi Arabia, which have an impact on the determinants of economic growth and may alter participants' forecasts. The rate of analogy refers to the extent of similarities between the benchmark (analogy) and the target situation (Saudi Arabia).

Figure 1: The Expected Returns of Sectors in Saudi GDP

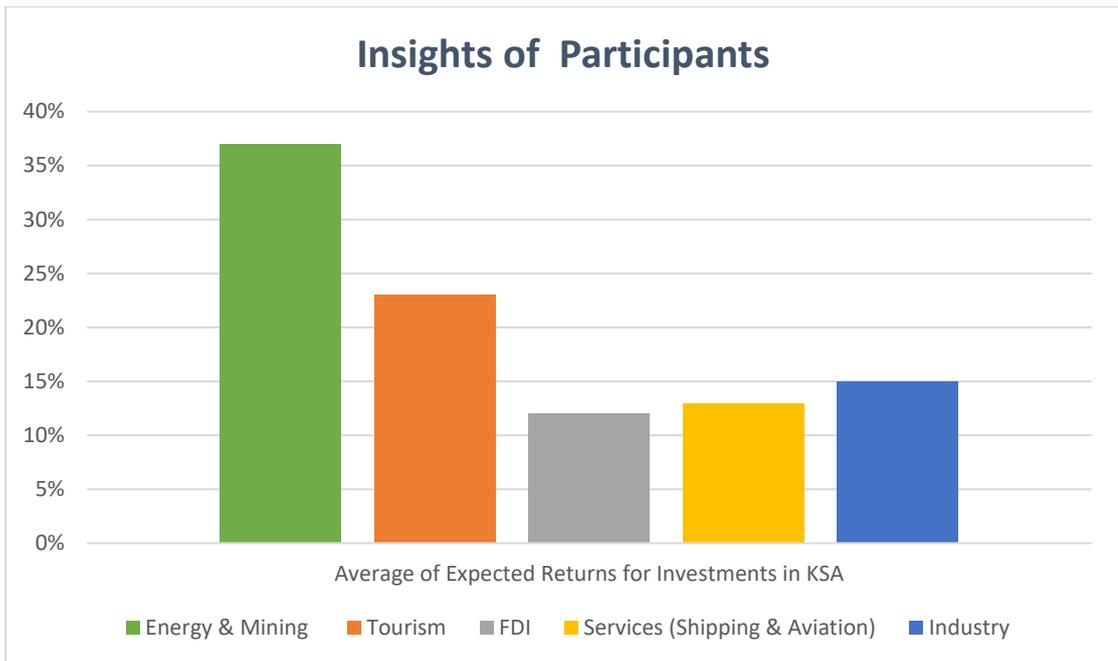


Figure 2: Comparison - Saudi Arabia and Cited Countries

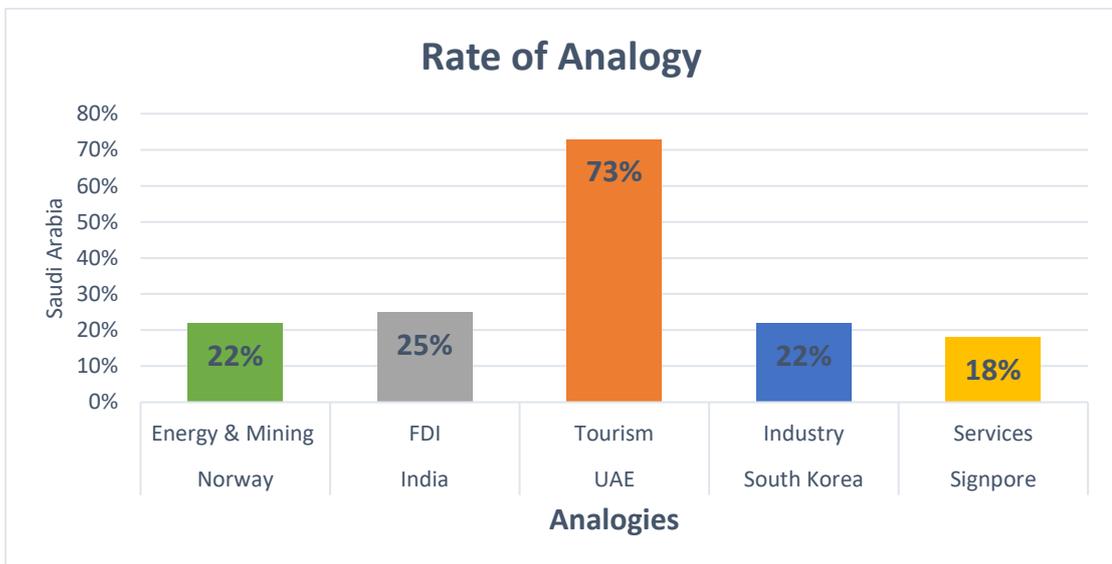


Table 16: Probable Inference of Impact of Diversification Strategy on Saudi Arabia's GDP

<i>Participants' Insights and Analogies of Investments in Saudi Arabia</i>						<i>Rate of Success</i>
<i>Sectors</i>	<i>Sub-sectors</i>	<i>Expected Return</i>	<i>Analogies</i>	<i>Variance</i>	<i>Rate of Analogy</i>	
<i>Public Sector</i>	Energy & Mining	37%	Norway	High	0.22	8%
<i>Private Sector</i>	FDI	12%	India	High	0.25	3%
	Tourism	23%	UAE	Low	0.73	17%
	Industry	15%	South Korea	High	0.22	3%
	Services (Shipping & Aviation)	13%	Singapore	High	0.18	2%
<i>Total</i>		<i>100%</i>	<i>Long-Term Forecast of Investments</i>			<i>34%</i>

### *1.6 Findings:*

Table 17 illustrates the main findings of this study, whereby the participants' insights about the financial contributions of the selected sectors on Saudi Arabia's income and the rates of analogy between analogous situations and Saudi Arabia are the inferences used to forecast the impact of applying a diversification strategy on the long-term GDP growth of Saudi Arabia.. The results in Table 17 suggest Saudi Arabia would be unable to adopt a diversification strategy, as most of the outcomes indicate the low impact of this strategy on the long-term growth of Saudi Arabia's GDP. Saudi Arabia is not suitably prepared to adopt this strategy due to the negative role of soft factors such as political, social and technological factors, which can otherwise positively affect economic outcomes in the long term. The absence of clear strategies and policies in the long term is the main intangible factor, which can have a negative impact on the determinants of economic growth in Saudi Arabia. The management of public finance is one of several negative factors in Saudi Arabia, the effects of which are revealed in the long

term. Specifically, frequent changes in the management of public finance causes a dysfunctional public-private partnership. In addition, the oil production strategy in Saudi Arabia represents another negative factor, where frequent changes in the production rate can cause financial and economic instability in the long term. The negative impacts of inefficiency in allocating resources (financial and non-financial) grow with the passing of time, and this poses a dilemma due to the inability to forecast the impacts and outcomes of such a strategy.

Currently, the long-term impact of a diversification strategy on Saudi Arabia's GDP would be limited. Specifically, the long-term forecasts indicate a low impact because of weaknesses in the determinants of economic growth in Saudi Arabia. The likelihood, in percentage terms, of this strategy succeeding in Saudi Arabia is 34% based on the interaction groups with structured analogies method (see Table 17). Saudi Arabia is unable to invest in different sectors due to poor administration in terms of allocating resources, which are vital determinants of economic growth and have a long-term impact on GDP growth.

### *1.7 Recommendations for Boosting Objectivity in Judgmental Forecasts:*

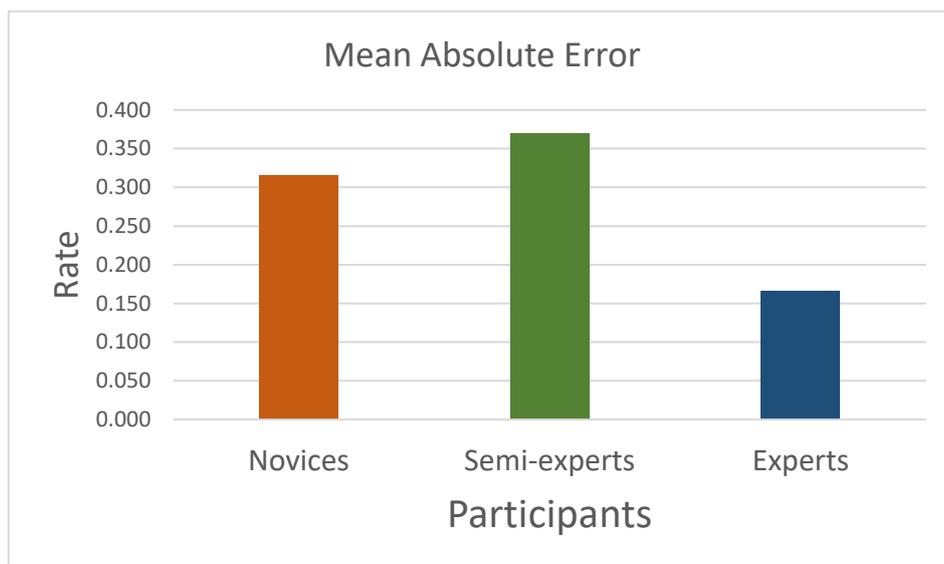
The structured analogy method is key to discovering the impact of soft factors in the long term. Deriving long-term forecasts of financial and economic outcomes based on past observations and ignoring the impact of soft factors can reduce the accuracy of forecasts in the long term. Judgmental forecasts are a sensitive process due to a strong correlation between human behaviour and the forecasts. Furthermore, there is no fixed procedure that can be used to estimate the accuracy of subjective forecasts. Theoretically, judgmental methods seem simpler than the econometrics methods; in practice, judgmental methods are more difficult than econometrics methods in terms of the ability to control the process of forecasting. For instance, the response rate for the targeted sample cannot be controlled. When using the interaction groups with structured analogies method, a high response rate from participants provides more insights and analogies, which might enhance the accuracy of forecasts. In addition, sometimes a lack of motivation for participants in the forecasting process presents a barrier to producing accurate forecasts. If participants do not consider their forecasts to be of value to them, they will apply less effort. On the contrary, when it is clear that the forecasts will be relevant to the participants' futures, they unconsciously fall into the trap of allowing their feelings such as optimism and pessimism to influence their forecasts. It is human nature to prefer to hear about the brighter side of the future, which stimulates a feeling of optimism. At the same time, sometimes the fear of future risks dominates the human mind. Moreover, selecting a sample of

forecasters from one particular cluster can affect the accuracy of the forecasts. Table 18 illustrates the mean absolute error (MAE) for the three groups of participants. Based on the participants' forecasts for a real case in the past used here as a mock case, the MAE for the undergraduate students (novices) and the MBA students (semi-experts) is convergent, at 0.316 for novices and 0.370 for semi-experts. Meanwhile, the experts demonstrated greater ability to derive accurate forecasts, as the MAE for experts was 0.167. Overall, this means that experts, among the three groups used in the interaction groups, are more likely to produce a more accurate forecast of the future.

Table 17: Estimating Participant Ability to Derive Accurate Forecasts

<i>Participants</i>	<i>Novices</i>	<i>Semi-experts</i>	<i>Experts</i>
<i>Mean Absolute Error (MAE)</i>	0.316	0.370	0.167

Figure 3: Rate of Participants' Errors



Increasing the accuracy of forecasts through judgmental methods is correlated with the level of control in the forecasting process, the extent to which biased sources are combated and the type of participants involved. When using structured analogies and interaction groups to derive forecasts in the long term, the majority of participants should be experts. Experts are the most eligible group for interaction groups with structured analogies due to their ability to derive accurate forecasts. In addition, the amount of information given to the experts helps them to derive accurate insights and to support their insights through recalling analogous situations. Moreover, this helps them to use analogical reasoning to derive a rate of analogy accurately

between the analogous situation and the target situation. The accuracy of forecasts for Saudi Arabia's case is estimated through using analogical reasoning with regard to the participants' capabilities. Table 19 illustrates the impact of the participation rate of each group (novices, semi-experts, and experts) on the accuracy of forecasts, as well as the accuracy of the forecasts of the low impact a diversification strategy would have on Saudi Arabia's GDP in the long term. The MAE of the forecasts is 0.327. Diminishing deviation in the forecasts' accuracy is correlated with increasing expert participation and reducing the participation of the other groups. The ability of semi-experts to derive accurate forecasts is the worst not because of a lack of knowledge and experience, but their size of participation. The ratio of semi-experts represents 66.4% of the sample; in turn, the novices' ratio represents 17.3% of the sample. The majority of participants should have a high level of knowledge and experience to assess the target situation in an objective manner and to generate accurate forecasts when the target situation is related to economic science. The long-term economic forecasts are influenced by hard and soft factors, although the impact of soft factors surpasses the impact of hard factors. Understanding and identifying the impact of soft factors requires a high level of knowledge and experience, as the impact of soft factors cannot be easily observed. When using econometrics methods, forecasters tend to exclude outliers and focus on the influential variables to minimise percentage errors. When using structured analogies, forecasters who have abundant knowledge and experience can see the prospective impacts of soft factors through finding the variances between the analogous situations supporting their forecasts and the target situation. In addition, through using interacting groups, experts can exclude radical forecasts and focus on common forecasts to minimise errors.

Table 18: Accuracy of Forecasts of the Low Impact of Diversification Strategy on Saudi Arabia's GDP in the Long Term

<i>Participants</i>	<i>Number of Participants</i>	<i>Mean Absolute Error for each Group</i>	<i>Weight</i>	<i>MAE</i>
<i>Novices</i>	19	0.316	17.3%	0.055
<i>Semi-experts</i>	73	0.370	66.4%	0.245
<i>Experts</i>	18	0.167	16.4%	0.027
<b>Total</b>	110	0.852	100.0%	0.327

Finally, the criteria that, if met, can boost the accuracy of long-term forecasts when using structured analogies and interaction groups are as follows:

- Motivation of participants.  
The participants should feel part of the outcomes being forecast.
- More participants.  
More participants can generate more insights and more brainstorming.
- More analogies.  
More analogies can lead to the discovery of more factors, which have an impact on the long-term forecasts.
- More time.  
Time should be sufficient for the participants to think broadly about insights and to recall more analogies.
- Relying on experts' forecasts.  
The majority of participants should be experts.
- Clear target situation and requirements.  
Descriptions of the target situation and the requirements for the participants should be clear and straightforward.
- In the first stage, insignificant information about the real case should be hidden.  
This helps to minimise the impact of human behaviours (such as bias), and to focus on the main issue. Moreover, a main reason for mentioning analogous situations is to support the participants' insights and their forecasts.
- In the second stage, reveal the full information of the real case.
- Use analogical reasoning and derive the rates of analogy. Then, adjust the forecasts based on the prospective impacts of soft factors.
- Dealing with participants' forecasts equally.  
This avoids cognitive bias.
- Analysing the participants' forecasts based on analogical reasoning and rates of analogy.  
This helps to derive forecasts in an objective manner.

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## Appendix

Experiments of Structured Judgmental Methods:

### A. *Disguised Data:*

#### *Case Description:*

Oil was discovered in X country in 1938, and the oil sector has been considered the main source of national wealth in X country, thus X country's GDP depends heavily on oil exports as a major income. In the 1970s, there were several factors, which encouraged X country to keep this policy and to control the global oil market with price manipulation. For instance, industrial revolutions in the US and Europe is one such exogenous factors, where demand increased for energy resources. Furthermore, the huge reserves of oil fields in X country is one endogenous factor, which encourages the continuation of this strategy. The risks associated with this policy started to show on the surface due to a difficulty in controlling oil prices because of several reasons. The supply and demand shocks caused oil price volatility. In turn, escalating concerns about serious environmental issues, such as climate change, global warming, and CO2 emissions lead to a decrease in demand. X country's strategy still relies on oil exports, even though developed countries have invested in innovation technology and exploited renewable energy resources efficiently in order to reduce the usage of non-clean

energy. Nowadays, X country's economy faces real threats and many challenges due to narrow-minded strategies and a general lack of considerations made to the current global initiative toward the adoption of a sustainable and eco-friendly system. X country policymakers aim to expand the investments circle through adopting diversification strategy. Where X country is classified from the resources rich countries in the world.

*Questions:*

- 1) What are the best five sectors for investing in the future and why?
- 2) What are the best analogous situations in some countries to your insights for investing in some sectors and why? Please recall analogous situation for each selected sector.

*B. Real Case.*

X country is Saudi Arabia.

*Questions:*

- 1) What are the expected returns of investments in the five selected sectors on Saudi GDP?
- 2) Compare the cited countries, which have been recalled to support your insights and Saudi Arabia, then derive rate of analogy?

*C. Estimating Accuracy:*

*1. Case Description:*

Nations sometimes renew demands for sovereignty in different parts of the world. They look to independence due to many factors, such as historical backgrounds, control of national resources and concerns about preserving their identity. These are legitimate rights for nations to decide their own destiny. On the other hand, states seek to centralize power in many political and economic aspects. There are many instances, which represent proper examples of this in the twenty-first century.

In Europe, there is the European Union (EU) – a pioneering political-economic union of 28 states. In the Middle East, there is the Gulf Cooperation Council (GCC), which consists of 6 politically and economically allied countries. In North America, the North American Free Trade Agreement has created a free market between the US, Canada and Mexico. The variance in the positions between integration and independence is clear. For instance, Country X is

considered one of the most advanced economic centres in the world in terms of industry, education and human rights. Country X is composed of different nations and territories (nations A, nations B, nations C, etc.) that form a union. A portion of nations B’s parliamentary representatives are promoting breaking this union and seceding from Country X – they aim to get full independence. One of the motivations behind this demand is their desire to control their own national wealth and resources, such as oil fields. The government of nations B decided to organize a referendum for to determine the majority position whether it means staying within the union of Country X or to secede.

*Questions:*

- 1) Forecast the decision of the majority, whether it is staying within Country X or separating, and the country name.
- 2) Briefly justify your forecast in a couple of sentences with mentioning analogous situation.

*Techniques & Tools:*

A. Disguised Data:

Phases	1	2	3
Judgmental Methods	Unaided Judgment (UJ)	Structured Analogies (SA)	Interaction Group & Structured Analogies (IG&SA)
Country Name	Hidden	Hidden	Hidden
Participation Type	Individually	Individually	Groups
Participants	Novice, Semi experts and Experts ( Underage students, MBAs and Fieldwork)		
Sample Size (n)	110 participants Novice(19), Semi experts(73) and Experts(18)		
Domain Knowledge	Business		



Analogies	Similarities & Differences	Rating	Outcome
		/10	