Trends in Information Technology Costs and Investment Levels in the Oil Industry

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1. Introduction

This paper presents information from two global benchmarking studies conducted since the early 1990s to provide oil company IT and business managements with information technology information technology (IT) performance measurements for exploration and production (E&P) and downstream operations. The annual surveys provide economic signals to help guide investment and budget decision-making for senior oil industry management. Data is collected with rigorous definitions to ensure comparisons can be made between different types and sizes of upstream and downstream operations.

The surveys not only provide a management level toolkit but also unique insights into the trends in economic commitments to IT in the upstream and downstream oil businesses in Europe, North America, and other regions. In this paper typical spending profiles of upstream and downstream operating units will be examined. Recent trends in operational efficiency and investment requirements will be analysed showing differences between company peer groups and geographical areas.

The paper also examines technological trends and the pattern of IT commitment between software application development and support and that on infrastructure components like desktop computing and networks and communications.

1.1 What are the AUPEC Global Upstream and Global Downstream IT Benchmark Studies?

Benchmarking is a tool to be deployed as an integral part of performance management, alongside, and complementing other performance improvement techniques. Benchmarking helps to identify what must be improved and more importantly, how it can be improved. The prime purpose is to identify best practice in selected key processes, products and services. Benchmarking can be carried out with any organisation (inside a large corporation or across different companies) as long as it involves similar or comparable processes to those under review.

Data supplied for benchmarking studies is often sensitive and confidential. Benchmarking consultants – like AUPEC – apply strict rules regarding publication and sharing of data. Reports showing individual company performance results are coded and only published to participating companies. In this paper information has been aggregated or presented in typical peer group results – rather than showing any individual company observations.

1.2 AUPEC IT Benchmarking Study Objectives

The AUPEC IT Benchmarking Studies are performance-benchmarking surveys of IT services in support of upstream E&P activities and downstream manufacturing and marketing operations. The chief objective of the benchmarking surveys is to provide analysis based on key data, which allows quantification of the effectiveness and efficiency of information services. The upstream study began in 1990 with sponsorship from Shell Expro and the downstream study was stimulated by a pilot study sponsored by Shell International Oil Products in 1994. The surveys analyse data for all IT activities in operating units or strategic business units for many of the largest energy companies operating in the oil sector. The results in this paper are based upon data from many operating units in all regions of the world. Table 1 provides a list of all participating companies segmented into upstream and downstream sectors.

Table 1 Benchmarking participants (2001-2002)

Upstream companies	Downstream companies
BHP Billiton	BP
BP	ChevronTexaco
Conoco	Marathon Ashland
Kerr-McGee	Petro-Canada
Kuwait Oil Company	Repsol-YPF
Marathon Oil	Shell International
Norsk Hydro	Statoil
Phillips Petroleum	Sunoco
Premier Oil	TotalFinaElf
Santos	
Shell International	
Statoil	
TotalFinaElf	
Total Business Units = 50	Total Business Units = 15

The AUPEC benchmarking models utilise the 'balanced scorecard' approach of Kaplan and Norton[1] of performance measurement with analysis being focused on financial, business customer and internal processes. The model provides:

- An industry view of total IT costs, baseline operating and IT investment
- Peer comparisons of commitments in the following business areas:
    - Exploration (including appraisal and development)
    - Production (including logistics)
    - Administration (for E&P)
    - Manufacturing and Supply
    - Marketing (including retail)
    - Enterprise Management and Business Support (for downstream operations)
- Peer comparisons within the following IT service lines:
    - Applications support and development
    - Desktop services (PC and Unix)
    - Networks and communications (including WAN/data, and voice, fax and video)
- IT effectiveness and efficiency indicators via Business Customer Satisfaction and User Satisfaction Surveys.

The benchmarking models employ both conventional accounting terminology and economic variables in the data model. Financial data is requested in order to provide the following key performance indicators:

- Total IT costs, OPEX (operating expenditure), CAPEX (capital expenditure), and depreciation
- Investment and baseline operating costs

The benchmark surveys produce over 50 benchmark signals or KPIs. For the financial perspective key benchmarks concentrate on total IT costs, costs of operating IT and investment spending. Most metrics or KPIs use the total number of desktops as the normalising measure. This is regarded as the most appropriate normalising measure when the focus is efficiency. This is because regression analysis shows the number of desktops to be the best explanatory variable when trying to predict or forecast overall IT costs. IT costs are also presented per barrel oil equivalent (BOE) or per sales volume or as a percentage of company expenditure. IT costs per barrel of production or sales volumes provide an indication of the intensity of IT use or penetration in the business rather than a measure of efficiency. The economic signals are provided at an overall level and in detail for each IT service and for each business process level (e.g., exploration, production and administrative services).

2. Upstream Oil Industry IT Commitments – the context

The Global Upstream IT Benchmark began as a survey of UKCS operating companies in the early 1990s. Today the survey is utilised by major global E&P companies, state oil companies, and smaller independents.

The survey is utilised as a management tool at both operating unit level and for high-level corporate analysis. The results presented in this paper are from the 2001 survey period and therefore data relates mostly to actual spending in the year 2000. AUPEC benchmark study results are typically released around the end of Quarter 2 each year in time for the next planning cycle.

Around 50 operating units supplied data from 12 E&P companies in the 2001 survey. To provide some context for the information technology commitments the total business expenditure amounted to $13 billion. Most companies supplying data to the 2001 survey were North Sea operators, 10 were North American, 6 from Africa and Middle East, 13 from Asia Pacific and 4 from South America. For the whole sample 38% of the total business expenditure was for European operations, 22% was North American and 40% for businesses outside Europe or North America.

Production figures are captured in the survey in gross operated and net terms. In most provinces outside of North America gross-operated production is seen as the most relevant output statistic when analysing commitments to IT. This is because the IT systems have been set up to match the demand of the operated assets. For the whole sample in the 2001 study production totalled 6.5 billion barrels oil equivalent with 57% being oil.

2.1 Upstream Information Technology Costs

Information technology costs are captured for exploration, production and administration activities separately. An IT service model split is also deployed to look at IT commitments for applications (software programs designed specifically for E&P business processes) and the accompanying infrastructure (servers, Unix workstations, desktop computing and networks and communications systems). At each level of the cost model a detailed economic split is obtained to identify baseload (operating) IT costs and IT investment spending as well as traditional accounting costs such as operating expense and capital expenditure (and depreciation). In this paper only high-level (aggregated) analysis can be shown, as the results for each company are confidential.

For the overall survey total IT expenditure commitments (operating expense plus capital expenditure) amounted to $1 billion. Information technology operating expenses totalled $805 million or 6.2% of the total company operating expense for all business units surveyed in 2001.

The profile of overall IT expenditures was $292 million for exploration IT, $258 million on production IT and $265 million on administrative activities. The uptake of enterprise resource planning systems like SAP and JD Edwards has had a tendency to increase the proportion of administrative IT spending in recent years – but more sophisticated allocation of the ERP costs will spread these costs across the core business processes.

The regional total for IT spending from the survey purely reflects the balance of observations coming from areas like Europe and North America – with $518 million spent in Europe, $288 million in North America and $205 million in South America, Africa, Middle East and Asia Pacific.

2.2 Global Upstream Peer Group Profiles

In order to make meaningful comparisons across business units it is necessary to create a number of peer groups and to present the key performance metrics for specific regions. One of the biggest drivers for differences in IT costs between operating units of the same size and complexity will often relate to local labour costs and the availability of local IT skills.

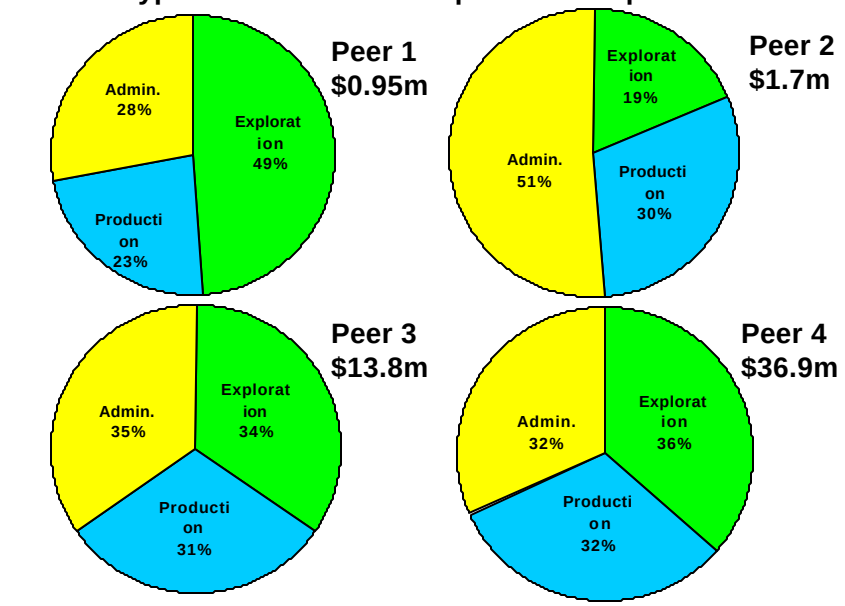
In the most recent AUPEC IT benchmarks the number of desktop devices has been used to create size peers groups. The E&P operating business units are grouped into four peer groups based upon the following schedule:

Table 2 Global Upstream Peer Groups

Size Peer Group	Number of desktop devices
1	0 to 249
2	250 to 449
3	500 to 1499
4	Greater than 1500

Based upon the 2001 survey typical IT expenditure profiles for each peer group are shown in Chart 1. The profiles are based upon average sized companies in each peer group and do not reflect actual results for any participating company.

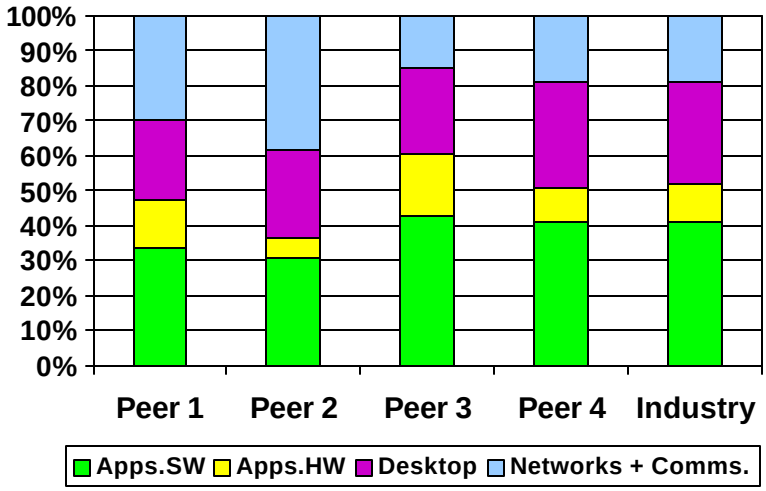
Chart 1. Typical Peer Profiles – upstream IT spend



The typical IT expenditure for a small E&P company is $1 million – with 49% on exploration IT, 23% on production and 28% on administrative activities. Note that the AUPEC survey does include explorationists as well as those that are exploring and producing oil and gas. A very large E&P company would typically commit to $37 million of IT expenditure per annum – split 36% on exploration, 32% on production and 32% on administration. The examples shown are based upon averages for each peer group. The actual business split will of course vary over time and between different companies depending upon the balance of exploration and production activities and whether major investments are taking place with enterprise resource planning systems.

Applications spending – on industry or business specific software systems – typically account for 50% to 60% of the total IT commitments for an E&P company. Chart 2 shows the relative split between applications and infrastructure components spending.

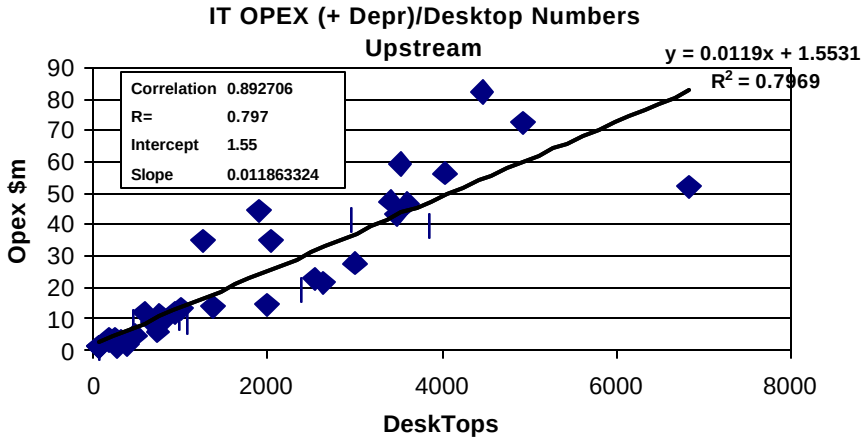
Chart 2. Global Upstream: IT Service Split



2.3 Some key cost performance indicators

When designing a key performance indicator it is important to find a normalising measure, which is a good explanatory variable for the topic being analysed. Over the last few years of the AUPEC survey it has become clear from simple regression analysis (Chart 3) that the total number of desktop devices is a very strong explanatory variable for total IT costs. The relationship between IT costs and oil and gas production is much less strong. The regression slide shown is a useful ready reckoning device for any E&P company as the expected level of IT expenditure can be read off for any size of operation or when planning growth (as measured by the number of desktop devices to be serviced).

Chart 3. Regression analysis – IT Costs versus desktops



Key cost performance indicators used by AUPEC tend to focus on costs per desktop. In the next two charts (Chart 4 and Chart 5) the total costs per desktop device are shown for each peer group and the industry overall. The maximum, minimum and average total unit cost is shown for each peer group. It is interesting to note that the highest cost peer group tends to be Peer Group 3 with average IT costs per desktop of $14,000.

Chart 4. Global Upstream IT Benchmark
Total IT Costs per desktop $

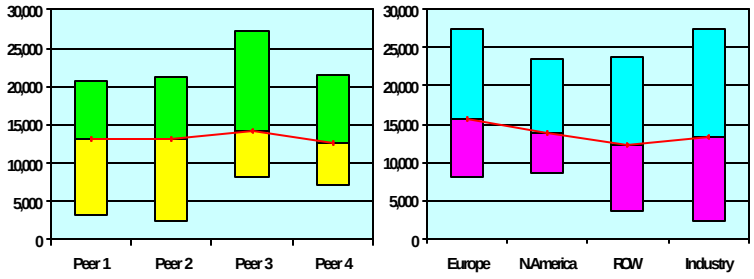
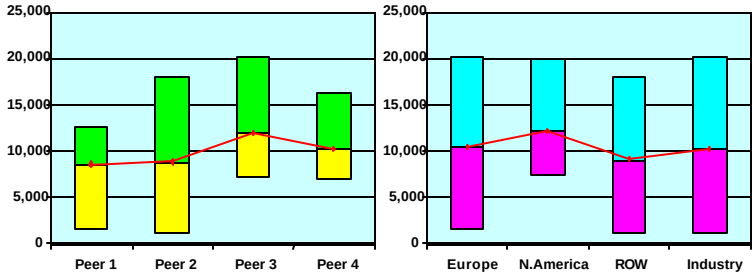


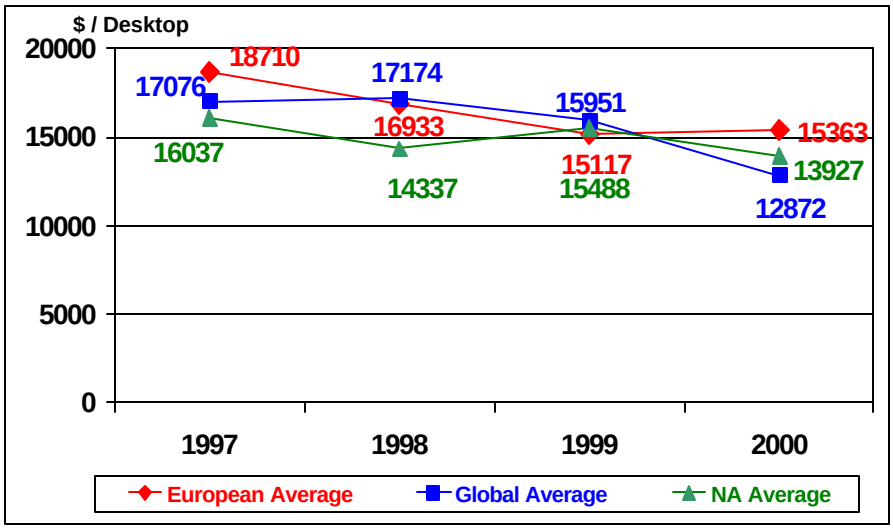
Chart 5. Global Upstream IT Benchmark
IT Baseload Costs per desktop $



Baseload or operating IT costs range from $5000/desktop to $25,000/desktop. Again medium sized business units are seen to commit relatively more to baseload operations.

Finally, a trend slide(Chart 6) is presented showing the overall trends in relative IT commitments (measured here as total IT costs per desktop) over the period 1997 to 2000. A strong downward trend is apparent. This will reflect several factors relating to trends technology costs generally and the industry reaction to oil prices. Many E&P companies will have benefited from the move to distributed computing environments in the early 1990s. The trend in oil prices in the late 1990s will also have made a significant impact on IT commitments and increased pressure to sweat assets as long as possible.

Chart 6 Trend Information: Global Upstream IT Benchmark
IT Opex (inc. depr.)/ Desktop



3. Global Downstream IT Benchmark – the context

The Global Downstream IT Benchmark began as a survey of global downstream oil companies in 1994. Data for the survey is supplied at the country, regional and global levels. The results presented in this paper are from the 2001 survey period and therefore the data relates most to actual spending in the year 2000. Fresh results will be available at the end of Quarter 2, 2002.

Total business expenditure amounted to $20 billion. Total sales volume for the financial period 2000 from all participants totalled 3.2 billion barrels of oil equivalent. The regional split was 37% in Europe, 37% in North America and 26% in all other regions.

3.1 Information Technology Costs – Overall Industry View

As with the Global Upstream survey the Global Downstream benchmarking model has evolved over time into a sophisticated cost data model covering manufacturing, supply, lubricants, marketing and retail and enterprise management activities. Information technology costs are further segmented into an IT Service model with an applications view in each business area and a breakdown of infrastructure costs into the desktop service and networks and communications services. For the overall downstream survey in 2001 total IT expenditure commitments (operating expense plus capital expenditure) amounted to $1.9 billion. IT operating expenses totalled $1.6 billion or 8.1% of total company operating expense for all companies surveyed. The business process split was as follows:

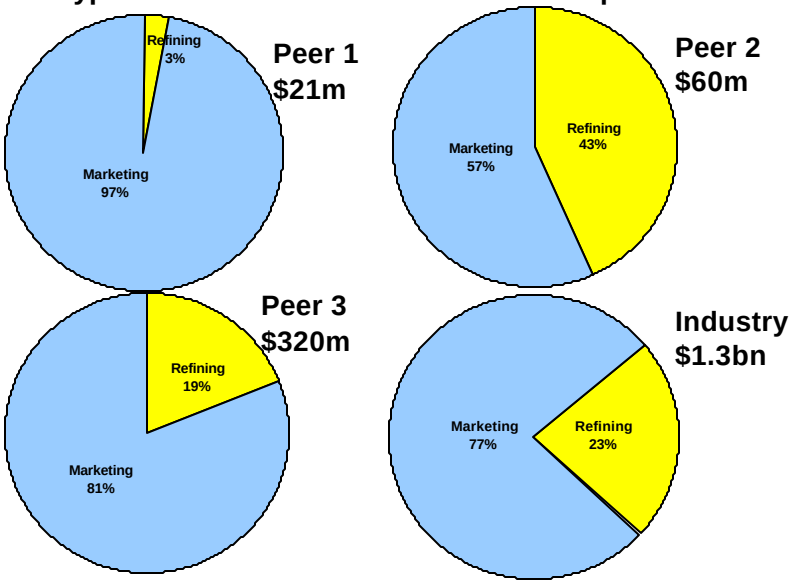
- Manufacturing and supply $300 million
- Marketing and retail $1 billion and
- Enterprise management activities $300 million.

3.1 Global Downstream Peer Group Profiles

In the Global Downstream IT Benchmark size peer groups have been organised in relation to sales volume, with the following schedule:

Size Peer Group	Sales Volume (mmbbls)
1	0-100
2	100-500
3	+500

Chart 7: Typical Peer Profiles – downstream IT spend



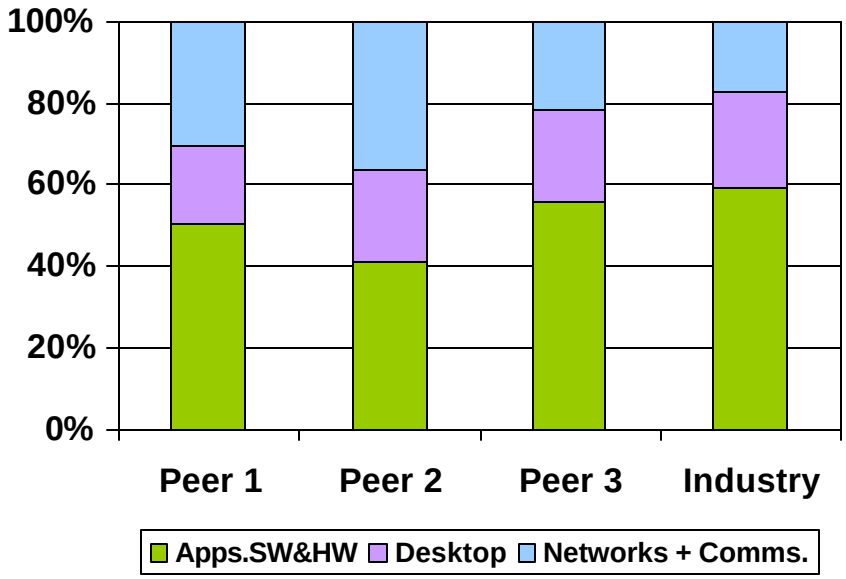
Based upon the 2001 survey typical IT expenditure profiles for each peer group are shown in Chart 7. The profile are based upon an average size company in each peer group and do not reflect actual results for any

particular participating company. The average IT expenditure for a small downstream company (say 50 mmbbls of sales volume) is around $21 million – with $20 million on marketing and $0.6 million on manufacturing per annum. A very large downstream operation (with a sales volume of more than 500 million barrels) would typically have an overall IT expenditure commitment of $320 million – with marketing accounting for 81% of the total annual commitments.

From the industry perspective the majority of IT expenditure in the downstream business is spent in marketing activities. For the data supplied for the 2001 Benchmarking study 77% of the IT expenditure (measured as IT operating expense plus depreciation) was on marketing (including retail), 23% on manufacturing and supply.

Applications spending typically accounts for the larger proportion of the overall IT spend for downstream businesses. Chart 8 illustrates the relative split between applications, desktop and network and communications infrastructure spending measured as IT operating expense plus depreciation.

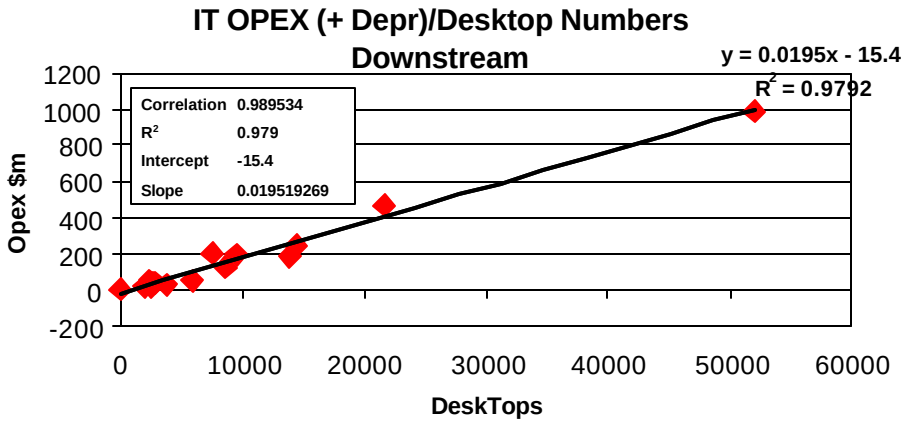
Chart 8 Global Downstream: IT Service Split



3.2 Some Key Economic Performance Indicators

The relationship between IT costs and the total number of desktop devices is very strong in the AUPEC 2001

Chart 9: Regression analysis – IT costs versus desktops



study sample. A simple regression analysis indicates an R^2 of 0.98 (Chart 9). As with the Global Upstream IT Benchmark key IT cost performance indicators used by AUPEC tend to focus on costs per desktop. In the following two charts (Chart 10 and Chart 11) the total costs per desktop device are shown for each size peer group and for the principal geographical regions covered by the participating company data. The maximum, minimum and average total Unit IT cost is shown for each peer group. Largest business units tend to commit much more than the smaller peer group companies.

Chart 10: Global Downstream IT Benchmark
Total IT Costs per desktop $

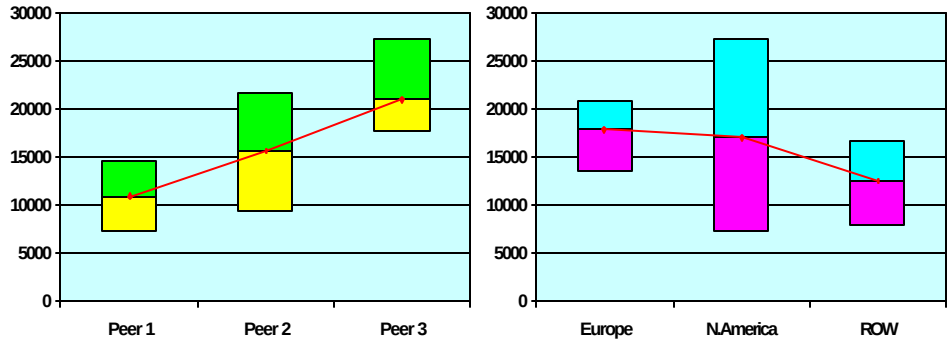
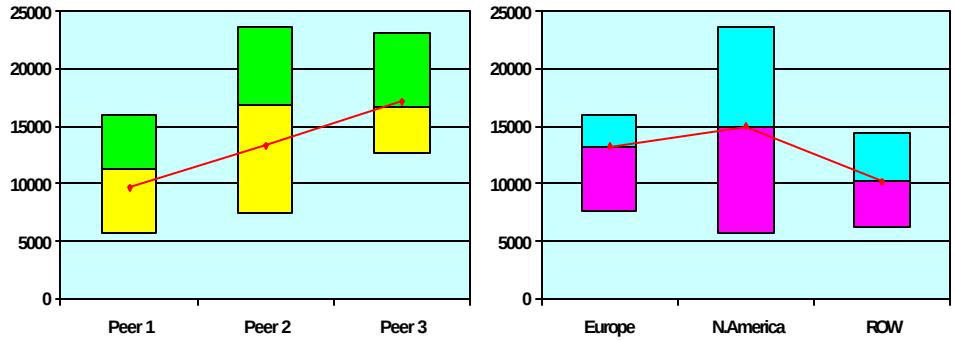
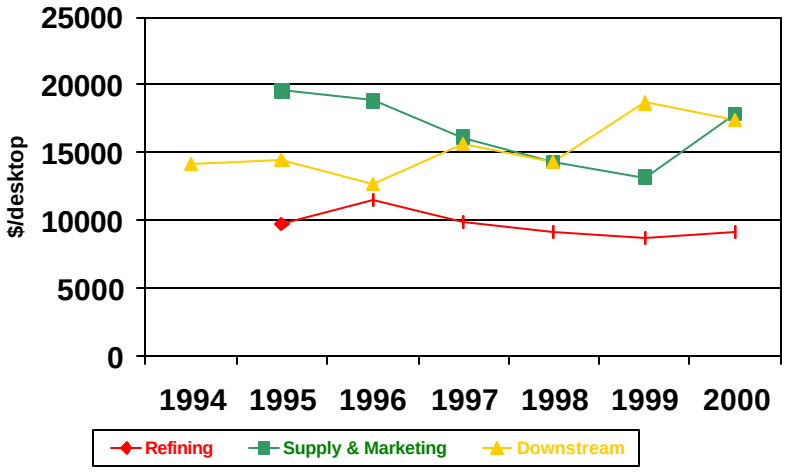


Chart 11: Global Downstream IT Benchmark
IT Baseload Costs per desktop $



Baseload or operating IT costs for downstream businesses range from around $6,000 per desktop to over $24,000 per desktop. Again larger operations tend to commit more to IT baseload operations costs.

Chart 12: Trend Global Downstream Total IT Opex (incl Depreciation)/desktop



Once again, to finalise the analysis of IT costs in the downstream oil industry a high-level trend picture is shown for the period 1998 to 2000 (Chart 12). This illustrates declining relative business area spend, but an overall upward trend when Enterprise Systems spending is included.

Reference

1. The Balanced Scorecard: Translating Strategy into Action, Robert S Kaplan and David P Norton, HBS Press, ISBN 0-87584-651-3, 1996