

OIL AND GAS

USA Texas Houston

Cluster Description and Evaluation

		Scale	Evaluation	Estim.	Comments, Explanations
CLUSTER (Name)		n/a			Oil and Gas
BIOGR. INFO (Primary Citations:)		Text			Al-Mazeedi, Wael, George Appling, Chad Ellis, Stuart Page, J. David Pelly, Katya Roudelson. Houston Oil & Gas Cluster. Student report prepared for Prof. Michael E. Porter's Seminar on Competition and Competitiveness, Harvard Business School, May 1998. Porter, Michael E. "The Houston Oil and Gas Cluster." (Confidential?) Presentation Slide for the Forum on Technology and Innovation, 2000.
	Number of data points (quant. & qual.)	No.		115	
	Number of data points (quant. only)	No.		64	
	Done	1 Yes 0 No		1	
	Data entry by	Text			Claas van der Linde, Niels Ketelhohn
	Last change (date)	yy/mm/dd		00/03/29	
DESCRIPTIVE INFO		n/a			
	Extractive / Natural Resource Industry	1 Yes 0 No		0	
	Generic Cluster (Primary Association)	1 Materials 2 Forest/Paper 3 Petroleum 4 Semiconductor 5 Multipurpose 6 Transport 7 Power 8 Office 9 Telecom 10 Defense 11 Food 12 Textiles 13 Housing 14 Health 15 Personal 16 Leisure		3	
	Generic Vertical Stage (Primary Association)	1 Primary Goods 2 Primary Serv. 3 Machinery 4 Inputs 5 Support Serv. 6 Multiple		6	Primary goods, primary services, machinery, inputs, supporting services
	Number of Vertical Stages in Cluster and Product / Service Description	1 1 Stage 2 2 Stages 3 3 Stages 4 4 Stages 5 5 Stages		4	Upstream (oil and gas exploration, development, completion and production); downstream (oil transportation, trading, refining, distribution, wholesale and retail marketing; gas gathering, processing, trading, transmission, distribution, marketing)
	Number of Companies in Cluster	No.		5000	More than 5000 firms in late 1990s
LOCATION (Nation)		Text	USA		
	Region	Text	Texas		
	City	Text	Houston		
GEOGRAPHIC BOUNDS		3 city 2 metropolitan area 1 part of state 0 state -1 across state borders -2 nation -3 across nat'l borders		3	The world's largest industry is dominated by one U.S. city
	Size of Country	sq. km		9529063	
REGIONAL ECO. DEV'T		n/a			
	National Per Capita GDP	U.S. \$ (1993/90)		36200	
	Cluster in OECD Area	1 Yes 0 No		1	
COMPETITIVENESS		3 world's strongest cluster 2 among world's top 3 1 among world's top 10 0 known internationally -1 known nationally -2 rather weak -3 uncompetitive		3	

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		INDICATORS OF COMPETITIVENESS (Change in Competitive Position)	3 rapidly gaining 2 modestly gaining 1 gaining compet. position 0 holding compet. position -1 losing compet. position -2 modestly losing -3 rapidly losing	1	Houston's position as the world headquarters for oil & gas innovation has strengthened in recent decades, even as its importance as a crude oil source has declined
		Cluster's National Share of Production or Exports (against competing clusters in the nation)	3 predominant (>50%) 2 dominant (<50%) 1 major (<20%) 0 significant (<10%) -1 visible (<5%) -2 insignificant (<1%) -3 invisible (<0.1%)	2	20% of all U.S. jobs in the oil&gas business, 12.2% of U.S. refining capacity
		Annual Cluster Growth	3 rapid (>+10%) 2 fair (<+10% p.a.) 1 slightly (<+5%) 0 neutral (+/- 2%) -1 slightly (<-5%) -2 fair (<-10% p.a.) -3 rapid (>-10%)	2 estim.	CAGR of sales of Oil Companies varies between 2.5% and 20.4%
		Local Firms Pioneer New Products or Processes (vs. Imitate)	3 usually pioneer 2 often pioneer 1 somet. pioneer 0 pioneer&imitate -1 somet. imitate -2 often imitate -3 usually imitate	3	Houston is the primary innovation center for the Oil and Gas industry. Recent Houston Technologies include ED Seismic, measurement-while-drilling tools, and horizontal drilling
		Local Firms Compete Primarily on ...	3 factors oth. than diff'n/cost 2 diff'n, cost is insignificant 1 differentiation, less on cost 0 differentiation and on cost -1 cost, less on differentiation -2 low cost due to innovation -3 inherited low input costs	-2	Competition among producers is based almost entirely on input cost, rather than differentiation, making competitive niches all but impossible
		Foreign Firms in the Cluster do more than just Marketing or Manufacturing (% who do)	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 <15%	3	Schlumberger, a passionately French company, does most of its development in Houston"
		DIAMOND Primary reason behind competitiveness (+ order of importance)	1 FC 2 DC 3 R&S 4 FSR 5 Other	3	3,1,2,4,5
		FACTOR CONDITIONS	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	3	
		General Factors	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	
		Geographic Location	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.	2	Proximity to Gulf of Mexico
		Cost of Production Inputs (Wages, etc.)	3 among world's lowest 2 very low 1 below average 0 world average -1 above average -2 very high -3 among world's highest	1	Cost of living and office space is lower than in many other U.S. cities; wages, however, are very high (high productivity)

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		General Physical Infrastructure (Roads, Ports, Airports, Telecom)	3 world's best 2 among world's best 1 above world average 0 world average -1 below world average -2 among world's worst -3 inexistant		2	Very good local general infrastructure: Houston Ship Channel, highways, three airports
		Other	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.		2	Attractive living conditions in Houston make attracting labor easier
		Specialized Factors	3 strong adv. 2 advantage 1 weak adv. 0 no effect -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	
		Cluster-Specific Natural Resources (Raw Materials, Energy)	3 among world's best 2 very good 1 possibly good 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		3	Proximity to gas and oil: Texas and the Gulf of Mexico account for over 50% of the oil reserves in the U.S. and over 50% of U.S. natural gas production
		Cluster-Specific Human Resources (Skilled Labor)	3 among world's best 2 highly specific skills 1 some specific skills 0 general skills -1 primarily unskilled -2 among world's worst -3 impossible to obtain		3	Houston is able to attract the industry's best people
		Cluster- Specific Knowl.- Transfer Resources (Vocat., Univ. Training)	3 among world's best 2 highly specific 1 some specific 0 general purpose -1 poor general purpose -2 among world's worst -3 none available		3	University of Texas, Texas A&M host America's two most important training programs for the oil & gas industry.
		Cluster-Specific Scientific Infrastruct. (Research Institutes & Univ., Testing Labs)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		3	University of Texas, Texas A&M, important research labs at suppliers.
		Cluster-Specific Capital Resources (Venture Cap., Knowledgeable Lenders)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		2 estim.	Probably highly knowledgeable local lenders; lack of venture capital (although it is unclear how much of a disadvantage this is in this industry).
		Cluster-Specific Physical Infrastructure (Specialized Facilities, Labs., etc.)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		3	The port of Houston is a complex of public and private facilities heavily oriented towards the oil and gas sector.
		Cluster-Specific Administr. Infrastruct. (Legal System, Business Regulation)	3 among world's best 2 highly specific 1 possibly specific 0 general purpose -1 possibly gen. purpose -2 poor general purpose -3 among world's worst		3	"The Gulf offers the best licensing terms, as well as does Britain."
		Cluster-Specific Info (Bus. Info, Corp. Disclos., Internet Access)	3 easily available 2 available 1 above world average 0 world average -1 below world average -2 hard to access -3 does not exist		3	Houston has the nation's highest number of oil & gas related events, creating opportunities for cross-learning and information sharing

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	Prestige, Tradition, or Pride Allow Attraction of Best People in Cluster Area	3 most celebrated 2 prestigious 1 above average 0 national average -1 below average -2 low prestige -3 disdained		-2	Oil & gas jobs have very low social status, "one survey showed that the petroleum industry ranked only above the tobacco industry in terms of public favorability"
	Impact of Selective Factor Disadvantages on Segment Focus or Innovation	3 major & beneficial 2 substant. & benefi. 1 some & benefi. 0 none or no impact -1 some & harmful -2 substant. & harmf. -3 major & harmful		1	Depletion of hydrocarbon resources in the Gulf of Mexico may force the cluster to concentrate even more on innovation and technology development, rather than relying on inherited resources.
	DEMAND CONDITIONS	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	
	Local Demand Size	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		0	Local demand size does not play a role
	Local Demand Qualities	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	
	Soph. / Demanding / Knowledg. Local Customers / Distrib. Channels	3 world's most soph. 2 sophisticated 1 above world ave. 0 world average -1 below world ave. -2 unsophisticated -3 world's least soph.		3	Local end buyers are not very sophisticated but local buyers from the industry and related and supporting firms are highly sophisticated and important drivers of innovation
	Government: Stringent Regulatory Standards (Product, Energy, Safety, Enviro.)	3 triggers innovation 2 stringent 1 above world ave. 0 world average -1 below world average -2 lax -3 retards innovation		0	Texas regulatory regime with respect to environment and electricity deregulation is behind more innovative California regime, threatening to undermine future competitiveness
	RELATED & SUPPORTING INDUSTRIES	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	Supporting industries are a major advantage and the source of numerous major oil innovations made during the past twenty years
	Suppliers	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	Suppliers are the principal source of innovation in the industry; cost pressures have made outsourcing and thus suppliers even more important to the industry
	Degree of Local Sourcing	3 > 85% 2 > 70% 1 > 55% 0 45-55% -1 < 45% -2 < 30% -3 < 15%		2	As much as 75% of oil & gas companies' upstream capital expenditures
	Local Components or Materials Suppliers	3 2&assist developm. 2 int'lly competitive 1 nat'lly competitive 0 many present -1 some present -2 uncompetitive -3 not locally present		3	World leading suppliers (oil field supplies and chemicals) are major sources of innovation

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	Local Process Equipment (Machinery) Suppliers	3 2&assist developm. 2 int'l'y competitive 1 nat'l'y competitive 0 many present -1 some present -2 uncompetitive -3 not locally present		3	World leading equipment suppliers (drilling rigs, drill tools) are major sources of innovation
	Local Services Suppliers	3 2&assist developm. 2 int'l'y competitive 1 nat'l'y competitive 0 many present -1 some present -2 uncompetitive -3 not locally present		3	Specialized technology services (drilling consultants, reservoir services, laboratory analysis), subcontractors (surveying, mud logging, maintenance), business services (MIS services, technology licenses, risk management); services companies have in effect become the Oil Majors research and development arms
FIRM STRATEGY & RIVALRY		3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		1	
	Rivalry	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		2 estim.	
	Vigorous Competition among Local Companies	3 drives innovation 2 strong, multidimensional 1 same as against foreign 0 primarily on price -1 sometimes lacking -2 collusive behavior? -3 cartel or monopoly		2 estim.	Competition is almost per definition based on cost as prices are dictated by world markets. Strong competition (e.g. for drilling licenses, via benchmarking) combined with extensive cooperation (e.g. consolidation joint ventures, asset mergers, alliances with specialists, OBO Operated by Others agreements); unclear just how important an advantage competition is.
	Government: Cluster's Economy is Open to Import Competition/ Foreign Direct Investments (FDI)	3 open imports, open FDI 2 economy almost open 1 decreasing restrictions 0 considerable restrictions -1 increasing restrictions -2 economy almost closed -3 no imports, no FDI		3	Many foreign companies invest in R&D in Houston, and distribute their final products across the US
	Cooperation	3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		3	
	Cooperation among Local Companies	3 joint labor / infrastr. upgrading 2 joint research in outside labs 1 vertical subcontracting 0 no cooperation -1 help each other in emergencies -2 horizontal subcontracting -3 outright collusion		3	There is a high level of cooperation between industry participants, including joint investments in training and research
	Local Industry Association (in Core Industry)	3 builds capacity 2 is trying to upgrade 1 gets execs together 0 exists -1 no impact/no assoc. -2 lobbies for subsidies -3 discour. competition		1 estim.	There are over 60 industry associations, but no all-encompassing cluster organization
	Relationship Among Cluster Participants who Know Each Other	3 strong social/family ties 2 sense of trust 1 promote cluster 0 compete and talk -1 cluster awareness -2 some cluster awaren. -3 distrust		0	Industry participants know one another very well
	Local Investment Context	3 strongly encourages any investments 2 encour. inv. in intangible/risky forms 1 encourages inv. in physical assets 0 neutral (world average) -1 discour. inv. in intangible/risky forms -2 discourages inv. in physical assets -3 strongly discourages any investm.		0 estim.	

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		Government: Targeting 3 does not occur 2 occurs seldom 1 occurs decreasingly 0 occurs -1 occurs increasingly -2 occurs often -3 distorts inv. patterns		3	Houston and Texas government have developed an "anti-oil mindset" preferring diversification of the local economic base rather than supporting the cluster
OTHER ADVANTAGES		3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		1	
		Early Mover Advantages 3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		2	First mover advantage based on diamond conditions
		Government: Other Influence 3 strong adv. 2 advantage 1 weak adv. 0 neutral -1 weak disadv. -2 disadvantage -3 decis. disadv.		0	Local and state government does not support the cluster (doesn't hinder it either)
EVOLUTION		n/a			
		Evolutionary stage of cluster 3 among world's top 3 2 highly developed 1 critical mass present 0 partly developed cluster -1 critical mass lacking -2 rudimentary -3 unclear if even a cluster		3	World's most highly developed oil & gas cluster
BIRTH		n/a			
		Primary reason behind cluster birth (+ sequence of events) 1 FC 2 DC 3 RSI 4 FSR 5 Other		1	1,4
		Birth of Cluster (Year) Year		1901	Birth in 1901 with oil discovery at Spindletop; 1920-1940 establishment of refineries; 1940-1950 establishment of petrochemical firms; after 1940 establishment of gas industry; 1990s opportunity to converge oil, gas and electricity industries.
	1	Birth due to Unique Factor Conditions 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		2	Birth due to "inherited" factor (oil), enhanced by "created" factor (Houston Ship Channel just one year after first oil discovery)
	4	Birth due to Firm Strategies, Structure or Rivalry 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		0	John D. Rockefeller's Standard Oil Trust created relative stability allowing firms to settle in Houston, while in other producing areas (notably Pennsylvania) the "Rule of Capture" which meant that producers owned whatever oil they could find under the surface created disincentives to proper property development and hindered the establishment of indigenous oil clusters
	5	Birth due to Other Reasons (Chance, Isol. Innov./Entrepreneurism) 3 sole factor 2 main factor 1 major factor 0 contrib. factor -1 minor factor -2 minusc. factor -3 no factor		0	Major position was achieved only in late 1980s after the 1986 fall in oil prices forced competing clusters to scale down, resulting in a transfer of jobs and skills to Houston and a major strengthening of the Houston cluster