Consilience: The Journal of Sustainable Development
Vol. 17, Iss. 1 (2017), Pp. 162–181

Sustaining Investment in Innovation in Oil Rich Gulf Countries Amidst Falling Oil Prices

"The jar of meal will not be emptied and the jug of oil will not fail"
(*The Prophet's Psalm*)

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Abstract

Oil rich Gulf Countries have identified all forms of sustainability as key drivers of innovation. Therefore innovating for sustainability is critical for an economy's political legitimacy, socio-economic reputation, and ecological performance. Sustaining investment in innovation requires an understanding of returns or payoffs accruing to an investment in innovation. Sustainable development is fraught with challenges particularly when an economy's growth is linked to a single resource. Research and development together with productivity growth rates have become innovation indicators and continue to raise questions about their interpretation and implication. In resource-laden rich countries the challenge is further exacerbated by inflows accruing from benevolent government subsidies. This empirical study reviews the variables for policy formulation associated with innovation in the six resource-rich oil countries of the Gulf and considers its determinants. Negative relationships between resource abundance and poor economic performance have often been empirically established, providing support for the "resource curse" hypothesis. The culture of governance, norms and values that pervade oil-rich countries become key determinants of their economic success. The primary purpose of this study is to determine the factors associated with sustainable innovation in the Gulf and to address the concerns related to the governance of resources that necessitate further innovation.

Keywords: innovation, resource curse, Gulf countries, investment in innovation

Introduction

The oil-rich Gulf countries share a common vision for economic development. Their national development plans highlight the need to innovate and to reduce dependence on the hydrocarbon sector. The creation of more decent and productive employment opportunities for their young and growing population is a milestone towards independence and self-reliance and an important step in completing the youth's transition to adulthood. An extensive and exhaustive literature survey on innovation and its economically complex relation to diversification, modernization, industrialization and poverty reduction consistently conveys the phenomenology of innovation is ubiquitous. This finding aligns with the Organization for Economic Co-operation and Development (OECD) suggestion that innovation goes far beyond the confines of research laboratories, to users, suppliers and consumers everywhere, in government, business and non-profit organizations, across borders, across sectors, and across institutions. Innovation has long been argued to be the engine of growth and the need to innovate has been identified by many notable authors, including Auty and Mikesell (1998), Freeman (1982), Porter (1990), Lundvall (1992) and Nelson (1993). Moreover, these authors have linked innovation to economic growth models. The support and encouragement for innovation varies among stakeholders. Innovation raises competition, presents lower pricing structures, and accords job creation opportunities. More importantly, innovation returns wealth for individuals, corporations and nations. Innovating for sustainability could assume a fundamental and radical change that accrues social and environmental benefits as well as economic value. Sustaining an investment in innovation within this context would include an examination of economic, political, social and environmental concerns in corporate operations and their interactions with stakeholders (Van Marrewijk, 2003). Ultimately, innovation is stimulated when innovators receive the resulting payoffs.

A scientist's view of innovation payoffs may very well be very different from that of an accountant or even that of the corporate social responsibility department in the same organisation. Accounting for an investment in innovation is problematic, in part because a single metric that reflects a return on this investment has not been identified. Consequently, there has been a paucity of research in this regard. Studies by Auty and Mikesell (1998) on sustainable development in mineral-rich economies merely focus on the accruing benefits of innovation. Lundvall (1992) and Nelson (1993) link innovation to competitive economic outcomes and their results have been widely adopted in the formulation of policy. However, the necessary preconditions in formulating and determining curse

reductive measure for oil rich countries remains unexplored, particularly in oil rich Gulf countries. This view is also consistent with that of Van der Panne and Van Beers (2006) who ask: "What favors regional innovation?" Economies are inextricably linked to the type of governance and political policies that states have endured over time, with Collier and Hoeffler (2000) eloquently addressing these issues in terms of greed and governance. Wilson (2011:5) in his seminal work, "Is it possible to build sustainable innovation capacity in oil rich Gulf Countries?", presents a pessimistic picture and suggests that there is very little scope currently for Gulf States to become more internationally competitive with respect to innovation and knowledge fundamentals. To varying degrees, each Gulf State is embarking upon an economic diversification strategy to move their respective economies away from hydrocarbon dependence. However, each Gulf State is severely constrained in key areas, such as educational achievement, innovation, economic incentive regime, and lack of coherent science, technology and innovation policy. Wilson (2011) goes on to add that the successful implementation of innovation in the Gulf countries requires due consideration.

Any contribution to innovation as a resource curse reduction mechanism must be interdisciplinary, taking into consideration the politics of the region, socio-economic issues, history, and the nature of business conducted by of the private and the public sector. Failure to address the issues from an interdisciplinary perspective may result in stakeholders being antagonized and the consequences could be disastrous. Furthermore, an interdisciplinary approach better addresses the complexity of Gulf countries' resource curse with their concomitant plurality of causes and effects. A range of perspectives should ideally be considered providing a more comprehensive understanding of issues and challenges. The thought that innovation is vital for socio-economic growth and human development was long recognized by Adam Smith and even Karl Marx. As long as the global socio-economic and political environments are in a state of dynamic change, these have a major impact on economies. Economies are in different stages of economic growth. According to the World Economic Forum's (2013-2014) key performance indicators for global competitiveness, Gulf Countries have achieved a status of high mass consumption and at the same time, have faltered in terms of innovation. Therefore sustaining an investment in innovation is crucial.

Over the years, Gulf countries have established certain traditions in order to maintain and sustain social, political, and economic cohesiveness. An understanding of these traditions is imperative for corporations that are domiciled within the Gulf. Equating the changes that are taking place in the external environment with these traditions should go a long way in ensuring that innovation is not a curse. Success for any corporation within the Gulf comes from adopting appropriate changes that reflect the

culture of the region. Any change that is effectively and consistently managed within cultural parameters, presents the corporation with opportunities for sustained growth and ultimately human and social development. The capability to innovate is not only critical to an organization's viability but also the country as a whole to improve its current competitive position. Acknowledging that innovation in any organization requires a thorough understanding of an economy's social fabric, geographical environment and political economy, an examination of the potential resultant changes accruing to an economy needs to be considered within a curse-blessing context. A haphazard approach in using innovation as a curse reduction tool may have disastrous consequences.

Revisiting Innovation and Positioning It Within Context

Sustainability of people, profit and planet is the *sine qua non* of organizational and technological innovations. Corporations are therefore becoming aware of the social and environmental pressures that confront them. The literature findings suggest that these new demands offer phenomenal opportunities and within this context innovation becomes the primary means by which organizations achieve sustainable growth. In reality corporations are fraught with issues around innovation and sustainable development pressures. Designing strategies that integrate the goals of innovation and sustainable development should ideally accommodate these complexities and uncertainties.

Although Bakken (2002) identifies innovation as a fuzzy concept that evokes sharp political reactions, Schumpeter's (1934) more dominant ideas posit that radical innovations shape big changes in the world and incremental innovations fill in the process of change continuously. The term innovation certainly covers a vast range of ideas and policies relating to change. Star (1988:1) considers innovation as going far beyond research and development. Governments, private businesses, non-profit organizations and other institutions are beneficiaries of innovation. The Oslo Manual of 2005, the foremost international guide for the collection and use of data on innovation activities across the OECD countries, contends that the ability to determine the extent of innovation initiatives and the characteristics of innovators are prerequisites for the pursuit and analysis of policies aimed at fostering innovation. The Manual investigates the field of non-technological innovation and the linkages between different innovation types. Furthermore, it includes an annexure on the implementation of innovation surveys in developing countries. Innovation is at the heart of economic change. Schumpeter (1942) proposed a list of various types of innovations, including: the introduction of a new product or a qualitative change

in an existing product; process innovation new to an industry; the opening of a new market; development of new sources of supply for raw materials or other inputs; and changes in industrial organization. The first issue, **product innovation**, involves a good or service that is new or significantly improved. This may include significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics. P**rocess innovation** refers to new or significantly improved production or delivery methods. Marketing innovation, the third form of innovation includes significant changes in product design or packaging, product placement, product promotion or pricing. Finally, **organisational innovation** relates to a new organisational method in business practices, workplace organisation or external relations.

Firms care about their ability to innovate, on which their future allegedly depends (Christensen and Raynor, 2003). Indeed, many management consultants are busy informing companies about how they can help them improve their innovation performance. Designing policies that stimulate innovation has become a major issue for politicians at various levels of government. The European Commission has made innovation policy a central element in its attempt to invigorate the European economy. A large body of knowledge has emerged, particularly in recent years, on various aspect of innovation and many new research units focusing on innovation have been formed (Fagerberg and Verspagen, 2009).

There is a distinction between an innovation and a product. Product is an output of innovation. This is consistent with what Drucker (1992:38) posits: "In a knowledge economy knowledge is a product, in a knowledge-based economy, knowledge is a tool". A brief analysis of economic history, especially in the United Kingdom, will show that industrial technological innovation has led to substantial economic benefits for the innovating *company* and the innovating *country*. The industrial revolution of the nineteenth century was fuelled by technological innovations. Nineteenth-century economic historians observed that the acceleration in economic growth was the result of technological progress. However, little effort was directed towards understanding *how* changes in technology contributed to this growth. Schumpeter (1934, 1939, 1942) was among the first economists to emphasise the importance of *new products* as stimuli to economic growth. He argued that the competition posed by new products was far more important than marginal changes in the *prices* of existing products.

This macro view of innovation as cyclical can be traced back to the mid-nineteenth century. It was Marx who first suggested that innovations could be associated with waves of economic growth. Since then others such as Schumpeter (1934, 1939), Kondratieff (1935, 1951), and Abernathy and Utterback (1978) have argued the long-wave theory of innovation. Marx suggested that capitalist

economies would eventually decline, whereas Kondratieff argued that they would experience waves of growth and decline. Abernathy and Utterback (1978) contended that at the birth of any industrial sector there is radical product innovation that is then followed by radical innovation in production processes, followed, in turn, by widespread incremental innovation. This view was once popular and seemed to reflect the life cycles of many industries. It has, however, failed to offer any understanding of *how* to achieve innovative success.

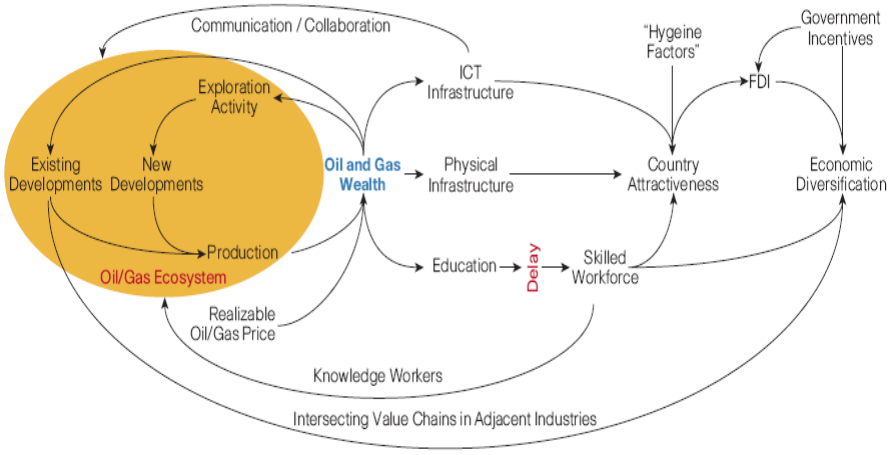
The characteristics of innovation suggest that innovation is the result of numerous interactions between key organizations and groups in the economy including universities, government, firms and other institutions, which together form an innovation system (Wilson, 2010). Wilson (2010) goes on to add that innovation does not take place within a vacuum and that there is an interaction between numerous stakeholders. A national innovation system consists of flows and relations which exist among industry, government and educational institutions in the development of science and technology. An investment in market-driven innovation and sustainable development innovation should ideally consider the exogenous future generation's economic, social and environmental pressures.

Diffusion of Innovation—Impact on Sustainable Development

Innovation is a solution to sustain competitive initiatives. Effective programs of innovation in the economy involve many elements, both macro and micro in character. These programs include the introduction of new goods and new methods of production, the opening of new markets and the sourcing of new material, as well as managing and restructuring enterprises, establishing an appropriate business environment, building financial intermediaries and promoting competitive market conditions. Innovation is affecting the technology of production and the organization of firms as well as triggering social and cultural changes. The accompanying Figure 1 shows the diffusion of innovation in terms of a wider definition that encompasses: the improvement of social relations, the fostering of economic growth, financial development and independence; reducing political, social and financial volatility; fostering employment growth; fostering sustainable environment; restructuring social security; re-focus on food security, ensuring fiscal discipline; and re-energizing trade agreements. An investment in all forms of governance of innovation plays a pivotal role in the pursuit of country attractiveness. Oil and gas-based economies have an opportunity to use the wealth derived from mineral assets to create societies capable of sustaining growth and diversity, with infrastructure and education taking priority, as

illustrated in Figure 1. Infrastructure will provide the platform for linkages across the oil and gas community, fostering creativity and innovation. Education will help to create an environment where innovation can take place, and will also provide the labor pool so desperately needed by an industry whose specialized knowledge and talent are currently dwindling.

Figure 1
Diffusion of Innovation – A Broadened View



Source: The Natural Wealth of Nations: Transformation of Oil and Gas Producing Economies, Cisco Internet Business Solutions Group (IBSG) (Wood, 2007, p.5)

Connected cities become part of the innovation network, providing access to data and enabling collaboration and cooperation among communities, companies, institutions, and government. When the workforce becomes connected, even while mobile or in remote locations, and manufacturing and production are tightly tied to business analysis and decision-making, the benefits become tangible and quantifiable.

Country attractiveness is also a major issue in the diffusion of innovation. An identification of the key drivers of country attractiveness could ideally include a country's economic growth and entrepreneurial potential; liberal conduct of financial institution; tax regime for business entry and exit; legal structures that protect property rights; the human and social environment of the country and the prevalence of an entrepreneurial culture.

Innovation Resource Curse Hypothesis and Blessings

It is widely acknowledged that revenues resulting from natural resources should generate wealth for an economy, promote economic progress, and increase the wellbeing of each citizen. A large windfall of revenues accumulating from an abundance of natural resources should place that economy in pole position when compared to others. Whether resource-rich countries have experienced better performance (in terms of economic progress and

poverty reduction) than countries without such apparent "benefits" is an important issue. However, this paper concentrates on understanding innovation as a strategy that converts the blessings into a common good for all. Much of this conversion process relies upon configuring governance structures that make innovation possible. The "Resource Curse" phenomenon is not an immutable law, but studies consider it a strong recurrent tendency.

In their seminal work, Berkhout et al. (2006) identify the changes that are taking place in the so-called *innovation economy*. Besides capital, labor and knowledge, creativity is identified as the fourth principal factor of production. The authors go on to describe the activities in an innovation economy as creative enterprise with knowledge. Creativity is an important aspect of human endeavor, particularly in distressing economic times. The assumption of the study is that together with creativity, innovation creates added value. This may be central to converting curse effects into blessings. Innovation is an imperative for the survival of economies endowed with natural resources and it is a solution to their political, social and economic woes. For much of the contemporary period the economic system of the GCC Countries entailed the provision of free housing and other welfare services to their nationals. Security from public sector employment is a privilege that is also accorded. This has created a dependence syndrome resulting in a "financial duty" and the state's obligation to fulfill this dependence syndrome. Government benevolence in the form of generous subsidies is becoming untenable as a result of the increasing population and the fact that fiscal revenues remain limited to the revenues generated by oil. In this regard, the Arab Planning Institute suggests that the continued welfare system will become unsustainable. Oil price fluctuations make government revenues unstable and therefore innovative ideas in dealing with the rulers' benevolence need to be considered. Policy makers must consider a different effective economic mechanism for achieving greater efficiency, strengthening the role of the private sector, improving the public sector financial health, and freeing up resources for allocation to other important areas of government.

Generally gifts of nature are defined as natural resources. These range from *inter* alia, mineral deposits, water, arable land and vegetation, to natural forests, marine resources, animal life and oil. By definition natural resources are in fixed supply and are therefore inelastic In the case of oil, most oil reserves lie in developing economies where governance mechanisms tend to be weak. This predicates a high prevalence of the resource curse syndrome. The "paradox of plenty" relates to any country that is richly endowed in natural resources and at the same time presents itself with numerous conflicts. These conflicts could range from social and political disorders to economic woes of the majority of citizens. As a result, an abundance of natural resources presents curse effects and encourages

conflict. Nevertheless there are studies (Ross, 2003) that suggest oil-producing developing countries that have very high levels of oil revenue are remarkably stable. An analysis of the ways in which governments spend oil revenues gives an indication of the extent of the paradox.

Auty (1998:9) reflects the view of numerous authors arguing that resource-rich and developing countries have not performed as well as countries that are resource deficient. At the Fourteenth World Congress of the International Economic Association in Morocco (Marrakech) held in 2005, Nabli and Silva-Jauregui analyzed in the MENA (Middle East and North Africa) region. They argue that there is no question that democracy has lagged behind in the MENA region; a persistent democracy gap persists. Contrary to what is observed in the rest of the world, there is no correlation in the MENA region between the level of income and progress in democracy. The rich oil exporting countries in particular have among the lowest democracy scores. Per capita income growth in the MENA region has also been low, though not as low as Sub-Saharan Africa. However, the general literature on the link between democracy and growth is not very conclusive and many of its results are either fragile or conditional. While there has been little democratic progress in MENA countries there has been progress in human development, particularly in education and health. They discuss a battery of governance indicators and conditions for good governance under democracy. Fragmented countries like Iraq, Lebanon and Syria have worse initial conditions for good governance. Oil producing countries usually have worse governance indicators. The authors are skeptical that good governance may come out of non-democratic regimes. On the other hand, obstacles to reform are numerous and political economy factors would tend to favor the status quo. This supports the idea that a resource-rich environment has an adverse effect on GDP growth. While this inverse correlation between growth and resource abundance has received widespread acceptance, recent research from Gupta (2007) and Karnick and Fernandes (2009) suggests a positive association between growth and resource abundance. However, the strong inverse relationships in the findings of Sachs and Warner (2001) and Auty (2001) are the basis for the principal premise of the resource curse hypothesis.

Models could be generated to determine whether countries are better or worse off with smaller or larger endowments of natural resources (and whether any econometric associations are subject to bias). However, the character of the resources themselves is more important to consider than the underlying reasons for any association. Should countries fail to build upon their resource base productively and exert caution in its use, the result would be a failure in development that can be attributable to a country's overt dependence on resources. Moreover, Cowen points out:

> ... it is unfortunate that economists have to debate whether natural resources are a blessing or a curse for a developing nation. Minerals, diamonds or oil may appear to represent automatic wealth but resource-rich countries usually become mired in corruption. High oil revenues, for instance, allow a government to maintain power and reward political supporters without doing much for its people. (Cowen 2007)

Yet Wright and Czelusta's (2002) findings suggest that some nations with large extractive industries – like Malaysia, Botswana and Chile – have overcome the resource curse and introduced sound development strategies that address poverty alleviation. Norway has also been cited as a country that has surmounted "the curse", along with Indonesia (prior to 1997), Australia and Canada. Auty (1998:46) questions if these exceptions exist, can it be true that "the problems of mineral economies are inherent to the production function of mining?"

When one considers and addresses how a development strategy exploits a country's abundance of resources, the argument is often reduced to a discussion of politics. Arguably countries whose political and social institutions and structures have not succeeded in supporting sustained development tend to be those who suffer from civil discontent, corruption and conflict. One can well imagine that in an environment of fragile institutions and factional politics, resource abundance may be a mixed blessing. The problem, however, lies not with the resources themselves, but in how the resources are managed. Whilst there may be strong evidence of the resource curse syndrome, there do remain compelling examples of economies that have converted the curse into a blessing. The resource curse appears in different ways and can manifest as political conflicts, social anomalies, or economic iniquities that stem from wealth based on natural resources. The poor governance of natural resource could be the major cause of conflicts.

The Characteristic of Investment Decisions in Oil Rich States

Effective investment decisions in oil-rich countries may be hampered by mismanagement. While irresponsible management may be attributable to poor governance structures, investment decisions can, at times, strongly support the growth and development of an unproductive economic base. Sarraf and Jiwanji, (2001) have outlined that poor investment decisions are evident in many countries. Poor investment decisions include greater investment in non-tradable sectors (e.g. military, prestige projects). Large oil revenues allow governments the luxury to borrow on the strength of these revenues, but this can also militate against sound decision-making.

A government policy for industrialization and innovation should be directed towards fulfilling certain goals and objectives. These may include the following:

What path should industrial development take?

How can sustained growth in productivity be maintained?

How can gainful employment, particularly for citizens, be expanded and optimal utilization of human resources achieved?

How can social and economic disparities be reduced?

How can poverty be eradicated and self-reliance attained?

How can international competitiveness be attained?

Policies of oil-rich states must ideally reflect the realization of these goals. A policy of industrialization and innovation ought to answer these concerns, and should ideally propose initiatives towards employing revenues for national reconstruction and development. Corden and Neary (1982) raised the concern that in the case of numerous resource oil-rich countries, they have generally failed to promote competitive manufacturing sectors. However many economists, including Wagenast (2007), Ross (2006) and Auty (2001), have since considered competitive manufacturing a primary source of technological progress and innovation.

When an economy adopts an industrial policy based on greater state intervention for the import substituting sector, this can help oil-rich countries break out of the cycle of underdevelopment - and develop markets that are powerful and efficient while serving the public interest.

Curse Effects – Political and Social Issues

A commonly held view, and a prevalent thread throughout the reviewed literature, appears to suggest that countries which exhibit extreme dependence on natural resources, such as oil, are always vulnerable to various forms of conflict and civil war (Ross, 2006). However, the impact of natural resources on social capital and institutional structures also needs to be addressed. Ross (2006) suggests that resource rich countries accumulate social capital at a far slower rate than poor countries. An explanation that can be advanced for this is that limited natural resources promote early industrialization which triggers earlier urbanization. People who migrate from villages into an urban environment become more enterprising, and better functioning markets develop. Savings are then repatriated into the poorer indigenous regions, thereby increasing the social capital of the region.

An abundance of natural resources not only stimulates dysfunctional economic policy choices, but can also pervert political and social behaviour, leading to conflict over the distribution (and non distribution) of wealth. Countries usually seek to avoid this by

using state machinery to bring resources within seemingly rational political control, with Auty (2001b) suggesting strong and transparent governmental involvement is needed in the production of oil. Royalty or taxation policy should guarantee income to the state from oil production. The establishment of an oil fund investment should ideally be a primary requirement to convert a curse into a blessing. Transparent and judicious involvement of the state in the oil sector strengthens one's expectations of benefits one may receive. However, at times, dissatisfaction contributes to reduced political trust in leaders and results in weaker institutional capacities.

Governments and corporations need to co-operate in reducing economic and social costs in order to deliver economic and social benefits. To this end a strong private sector must communicate its integrity in a transparent way. Corporations may seek innovative ways to increase the social and economic benefits that accrue to communities, thereby helping to raise the standards and capacity of public involvement in governance (an absence of which is often a causal mechanism behind conflicts).

Generally it is assumed that an abundance of oil revenue causes broad-based socio-economic and political problems (Ross, 2006). Other authors, including Engeli and Pieth (2000) and Wegenast (2007), blame abundance directly for motivating rebellion and allowing the finance of large-scale armed violence. Using a host of alternative measures of natural capital wealth (aggregated as renewable and non-renewable), Soysa (2002) finds that an abundance of renewable resources — not their scarcity — leads to violence and to lower economic, human and institutional development. According to Wagenast (2007), international sanctions for poor governance on all fronts are thus important in ensuring acceptable governmental performance levels in line with the expectations of the different parties.

Purpose of this Study

The primary purpose of this study is to determine the factors associated with innovation in the Gulf. Initially, this study reviewed the variables for policy formulation associated with innovation in the six resource-rich oil countries of the Gulf and considered the determinants. Since negative relationships between resource abundance and poor economic performance have often been empirically established that provide support for the "resource curse" hypothesis, the culture of governance, norms and values that pervade oil-rich countries become key determinants of their economic success. These determinants include: inefficient government bureaucracy, inadequate educated workforce, poor work ethic in the national labor force, government instability and coups, technological readiness and market efficiency. Firms' realization of technological

innovations may critically depend on the degree of these determinants. The question is: why do oil-rich Gulf countries with great potential gains from innovation fail to do so? The determinants are statistically tested and relationships are established.

Data and Methodology

Within the context of innovation, this paper considers the existence of both long-run and short-run relationships affecting sustainable economic growth in oil-rich Gulf countries. It also examines the challenges of innovation activities and political and socio-economic practices. In this regard, the model estimation and analysis rely heavily on both secondary data and various panel data techniques to establish any causal relationship between sustainable economic growth in oil-rich countries and the influencing factors and impact of innovative activities. The study uses data from six GCC countries. Three sets of data sources were used: the World Economic Forum's Global Competitive Reports over the period 2005-2014, the published financial statements of the ten top companies in each of the six GCC Countries over the period 2004-2014, and the GDP per capita data of each of the six GCC countries. Each year the World Economic Forum provides a list of at least 14 factors. Respondents are required to select the five most problematic ones for doing business and to rank them between 1 (most problematic) to 5 (least problematic). At least 12 of the most problematic factors for each country are usually reported upon. Nine common factors were originally selected as independent variables. The original regression output revealed that none of the variables were significantly related. This was the adverse effect of multicollinearity. Using backward stepwise regression, three independent variables (crime and theft, access to financing, and foreign currency regulations) were removed from the original model.

The variables and analysis employed in the study are reflected in Table 1. The model to be tested is represented by:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Table 1 summarizes the data as used in this study. *Y* the dependent variable is the growth in research and development per capita gross domestic product. Total research and development (*a*) of 10 top listed companies over nine periods in each of the six Gulf States was determined and this value was divided by the country specific per capita gross domestic product for each of the nine periods. The computation is as follows:

$$I_{i,j,t} = \frac{\sum a_{i,j,t}}{GDP_{j,t}}$$

Where *i* is the company (10 companies), *j* is the country (six Gulf Countries), *t* is the time (nine years), *a* is the investment in research and development and GDP is the GDP per capita. The growth in

research and development per capita gross GDP was the dependent variable representing the growth in innovation.

The use of research and development is the proxy data for innovation. Expressing research and development per capita gross domestic product provides the ratio of research and development to per capita GDP. A ratio of 3:1 suggests that there is an innovation investment of $3 for every $1 GDP per capita. For the purposes of this study, the change in this ratio reflecting the growth was used as the dependent variable. This measurement is consistent with the variation of the innovation index used by Areppin (2012).

Table 1 - Data Summary

DATA	SOURCE OF DATA
Y Dependent variable Growth in research and development (as a proxy for innovation) per capita gross domestic product. $I_{i,j,t} = \frac{\sum a_{i,j,t}}{GDP_{j,t}}$ Where *i* is the company (10 companies), *j* the country (6 Gulf Countries), *t* is the time (9 years), *a* is the investment in research and development and GDP is the GDP per capita.	Published company financial statements; Published country specific data; and Published World Economic Forum Global Competitive Reports.
X Independent variables x_1 Inefficient Government Bureaucracy	Published World Economic Forum Global Competitive Reports.
x_2 Inadequate educated workforce	
x_3 Poor work ethic in national labor force	
x_4 Government instability/coups	
x_5 Technological readiness ("unreadiness")	
x_6 Market Efficiency	

Results

Table 2 represents the findings of the study. The coefficient of determination (R^2) is 0.54050292 suggesting that 54% of variation in the growth in investment in innovation per capita GDP is explained by the six independent variables. The model's fit is moderately good as reflected by the adjusted R^2 of 0.48184. The large *F* value resulting in *p* = almost zero further indicates that a significant proportion of the variations in a growth in investment in innovation per capita GDP is explained by the regression equation. The regression model is therefore estimated by:

$\hat{Y}$ = 31.059897 – 2.5898 X_1 – 0.325959 X_2 + 3.4097865 X_3 + 0.144290324 X_4 – 2.91189571 X_5 + 1.227428713 X_6

The statistical findings are further summarized in Table 3. The findings suggest that inefficient government bureaucracies together with technological readiness ("unreadiness") of the country are major stumbling blocks to a growth in innovation in the Gulf. Bureaucracy exists both in private and public sectors. However, the notorious inefficiencies of public sector bureaucracy are a concerning factor against innovation. The question arises whether governments in Gulf States can reinvent themselves as innovative forces?

Table 2 -Statistical Findings of the Study

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	31.05989814	10.14747644	3.060849	0.003642
X_1	-2.58946806	0.392480409	-6.5977	3.34E-08
X_2	-0.32595931	0.332847004	-0.97931	0.332443
X_3	3.409786544	0.769662277	4.430237	5.6E-05
X_4	0.144290324	0.931403317	0.154917	0.87755
X_5	-2.91189571	1.312349405	-2.21884	0.031363
X_6	1.227428713	0.467853618	2.623532	0.011698

In a several Gulf States some progress has been made to address government bureaucracy. That said, Gulf States continue to remain a highly paper driven society with archaic practices and have yet to incorporate modern bureaucracy into their political systems. Gulf States with vast resources and oil wealth continue to have problems in properly administering benefits in a way that is fair and beneficial to their citizens. Recurring themes can be readily be identified in the literature on bureaucracy relating to corruption, nepotism, and incompetence.

Table 3 - Interpretation and Summary of the Findings

INDEPENDENT VARIABLES	*p value*	
x_1 Inefficient Government Bureaucracy β_1 = -2.58946806 Inefficient government bureaucracy has a negative impact on the growth in an investment in innovation.	3.34E-08	**Statistically significant.** There is adequate evidence to infer that inefficient government bureaucracy and a growth in investment in innovation per GDP capita are linearly related.
x_2 Inadequate educated workforce β_2 = -0.32595931	0.332443	**Not statistically significant.** There is not enough evidence to infer the existence of a linear relationship between inadequate educated workforce and a growth investment in innovation per GDP capita are linearly related.
x_3 Poor work ethic in national labor force β_3 = 3.409786544	5.6E-05	**Statistically significant.** There is adequate evidence to infer that poor work ethic in national labor force and an investment in innovation per GDP capita are linearly related.
x_4 Government instability/coups β_4 = 0.144290324	0.87755	**Not statistically significant.** There is not enough evidence to infer the existence of a linear relationship between Government instability/coups and an investment in innovation per GDP capita are linearly related.
x_5 Technological readiness ("unreadiness") β_5 = -2.91189571	0.031363	**Statistically significant.** There is adequate evidence to infer that technological readiness ("unreadiness") and an investment in innovation per GDP capita are linearly related.
x_6 Market Efficiency β_6 = 1.227428713	0.011698	**Statistically significant.** There is adequate evidence to infer that market efficiency and an investment in innovation per GDP capita are linearly related.

Bureaucratic institutions that adhere to strict rules, regulations and habitual ways of doing things, are devoid of innovation prerequisites, which include *inter alia* creative thinking, inventiveness and idea experimentation. There is adequate evidence to infer that technological readiness ("unreadiness") and an investment in innovation per GDP capita are linearly related. The more ready an economy is, the greater is the propensity for an investment in innovation. In the information age, the gap between the ready and

the "unready" Gulf economies is decreasing but not at an alarmingly increasing rate. Technology ready economies tend to have a higher innovation per GDP capita. The promotion of readiness is to ensure that the stakeholders are prepared to participate in the information age networked-world.

There is adequate evidence to infer that poor work ethic in national labor force and an investment in innovation per GDP capita are linearly related. Work among the national labor force is viewed as an obligation and not as a privilege. Despite the image of the national labor force being inefficient and ineffective, successful innovations have flowed into the Gulf economies.

Finally, there is adequate evidence to infer that market efficiency and an investment in innovation per GDP capita are linearly related. Efficient markets promote investment in innovation.

Conclusion

Among the most critical issues in recent innovation literature is the lack of data adequate for the analysis of innovation and for policy-making. This would provide a suitable measurement framework to capture the substantial innovation activity within economies. An expansion of the innovation concept beyond technological product and process innovation and a more complete treatment of linkages and knowledge flows, provides greater coverage of innovation. However, while these changes are a significant step forward in innovation measurement, there are a number of areas in which a metric can be improved further: inter alia government bureaucracy and stability, workforce issues, technological readiness, and market efficiency. Since negative relationships between resource abundance and poor economic performance are well established, leading to stylized "resource curse" hypothesis, the culture of governance, norms and values that pervade oil-rich countries become key determinants of innovation.

Embracing an all-encompassing concept of innovation, this paper established that innovation is a political and socio-economic issue that sustains an economy and improves productivity. The implementation of innovation becomes a critical component within this definition, particularly in getting economies into e-readiness. In ultra-conservative societies the inertia for change comes from certain policy initiatives created by the government. A mandate by the government to change its modus operandi is indeed an impetus for change. An investment in innovation becomes critical when one considers the broadened view of innovation in relation to Gulf countries endowed with rich natural resources since negative growth and development outcomes resulting from natural resources have been established in these countries. Moreover, the manner in which natural resources are exploited becomes a cause for concern. Since the gifts of nature are not renewable and cannot be replenished, countries endowed with rich natural resources need to align themselves with economic, political, social, ethical and moral forms

of governance that encourage innovation. Should countries fail in this endeavor they may find themselves financing conflicts through natural resource exploitation and predatory institutions. Investment in innovation advances important national and societal goals and prepares economies to conduct themselves in ways that does not undermine social, economic and political goals. Gulf States have not been quick enough in acquiring the basic determinants of modern technological components for effective growth and development.

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