DETERMINANTS OF ECONOMIES OF SCALE AND THEIR INFLUENCE ON THE OIL & GAS SERVICES: A DISCUSSION

Review of Integrative Business & Economics Research

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ABSTRACT

The commercial viability and feasibility of projects in oil and gas industry depends majorly on the economies of scale. The critical evaluation of the determinants of economies of scale with respect to Oil & Gas industry helps the companies achieving competitive advantage. The study focuses on four main types of services in oil and gas industry, viz. (a) Oil Field Services, (b) Energy & Utilities, (c) Business Consultancies and (d) Credit Rating. The study tries to measure the influence of the determinants of economies of scale on these services provided by the Oil & Gas Service Providers. This helps the service providers in gaining sustainable competitive advantage by optimizing time, cost and resource as well as in formulating suitable strategies by considering the critical factors of Economies of Scale in capacity-constrained situation.

Keywords: Economies of Scale, Cost Optimization, Risk Management, Commercial Viability

1. INTRODUCTION

Economies of Scale (EOS) are the key determinants of market structure and entry for any organization. The phrase “bigger is better” found in the history of economics which trace the history of economies of scale. The close coordination of economies of scale with era when demand of the products in the market starts increasing and mass production became the trend for most economic processes. The Economies of Scale facilitates a firm or an industry in identification and measurement of the horizontal boundaries, which identify the quantities and varieties of products and services that it produces. The extent of horizontal boundaries varies across industries, along with importance of scale economies. This source of Economies of Scale is very critical to formulating and implementing the competitive strategy.

In General, Economies of scale[i] is defined as “reduction in cost per unit resulting from increased production, realized through operational efficiencies”. Economies of Scale allow some firms

to achieve a cost advantage over their rivals. Alfred Marshall has made a distinction between internal and external economies of scale. When a company reduces costs, time for completion and increases production, internal economies of scale is achieved. External economies of scale occur outside of the firm, within an industry in form of merger and acquisition or expansion or adding more product/service in the firm's offerings.

Oil & Gas industry is capital-labour-equipment intensive. It is capital intensive due to huge amount of capital employed, equipment intensive because of the number of process and procedures involved and human capital intensive due to involvement of concerned employees. As the Oil & Gas value chain starts from exploration & production to marketing & distribution, the Economies of Scale for Oil & Gas industry can be discussed with respect to cost optimization, time reduction and commercial viability of the project in a given period.

2. STUDY OBJECTIVES AND METHODS

The study examines the influence of the given below factors on the Economies of Scale with respect to Oil & Gas Industry:

- Capital Expenditure
- Standardization and Replication of Standardization
- Risk Management Techniques
- Technological Advancements
- Complexity of an Asset or Raw material availability
- Entry Barriers

The effect of Economies of Scale in Oil & Gas sector is being discussed by presenting the first deepwater drilling case in India of KG-D6 and measuring each factors or sub-factors with respect to the types of Oil & Gas services.

2.1 Types of Services in Oil & Gas Sector

The study has identified four critical services in Oil & Gas industry which involves from the first link of value chain - exploration & production to last link of value chain - refining & distribution. These services are:

A. Oil Field Services[ii] [OFS]

These **oilfield services** companies provide the infrastructure, equipment, intellectual property and services needed by the international oil and gas contractor companies like Exxon Mobil, Chevron, Reliance Industries Ltd etc, to explore, extract and transport crude oil and natural gas to the refinery, and eventually to the consumer. Oilfield equipment and services represent a globally-wide and lucrative market for upstream equipment, components, other supplies and professional services to companies specializing in Oil & Gas exploration and production (E&P).
Major Companies Involved: Schlumberger, Halliburton, Baker Hughes and Weatherford International

B. Energy & Utilities Services [EUS]

The age of information with technological advancements has transformed the business strategically by reducing time, effort and capital and providing much needed infrastructure to work effectively and efficiently which results in success. This thought has led to the creation of many Information technologies (IT) companies across the globe. This further has led to the creation of subset of the IT sector as "Energy & Utilities" service industry. Energy and utility service start by defining the problem of the product and then developing the solution of the same throughout the Oil & Gas value chain. The requirement of Energy & Utilities ranges from complex engineering and customer relationship management solutions in the upstream (exploration & production) to downstream (refining & distribution).

Major Companies Involved: Accenture, Capegemini, IBM, TCS, Infosys, Wipro, Mahindra Satyam, and HCL.

C. Business Consultancies[iii] [BC]

"Management consulting is an independent professional advisory service assisting managers and organizations to achieve organizational purposes and objectives by solving management and business problems, identifying and seizing new opportunities, enhancing learning and implementing changes." (Kubr 2002: 10). Management consulting involves 'two partners' as Kubr (2002) puts it; the client and the consultant, a buyer and a supplier. However, management consulting involves much more than just this buyer-supplier relationship. Various kinds of consultancies include Audit-Tax-Corporate Risk advisories, Program & Project Management, Strategy and IT consulting.
Major Companies Involved[iv]: Deloitte, E&Y, KPMG, PriceWaterhouseCooper

D. Credit Rating Services [CRS]

A credit rating is responsible for assessing the financial strength of a company or government entity. This includes both domestic and foreign companies. The main area that a credit rating focuses on is the ability of the company or government entity to meet the interest and principle payments on their debts and bonds. A credit rating is an opinion on the creditworthiness of a debt issue or issuer. The rating does not provide guidance on other aspects essential for investment decisions, such as market liquidity or price volatility.

Major Companies Involved: Crisil, CARE, ICRA, Fitch

Economies of Scale in Oil & Gas Industry are delved into the value of (1) Standardization and effective project management (2) Exploring new opportunities and (3) Doing best practices. The upstream or exploration & production sector in Oil & Gas Industry involves geologic survey, exploration, development and production. These are four different process involved to produce "first oil" from the reservoir. The process takes 7-8 years to discover "first oil" and the economies of scale can be ideally achieved if the time taken for the process can be reduced to 4-5

years. This is part of "capital value process" where the capital expenditure involved in installing heavy equipments like rig, pumps, valves, etc can be optimized by latest technologies in a most successful way. The downstream or refining sector involves the process like crude distillation, cracking, recovery, storage and distribution to get the petroleum products for transportation and industrial applications.

2.2 Case: KG D-6 Project first Deepwater block's analysis with respect to economies of scale

Technological advancement is providing an essential support in exploring conventional and unconventional resource in India. The first of its kind is Deep Water Drilling project at KG-D6 field has proved to such an extent that the economies of scale are achieved by cost and time optimization through perfect execution from different equipment and service providers.

Exhibit 1: Definition and Features of KGD6 project[v]

KGD6: Both D1 and D3 Deepwater Gas Projects (D1D3 Project) and D26 (MA) Oil, Gas and Condensate Field Development Project (D26 (MA) Project), together called KG-D6 Development Projects.

Unique Feature of the KG-D6 Project

- The projects were executed during a time of unprecedented growth in global capital project activity for Oil & Gas industry
- The KGD6 project was performed in a "thin market". Thin markets are defined as those in small number of buyers and suppliers as few transactions taken place in this market.
- Prices are often more volatile with larger spread between quotes from bidder
- The time period from 2003-2008 is characterized by rapid and steep cost escalation in the project market.

The capital project markets are characterized by limited number of services and suppliers due to various factors such as size, location, the technical nature of the work, etc. In E&P capital projects market, there are few providers for some specific services and supplies (such as subsea flexible pipe manufacturers and deepwater lay vessels) and high barriers to entry, which essentially means that these providers dominate the market. This will further lead to high capital expenditure in the E&P business for both contractors (Reliance) and service providers. Global problem area for E&P Project includes:

- Offshore drilling rigs
- Subsea component manufacturers and installers (specially deepwater installers)
- Deepwater lay vessels and Heavy lift barges
- Large and specialized equipment fabricators

2.2.1 Cost Optimization

The total contract cost for KGD6 from inception until 31 March 2011 was $9,473m. Within this amount of $9,473m, approximately $8,505m or 90% of all costs recorded for KGD6 relate to

exploration and development and $7,426m i.e. 78% of all costs relate to development of the D1-D3 and MA fields. $7,426m is within the total value of development plans approved by the Management Committee for these fields, although some planned work is in progress or is yet to be initiated.

Table 1: Total Cost involved in KG-D6 Project since March 2011[vi]		
KGD6 Field Development	Development Cost Incurred to March 2011 ($m)	Development Plan approved by MC ($m)
D1-D3	5693	8836
MA	1733	2234
Total	7426	11070
Source: E&Y report on KGD6 Project (Refer the References at the end)		

The oil field service providers like Halliburton and Schlumberger has played the crucial role in optimizing the resources with specialized knowledge (Information and Data) management software for successfully producing Oil & Gas from the reserves. The services like Business Consultancies has provided much needed assistance in form audit-tax-corporate advisory after successful production in internal management and helps the Reliance Industries Ltd in recommending the natural gas price for approval to Government of India (GoI).

2.2.2 Learning from KGD6 Project

The KG-D6 project faced considerable difficulties in the E&P capital project market which includes input availability, inflation factors during development phase, lack of established deepwater infrastructure in India and project execution in most difficult time period in petroleum environment has ever experienced. Thus, the KG D-6 case presents the perfect example of achieving Economies of Scale with respect to all factors mentioned earlier.

2.3 Capital Expenditure

Capital expenditure involves acquisition of land/field, seal and safety equipments, heavy machineries and other fabrication devices for contractor companies like Exxon Mobil, Chevron, etc. Capital expenditure is different in Oil & Gas upstream as well as downstream industry. The common factors involved in this category are as follows:

Table 2: Capital expenditure in Oil & Gas Upstream and Downstream	
Upstream	**Downstream**
Study prior to bidding	Land Acquisition
Area Allocation as per Fiscal Regime	Site Development
Service Provider Charges	Engineering & Licensing Fee
Storage cost	PMC,Detail Engineering and Other charges
Contractor charges	Infrastructure development
	Pre-operative expenses

These factors led the associated companies in the project for capital expenditure at the initial level. For **Oil Field Services**, the capital expenditure involves installing rig, drilling, well logging equipments and others. The cost, time and scale of work involved in the process makes the service providers **High** in measuring the Economies of scale for Oil Field Services in the Oil & Gas industry. For example, the cost and time investment for KG-D6 project from 2002-09 or before starting production by service providers like Halliburton and Schlumberger.

For **Energy and Utility Services**, capital expenditure involves training institute, incubation centre, recruitment of engineers and managers, time and capital involved during training and before actual implementation. This capital expenditure factors make Energy & Utilities services **moderate** in checking the Economies of scale in equipment intensive industries like Oil & Gas.

For **Business Consultancies,** capital expenditure involves everything before getting the order for consulting in the form of audit-tax-corporate. Business consultancies are dependent service business where the health of industry directly and indirectly affects to other. The process starts from customer identification, requirement gathering to establishing business. This is very long process which requires consistency in information gathering, analyzing current trend and following standards. Thus, the capital expenditure required is **high** for this service in Oil & Gas industry.

For **Credit Rating**, it is pure service business which requires capital expenditure includes setting up of training and incubation centre, cost involved in recruitment, training and development. The rating service is also pure service firm where the core service includes rating, research and analysis. Rating is done only after analyzing the available data and following the standards practice. Thus, the capital expenditure in Credit Rating will remain **moderate** in checking the Economy of scale in Oil & Gas industry.

The overall measurement will be "**moderate to high"** for the Economies of Scale in Oil & Gas Industry for contributing factor called "capital expenditure".

2.4 Standardization

The requirement of **standardization** is essential for service providers, Information Technology companies and Credit Rating Services as compare to business consultancies and business analysts. Standardization is long term process and an integrated approach is crucial[vii] (Source: Economist 2011). Such dramatic savings in time and cost are achieved through scaling-up supply chains for volume discounts, building long-term partnerships with contractors, streamlining decision-making and formally implementing a company's lessons learned through an iterative process. This requires several years of acquired expertise to deliver projects with speed and precision.

For **Oil field Service Providers (OFS)**, standardization is very essential from the inception of submitting the bids to execution. The service providers need to follow global standards in order to not damage the properties of the nation. The recent case of spill and few more in the past has raised several issues and helps in establishing the standards for compulsorily follow across the globe. The standards lead to operational excellence, quality and safety practices. These standards

are designed by various institutes like American Pipeline Institute, Occupational Safety and Health Administration, International Drilling Standards, Inspection and Quality standards. Thus, the standardization is upmost (**High**) requirement for Oil Field Services.

For **Energy & Utilities Services (EUS)**, every Oil & Gas international companies are having their set of standards and the EUS companies need to comply with the same. There are some standard that every companies follow like ISO and Quality standards. There are also some standards that are unique with their own practices which sometimes called "certification". The client of these companies will appreciate the best among the lot. Thus, the adopting, complying and offering standards is very much required (**High**).

For **Business Consultancies (BC)**, the understanding, analyzing and helps the customer companies in implementing the International standards in Tax and Accounting consultancies. The complying with standards is the foremost requirement of the companies to follow. The other standards will remain common to every consultancy as the customer will look for before investing in the consultancies. Thus, the standards are the top most but an optional requirement due to it varies from different management consultancies. The measurement is **moderate** for not only applying to the practice being followed but also conveying the same to the customers by setting up Institute. i.e KPMG IFRS institution for helping the clients to implement the IFRS and replace it with India-GAAP[viii]

For Oil & Gas **Credit Rating Services (CRA)**, the big three of this industry has set the standards for the companies to follow the rating procedure in close-coordination with the Oil & Gas industry and governments. The rating of the Oil & Gas contractor companies is meant for communicating all aspects of information to the shareholders for the investment purpose. This practice is followed by Basel norms of regulations. Thus, there is utmost importance (**High**) of standardization in the Oil & Gas industries for further communication to the stakeholders.

The overall measurement of the standardization will be "**High**" for Economies of Scale in Oil & Gas industry.

2.5 Replication of Project or Standardization

Replicating a project involves standardizing the material as well as project development process, and then creating a template for delivery that harmonizes the effort of owners, contractors, and project teams to eliminate waste and synchronize deliverables. To succeed at standardizing a project management plan, executives must make replication a criterion of success so that project teams will focus on process as well as infrastructure from the beginning of the project. Thus, replication of standardization or established project is high in Oil Field services due to their exposure to their previous projects, to Information technologies, business consultancies, business analysts and Credit Rating Services.

The **Oil Field Services** need to be established in their area of expertise which includes core and add-on services. The service providers used to take reference of the established services or on which the companies are expert at. For example, Halliburton provides relatively good solution to the unconventional exploration in the North American market than others in reservoir analysis

but M/s.Schlumberger provides an excellent result in drilling and logging in the same market. There are some competencies on which companies used to stand in the market and this reference helps them in getting opportunities to prove again and again. The replication of the project or standards help the clients in getting know-how about the standards used in the offerings and best practices followed by the companies (or competitors) in the same area of services. For example, M/s.Halliburton is leader in providing the reservoir analysis and this helps various companies associated with conventional and unconventional reserves in North America market. Thus, the role of replication of project and standards remains **high** for the oil field services while measuring the economies of scale due to the competencies developed by oil field services and global market share (or domestic market share).

Energy & Utilities services have to follow certain standards as per terms and condition of the industry practices which remain same for all Oil & Gas contractor companies. The exploration and production companies' requirement of system innovation will remain almost same due to same kind or process challenges in conventional and unconventional reserves. For example, M/s. IBM has developed software for seismic and reservoir analysis for conventional reservoirs but M/s.Accenture has developed some solutions for drilling and logging sensors for unconventional reservoirs. Thus, IBM solution will remain for replication to all conventional reservoirs and Accceenture solution will remain for replication to unconventional reservoirs. The technological advancement can replace the solution in a way the companies in positioning themselves in the Oil & Gas industry as a whole. Thus, the role of replication in project and standardization will remain **moderate** in measuring the economies of scale.

Business consultancies require customize approach in providing service to the Oil & Gas contractor companies. The core service of business consultancies like audit-tax-corporate advisories provides customize solution based on the inputs like financial data, process issues and challenges received from the companies. Thus, the role of replication will be **moderate** in case of business consultancies in Oil & Gas contractor companies.

Oil & Gas **Credit Rating Services** adopts the relatively different methodologies to all other sectors. In case of Oil & Gas, the basic financial requirement will remain same but the addition in part of the components like pre-tax investment multiple (is ratio of cumulative net cash income to the cumulative exploration & development cost), cost oil etc in their rating analysis. Thus, the fundamentals will remain same but the customization with respect to every other sector requires to be done. Thus, the role of replication will be **low** in case of rating Oil & Gas contractor companies for measuring the economies of scale.

The overall measurement of the Replication of standards or established procedures will be "**Moderate"** for Economies of Scale in Oil & Gas industry.

2.6 Technological Advancement

Technology is the front runner in deepwater drilling project like KGD6 and unconventional resources in North America. Technologies such as hydraulic fracturing and horizontal drilling helped US to become net exporters of natural gas from net importers. Technologies such as

digital oilfield, cloud computing, digital sensors and other information technologies help the contractor companies in exploration.

"First mover advantage" is vital for the **oil field service** companies in the Oil & Gas sectors. Technology has the potential of playing essential role in the oil field service companies. Because less conventional sources of exploration and production rely on more advanced technology to extract the oil, oil field service companies that offer an array of advanced technology have the potential of benefiting from the rise in exploration and production investment. The companies want to be become leader in the development of unconventional reservoir through the provision of its innovative proprietary technologies to the market, along with improved process efficiencies and expert reservoir knowledge. The recent technologies like horizontal drilling and hydraulic fracturing has change the game for US in exploring the unconventional shale gas, which has transform the US from net importer to net exporter. Thus, the technology is much needed (**High**) requirement to survive in the Oil & Gas sector for oil field services to sustain their competitive advantage.

For **Energy & Utilities services**, business leaders are driving technologies to help bring a competitive advantage through efficient and effective use of the company's greatest and yet under-utilized assets and that is "Data". In Oil & Gas sector, many business decisions are being taken from the critical analysis of the data and for that right tools and technologies required to mine the data and get the effective results. As the business grows — and with it the volume of data— the issues of data quality and data integrity become more important. The creation of an enterprise data strategy becomes necessary to allow the business to scale by enabling timely and accurate decisions based on solid data. The strategic units of the Energy & Utilities services focusing on developing new technological solutions like for cloud computing to deliver new operating models to existing and new consumer segments. The role of technology will remain **high** for Energy & utilities services in offering solutions to Oil & Gas contractor companies.

Business consultancies are pure service firms which provide services like audit-tax-corporate advisory along with research and market analysis and sometimes forecasting the demand. The consultancies are getting their majority of the revenue from audit-tax-corporate advisory because the companies are not having the expertise and these consultancies are having the same as their competencies (more than expertise). The offerings are more on critical analysis through on the field experience, working at client site and strong base of fundamentals. The role of technologies will be software complementing core services for effectively apply the fundamentals and no state-of-the art technologies required for the critical analysis. As the use of technologies will be secondary and much importance given to the primary or firsthand information, there will be **moderate** kind of technology role in Business and Management consultancies.

Oil & Gas **Credit Rating Services** also develop their model according to strong base of financial fundamentals and other financial information. The competitive factors in Credit Rating Services are their modus operandi of rating companies, approval from respective government watch-dogs and credibility of their ratings in the market. The primary input for the Credit Rating Services are the source of available information from the companies then the technological tools helps in providing some other inputs for further processing. Here also the role of technology will be **low** in measuring the economies of scale for Oil & Gas industry.

The overall measurement of the technological advancements will be "**Moderate to High**" for Economies of Scale in Oil & Gas industry.

2.7 Risk Management Techniques

The **risk management techniques** like qualitative techniques (includes brainstorming, assumption analysis, interviews, checklists, risk register, risk mapping and probability impact table) and quantitative techniques (includes decision trees, monte carlo simulation, sensitivity analysis, probability impact grid (PIG), crystal ball, and other simulation analysis) helps the companies in mitigating the risk related to internal and external management. These risks can be measured at all levels including corporate, strategic business and project. The results of risks analysis, both sensitivity and probability can identify the quantitative effect on a project economics should such risk occur. Potential losses and gains can be identified and managed by doing the risk management techniques. Risk management creates confidence in decision making. Effective risk management improves the commercial viability of the oil and gas project at an inception level and at operation level.

Business consultancies apply the above mentioned the risk management techniques in their services of corporate advisories to the Oil & Gas contractor companies. The business consultancies used to provide recommendation for process improvement in form of preparing standard operating procedure, cost optimization or time reduction to the Oil & Gas contractor companies. Business consultancies also provide solution to the service providers like Halliburton, Schlumberger, Baker Hughes and Weatherford while serving for the exploration and production companies. This may be in form of cost and time reduction. The Business and management consultancies also provide solution in coordination with the energy & utilities to implement the enterprise solutions in order to achieve the desired benefits which they are ask for. The recent trend in the business consultancies is to have an "Enterprise Solution" department which works in close coordination with corporate advisory or the consultants in the respective companies to recommend and help in implementation of the solutions. This are few reason on the **high** role of risk management techniques in business consultancies compare to other types of services (**Moderate for Oil field Services and Credit Rating Services, Low for Energy & Utilities services**).

The overall measurement of the risk management techniques will be "Moderate" for Economies of Scale in Oil & Gas industry.

2.8 Barriers to Entry

High barriers to entry signify that these service providers dominate the market. This situation results in imperfect E&P market and lack of cost transparency. In this market, cost estimates based on previous experience and understanding of the project costs can be diverge greatly from actual price charged by these suppliers. The striking location differences are generally accepted in the E&P industry as part of the "License to operate". The high barriers to entry create "imperfect market" to Oil & Gas service industry. Imperfect market contributes heavily to **cost**

escalation and cost volatility in the market. These will lead difficulty in capital expenditure for the project for any new supplier.

The establishment of **oil field service** companies like Halliburton, Schlumberger, Weatherford and Baker Hughes in their respective area of expertise. The track records, core and add-on offerings and scale of operation with technicalities has made difficult for other companies to enter in the Oil & Gas market. The new service provider must come with something that is very crucial to the exploration and production companies in terms of reservoir analysis with accuracy and depth which has not been done till yet, will make difference but this also require close coordination with respective government and Oil & Gas contractor companies. The global market share of these four companies is approximately 75% and this make difficult for new companies to establish (Source[ix]: GBI research, 2009). These four companies used to acquire the new companies in order to build their range of services. (**High**)
The **Energy & Utilities services** are completely based on the type of requirement from the Oil & Gas contractor companies from exploration and production to retail distribution. New entries are not relatively **difficult**[x] as in other types of services. This is due to the kind of solution in form of software they provide to the Oil & Gas contractor companies. Thus, the barriers to new entries will be **moderate** in case of energy & utilities for Oil & Gas contractor companies.

Business consultancies like Deloitte, Pricewaterhousecooper, KPMG and E&Y are established in their core offerings like audit-tax-corporate advisories which contribute significant to their revenue share. The other kind of consultancies like research and analysis where the close contact with the government and companies help in getting useful information and other algorithms to forecast the demand of the energy products. These consultancies have established themselves in close coordination with respective Oil & Gas contractor companies with the kind service effectiveness and efficiency provided by them. This makes them difficult to replace the business consultancies. (**High**)

Same explanation of business consultancies applies to **Credit Rating Services**. Credit Rating Services also have established their credence and believability through systematic reports and grading which helps the Oil & Gas contractor companies in attracting investors and in earning reliance in the market. The new rating firms should have support of the established companies and transparency in their rating methodology for entering in the market. This further will create difficulty for the new entrants but it is not much difficult as in other forms of services. (**Moderate**)

The overall measurement of the barrier to entry will be "**Moderate to High**" for Economies of Scale in Oil & Gas industry.

2.9 Level of Complexity

The level of complexity differs from scale of operation of each types of service in the given Oil & Gas projects.

The factor of uncertainty is **higher** in the service offering from **oil field service providers** due to being on pro-active side. These service providers will start getting information with few inputs

from the government agencies and helps the Oil & Gas contractor companies. The complexity factor will remain high for the oil Field service providers due to their exploration and production activities which help the Oil & Gas contractor companies and the government to explore the conventional and unconventional reserves.

The **Energy & Utilities services** also offers solution which is either not attempted by anybody before this assignment or providing solution with experience in the particular area (mainly by Oil field service provider's information management arm). The uncertainty factor will remain **high** due to system innovation and process improvement which leads to cost and time reduction and helps in decision making of complex reservoirs. However, the level of uncertainty remains high at initial level but after the basic understanding will be moderate for the programmers and service implementers in Oil & Gas industry.
Business consultancies' arms of corporate advisory, analysis and research provide services which should be unique to make it lucrative to the investors from Oil & Gas contractor companies. The corporate advisory is complex in terms of understanding, analyzing and recommending solutions for cost leadership. The analysis and research arm provides solution in close coordination with the respective government and Oil & Gas contractor companies in order to make worthy analysis for all stakeholders. The business consultancies are already using established models for evaluation and for recommendation make them **moderate** while measuring for economies of scale for Oil & Gas industry.

For **Credit Rating Services**, The rating methodologies require financial inputs from the companies and rate them on the basis of the tools and technologies set up for the same. The established Credit Rating Services are using their own developed and approved models for evaluation from the regulators of respective governments and since they are on the re-active side of the Oil & Gas sector it makes the complexity factor **moderate**.

The overall measurement of the complexity will be "Moderate to High" for Economies of Scale in Oil & Gas industry.

3. CONCLUSION

The economies of scale defined by the various factors as mentioned above suggests us the different intensities in four mentioned types of services. This is explained in the table below:

Table 3: Importance of EOS factors vis-à-vis Types of Services

Types of Services/ECONOMIES OF SCALE Factors	OFS	EUS	BC	CRS	Total
Capital Expenditure	High	Moderate	High	Moderate	Moderate to high
Standardization	High	High	Moderate	High	High
Replication of Std or established Procedures	High	Moderate	Moderate	Low	Moderate

Technology	High	High	Moderate	Low	Moderate to high
Management Techniques	Moderate	Low	High	Moderate	Moderate
Barriers to Entry	High	Moderate	High	Moderate	Moderate to High
Complexity	High	High	Moderate	Moderate	Moderate to high
Total	High	Moderate to High	Moderate to High	Low to Moderate	

Abbreviations of the Types of Services: Oil Field Services (OFS); Energy & Utilities services (EUS); Business Consultancies (BC); Credit Rating Services (CRS)

The overall measurement level for five among eight factors remain in the direction of "high", which shows the importance of the factors like capital expenditure, standardization, technology, and complexity to the Oil & Gas industry as a whole. The overall measurement of this **four factors** contribute moderate to high for Economies of Scale in Oil & Gas industry. These five factors define the economies of scale for the industry. The economies of scale for any project or activities or at large for any firm is depend on the economic viability and feasibility of the project by focusing on this main four factors.

ENDNOTE

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