

Background

Common Data Access Limited (CDA) is a not-for-profit subsidiary of Oil & Gas UK, the leading representative body for the UK offshore oil and gas industry.

During 2010 CDA commissioned Schlumberger to study the 'Value of Data Management'. This study included interviews with senior executives, a search of related literature, a roundtable meeting and a variety of other inputs all designed to illustrate the high value of Data and Data Management to working exploration and production companies.

In the course of the study input was provided by staff at CDA, Schlumberger and a wide range of other organisations. In particular the authors would like to thank staff from the following organisations for providing invaluable insights:

Apache	BG	BP	Centrica	Chevron
ConocoPhillips	Dana Petroleum	DONG Energy	EnQuest	Fairfield Energy
First Oil	Ithaca	Noreco	NPD	Petoro
Premier Oil	Shell	Talisman Energy	Total	UK DECC

This document combines the four elements delivered by the study:

Results	Roundtable	Related Literature	Process
The value that data management and data deliver to E&P companies	A discussion held between senior oil executives about data management	A survey of the documents about the value of data in the oil industry	A description of the process that was followed during this study

All four can also be downloaded individually from the Oil & Gas UK web site at:

<http://www.oilandgasuk.co.uk/datamanagementvaluestudy/>

About the authors

Steve Hawtin joined Schlumberger in 2001 where he has consulted on a wide range of Information Management engagements. For more than 10 years before that Steve worked for Oilfield Systems Limited where, as Technical Director, he was responsible for the creation of products such as GeoScene, DAEX and Quadrate.

David Lecore has worked in the Oil and Gas industry for 25 years, working initially for major operators and then joining Schlumberger in 1997. David's work in Schlumberger has focused on both Information Management and Knowledge Management, concentrating on the governance, process, strategy and value aspects as opposed to technology solutions.

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Introduction

The way subsurface data is handled can have a significant impact on the overall performance of exploration and production (E&P) organisations, all oil companies understand that data is crucial to their operations. Corporate officers are aware of how important this is, and yet many data handling professionals report that their ability to effectively manage data is being hampered by a lack of investment.

Is this perception fair? Are there really attractive opportunities to dramatically improve overall oil company performance by investing more in data management? Or is the current spending level appropriate? This report describes the results of a study commissioned by CDA to explore these questions. This paper was made possible by the support of CDA and Schlumberger, in addition senior executives from the following participating organisations provided invaluable insights:

Apache	BG	BP	Centrica	Chevron
ConocoPhillips	Dana Petroleum	DONG Energy	EnQuest	Fairfield Energy
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This report starts by estimating the value that data generates within E&P companies. It then reviews the most important themes that emerged from the interviews before suggesting areas where improvements are commonly to be found. All E&P companies are generating value with their existing data management, the important question is whether there are compelling business cases to expand on their current capabilities.

The study focused on the information related to the subsurface. This data ranges from exploration data, such as seismic surveys to production data, such as hourly flow readings, and from objective measurements, such as raw log readings to interpreted results such as dynamic reservoir models. The key reason that oil companies employ these categories of data is in order to reduce the “geological uncertainty” that inevitably arises from a lack of direct evidence of the subsurface.

The final conclusion is that all oil company personnel should carefully review their current data management. In most companies there are opportunities to expand the governance, access, security or quality of data which would significantly increase the total value an organisation generates.

Value Based Management

It is reasonable to start by assuming that the goal of any organisation is to generate the maximum benefit from limited available resources. Rational managers have to balance how much they spend on various activities. In an oil company, for example, spend on facilities construction, staffing, production intervention, data acquisition and data management must all be proportionate.

In a perfect world this would mean that budgets would be allocated to different functions based on their “expected rate of return”. When additional budget becomes available it should be given to the department that would have the most positive impact on overall value.

However, even in a simple case, finding the optimal spending balance can present a challenge. In the picture below an extremely simple model of an oil company was exercised with various combinations of spend on three key areas. As the results show even this straightforward model does not have a single simple optimal strategy.

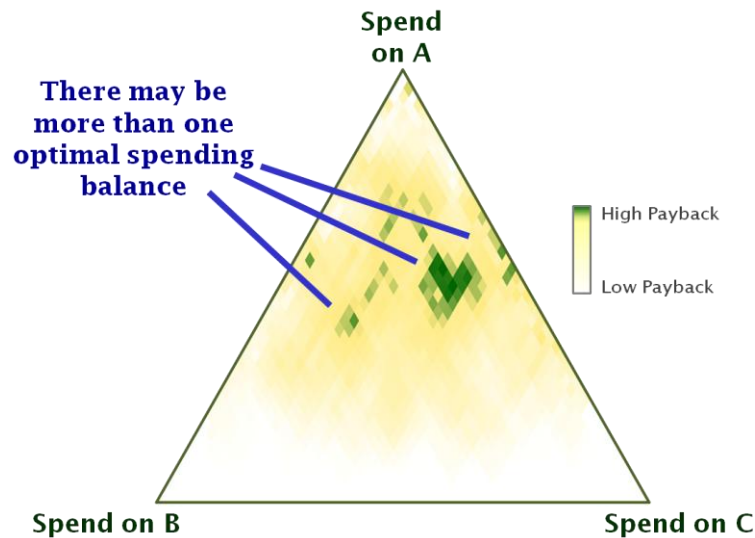


Figure 1: There may be more than one optimal strategy

In the real world, not only is it impossible to experiment with a range of different strategies it is even challenging to tease out the impact of changing a single aspect of the business. The senior executives who decide how to divide up the limited total budget rarely have a background in data management, so it must be up to the data management specialists to demonstrate the real impact that their discipline has on the company's overall performance.

The goal of data management is the timely delivery of relevant information of a known quality in order to inform business decisions. So to understand the optimal amount to spend on this activity one must first understand the value that data currently delivers, and the potential ways that this can be diminished or enhanced.

The "International Valuation Standards Council"¹ suggests that there are three ways to come to a valuation of an intangible asset such as petrotechnical data:

- **Direct market comparison:** identify a "market" where an equivalent is available and use it to estimate a fair price
- **Profit:** Identify the current and future benefit that the company derives from the asset, and use that to estimate a level of investment that would deliver an equivalent yield
- **Cost:** Identify the complete cost to acquire, maintain and if necessary replace the asset

The most reliable estimates of the value of intangible assets would come from the price paid in an open market to obtain it. However while petrotechnical data may be exchanged as part of a company acquisition or a farm-in this almost inevitably combines the data with other assets and makes isolating the data's value impossible.

¹"International Valuation Standards Council" is a body set up to ensure that consistent standards are applied for inclusion in financial statements, whether for regulatory compliance or to support secured lending and transactional activity. Their standard IVS 301.02 describes how to estimate the value of intangible assets.

The value that data generates

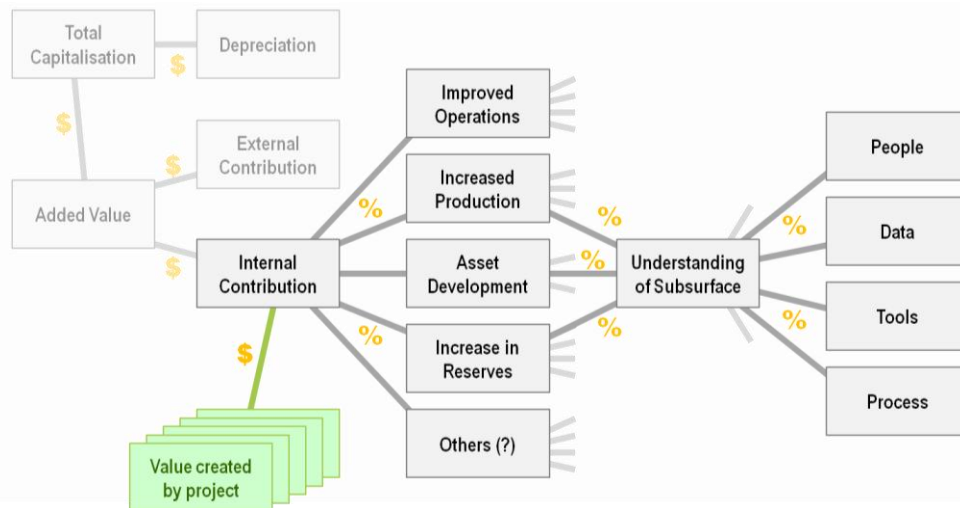


Figure 2: Simplified model of data value

This study adopted the simplified model of value generation shown above. Within this picture the company creates value by participating in a range of projects. The projects most reliant on data can be characterised as being focused on three main goals, “Increasing Production”, “Increasing Reserves” or “Developing Assets”. Each of these tasks is affected by a variety of factors, one of which is how well a company understands the subsurface. This understanding in turn arises from a combination of the people employed as experts, the data available, the tools utilised and the processes adopted.

So the value that data delivers can be estimated by exploring four elements:

- The total value delivered each year by projects
- The company’s balance between exploration, production and development
- The contribution that knowledge of the subsurface delivers to these activities
- The extent to which interpretation of the subsurface is dependent on the data

These questions were explored by interviewing senior oil company managers none of whom were data management specialists. Each of the participants was asked about these four aspects during the interviews, the value that data is delivering to each organisation was estimated by combining these answers.

The value of projects

The financial value delivered annually by each participant in the study varied from company to company and role to role. The values ranged from tens to hundreds of millions of dollars total value per year.

In some cases it is easy to understand the value a particular project generates, for example if a prospect required \$6M of total investment and, once the reserves had been proved, was sold to another company for \$54M then the total value created would be \$48M. If this particular field took 3 years of effort to get to this point then the value generated comes to \$16M/year. If in turn the “Exploration Department” completes two projects of this size in a typical year then that group delivers \$32M of value to the company each year.

In the case of a mature producing field it may be easier to consider the anticipated decline. If no interventions were made for a year it could be that production on a 50,000 barrel per day field would

be expected to drop by 10% per year. A company may arrest this decline by drilling additional wells and performing other interventions, perhaps with a total cost of \$30M. The value this work generates is the anticipated loss of production less the cost of intervention. At, say, \$40/barrel that would be just over \$40M in total. Of course if the operator in this case has partners a proportion of this benefit will be passed to them.

The balance of activities

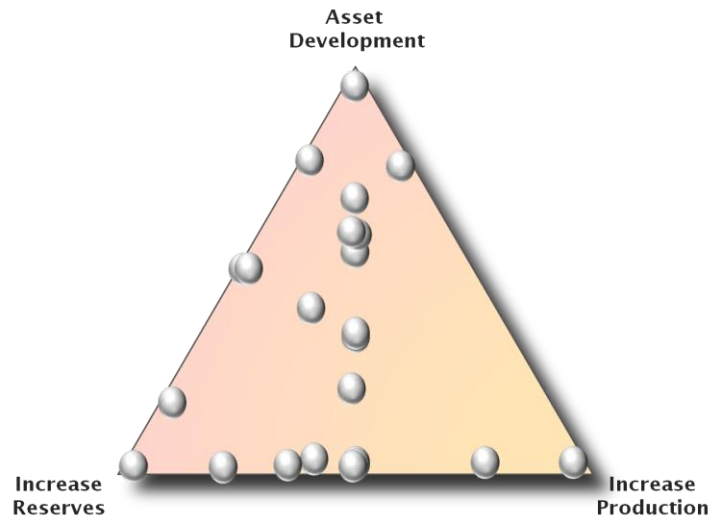


Figure 3: Different oil companies adopt distinct strategies

Oil companies adopt a range of different business strategies. For example one may focus on exploring for new discoveries, another may specialise in optimising production and a third may invest in developing assets to bring them closer to creating revenue. The diagram above shows how the study participants each balanced between these goals, this picture illustrates the range of different roles that the 22 participants have adopted.

The contribution of the subsurface

The impact that a company’s understanding of the subsurface has on its business goals varies from one situation to another. During this study it was assumed that each of the three goals defined above would be influenced to a different degree by the subsurface understanding.

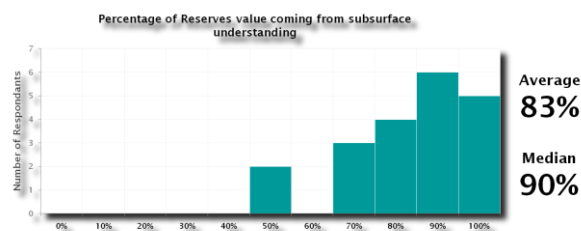


Figure 4: Impact of subsurface on Reserves Replacement

Those that described reserves replacement as one of their key goals were asked to estimate the impact that understanding of the subsurface had on that activity. The results are shown above. All participants estimated that its influence was at least 50%. The majority of participants suggested that at least 90% of the value of increased reserves came from understanding the subsurface.

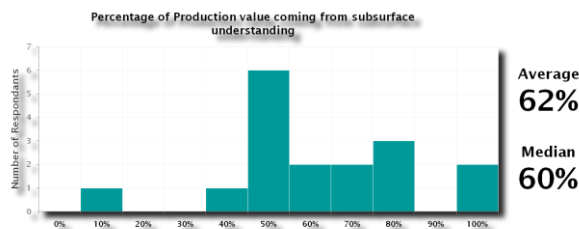


Figure 5: Impact of subsurface on Production Improvements

In contrast the value that subsurface understanding brought to increased production was generally held to be somewhat lower. Many interviewees mentioned the fact that technical innovation and business factors, such as the business relationships with partners, were also major factors. Even in this case however most participants felt that the contribution was more than half the total.

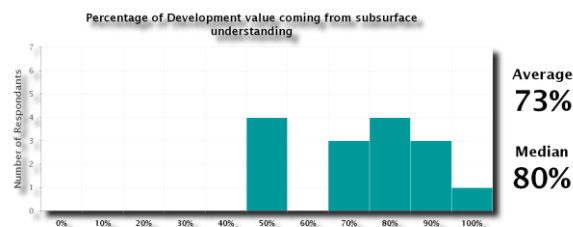


Figure 6: Impact of subsurface on Asset Development

Somewhat predictably the contribution of subsurface understanding to asset development was felt to lie between the two other activities.

Combining the various corporate strategies with the estimates of value the participants in the study on average felt that more than 70% of the value their teams generated came directly from their group’s understanding of the subsurface. Given that the study specifically focused on talking to senior managers in charge of exploiting subsurface resources this should not be a surprising finding.

The interpretation process

The next step is to understand the crucial elements involved in creating the subsurface understanding. The simplified model suggests that this arises from a combination of four components: the people, the tools, the data and the processes they employ.

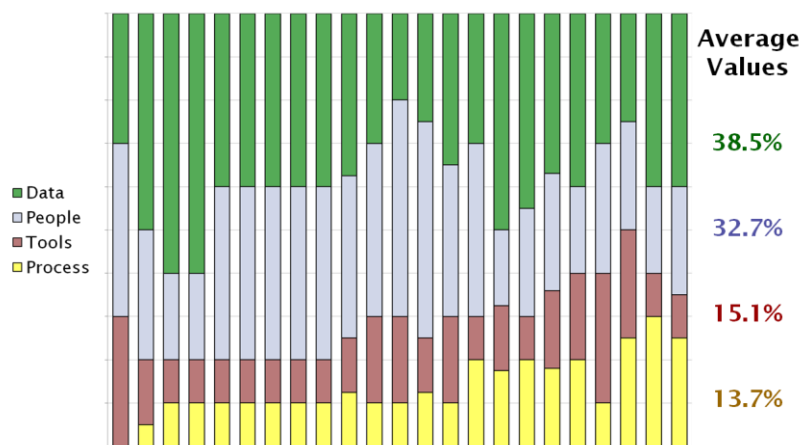


Figure 7: Participant’s individual estimates of what creates subsurface understanding

All of the executives interviewed felt that splitting the interpretation process into these four components provided a reasonable overview. They each assigned different proportions to the four

elements. As the picture above shows most participants emphasised the roles of people and data and felt that tools and processes had a lesser impact.

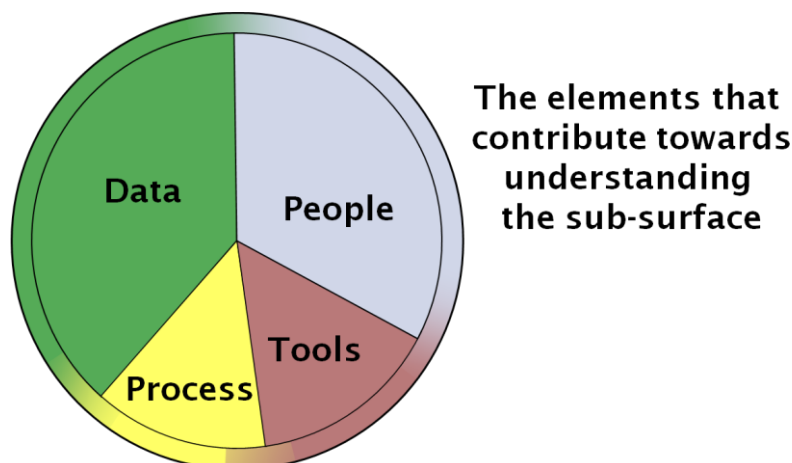


Figure 8: Overall estimates of contribution

These findings are summarised by the pie chart above. This shows that, of the four elements, the majority opinion was that data was marginally the most important.

Resulting Value

Up to this point the strategic balance, the impact of subsurface understanding and the elements that contribute to it have all been estimated in isolation. Combining them together provides an estimate of the impact that data has on an E&P company’s total performance.

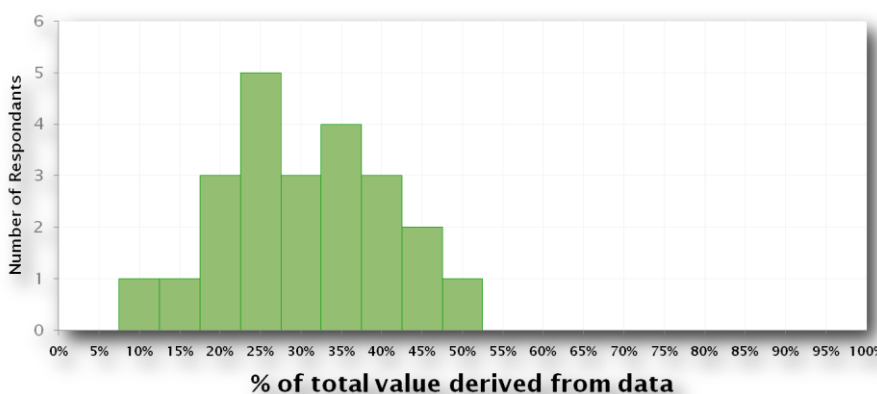


Figure 9: Participant’s estimates of the contribution of data to total corporate value

The conclusion from the senior oil company staff interviewed is that data contributes between a quarter and a third of the total value generated each year by all the activities of a typical E&P company. So in an asset team that is generating \$100M of value a year, for example by arresting the production decline of a field, a value of \$25M-\$33M a year is derived from the petrotechnical data it holds.

Unexpected Data Value

The day-to-day manipulation of data delivers a high value to E&P companies every year. However this estimate comes from the expected use of the data, there are also some specific occasions when data leads to unexpected benefits. During the course of this study a number of these cases came up.

One might anticipate that once a field is depleted the associated data is no longer of any value. However there are a number of fields in the Southern North Sea that, while they no longer have viable reservoirs of hydro-carbons are being discussed as possible locations to sequester carbon-dioxide or to store gas. Knowledge of subsurface geometry is one of the key factors to make these possibilities viable.

The most extreme case encountered concerned data that was thought no longer valuable 20 years ago. In the UK many coal mines were closed down when they were deemed to not be economic. The “Coal Board”, who was the body responsible, decided that any interpreted data should be disposed of since it had ceased to be of any value. Recently it has been realised that the coal beds could be an economically viable source of methane. The companies involved are now actively seeking hand drawn subsurface maps that were surreptitiously kept by ex-miners for sentimental and artistic reasons.

The Staffa Field in the North Sea is another well documented case². The field has had four operators; the company who discovered it in 1985; the company who brought it to production in 1992, but then applied for cessation of production in 1999 after producing only 13% of STOIP due to wax or wax hydrate problems in the export pipeline; a third company who took over the licence, only to relinquish without further activity in 2006. The fourth operator has managed to overcome the wax issues, due in part to a re-evaluation of crude oil samples found to be still in storage. The lesson here is that data, even for fields that have been through cessation of production can reveal unexpected value.

A company who had taken over a large mature North Sea field from its original operator put together a program to rejuvenate the field and commenced a program to re-create the reservoir model. They soon identified short-falls in data reliability in both recent and historic data³ and had to do considerable work to improve data quality; however other ‘model build activities’ involved data mining for a number of data types not applied in the field for some time. Although the original operator had not been fully applying these data types they had fortunately continued to collect them and with some work the data could be found, often buried in boxes in a 3rd party store. These data types have proved to be a valuable contributor to the new reservoir model. The lesson here being that had the original operator not continued to capture and store the data, the current operator could never have added value it has.

Issues of confidentiality and space have limited the number of cases we can outline here, however anyone experienced in the E&P industry will have their own list of cases where data has had an unexpected high impact on the value a project has delivered.

Cost of data

Given that data delivers significant business value to the company it is obvious to ask how much it costs to obtain it. The costs vary from one data category to the next, however these can be grouped into two sets: data that comes from direct measurement; and that from interpretation processes.

² See <http://www.fairfield-energy.com/pages/view/staffa>

³ Pyle J. “Forties Field: Data Management to Full Field Simulation” (2010) presented at the SIS Global Forum 2010

Measurements

In the case of direct measurements, such as seismic surveys, well log curves and production measurements, these costs are well defined and relatively easy to estimate. Many of the companies interviewed employ a “Value of Information” (VoI) process when acquiring significant data sets such as seismic surveys, well log data, even reprocessing of existing seismic. This process creates a business case for acquiring the data where the company considers the cost of the data and a specific question it would address.

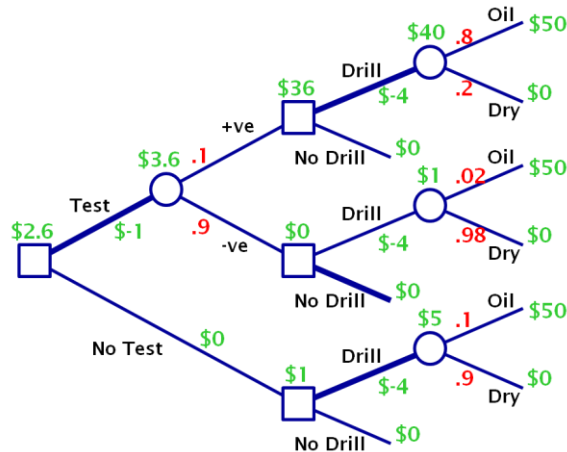


Figure 10: Decision trees help support the business case for data acquisition

In most VoI processes the business case for acquiring data is tied to a particular question that the target data will answer and, this value will often be realised within a few months of the data being available. Data is often acquired to meet a very specific need. However in most cases it will also help clarify other issues, and in some cases it may deliver completely unexpected value. The VoI process usually ignores these additional sources of data value.

The costs of purchasing some data is closely monitored and widely understood, however the data obtained, the “raw measurements”, can only be understood by technical specialists.

Interpretations

The data that has the most direct impact on business decisions, such as static geological models and dynamic reservoir models, are the result of combining a wide range of evidence using the skill and judgement of experienced staff. The cost of obtaining these interpreted results is much more difficult to estimate. Any attempt to do so would have to be aware of all the contributing elements and the cost of the interpretation process.

It is noticeable that for the unprocessed data it is simple to estimate the costs, but complex to understand the impact, while for the interpreted data understanding the business impact is easier but the costs are more difficult to calculate.

Key Themes

Over the course of this study a large number of different aspects of data handling were discussed. A small number of these emerged as consistent themes. There are many factors that influence the optimal strategy for data management, this section focuses on the ones which senior managers should consider.

At the start of the study a number of themes were explored which in the analysis did not prove to have a significant impact. These included whether a company was publicly quoted or privately held or how much competition each organisation felt it had. The location of participating companies was primarily within the UK, however experience from other markets suggests that the role that data plays, the importance placed on good data management and the levels of spending are similar in the UK to many other regions.

Oil companies each have their own balance between exploration, production and asset development. As has already been seen the participants in the study span the complete range of possible combinations and, there are clear differences in the importance placed on different categories of data, however there were no systematic differences in the way that data was handled across this spectrum.

Data lifetime

When measuring the impact of data management it is important to be aware of how long data continues to generate value. If a measurement is only relevant for a short period of time then deploying scarce resources to keep it for long periods is clearly not justified. The anticipated lifetime of data depends on the category of data. In the course of this study three distinct groupings emerged: seismic data; measurements from wells; and interpreted data.

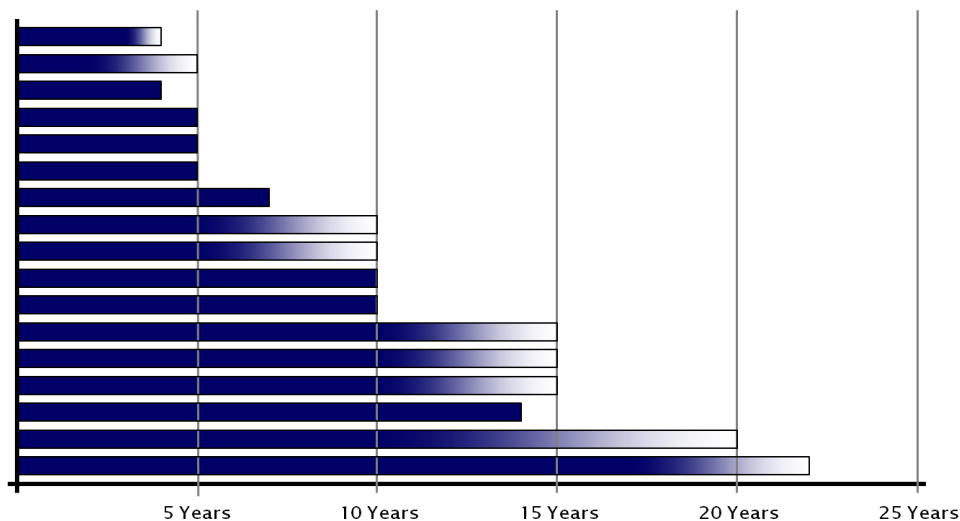


Figure 11: The expected valuable lifetime of seismic data ranges from 4 to 20 years

When participants were asked how long they expected to keep getting value from seismic they gave answers ranging from 4 to 20 years. This is based on the fact that innovative seismic technologies are being created which make it more cost effective to re-shoot a survey than attempt to reprocess it. Seismic acquired more recently usually supersedes older surveys.

In contrast, when the same question was asked about measurements from wells, the universal answer was that this data would continue to be valuable for the lifetime of the field. It didn't matter whether those were well logs taken early in its life, continual readings such as production numbers or occasional measurements such as well tests. Well curve data acquired in the 1970s is still continuing to deliver insights into some fields in the North Sea. Even if this data appeared not to be delivering value the UK government imposes some legal obligations on making the data available for future analysis.

The interpretations, such items as static and dynamic models of the fields, have a more varied perceived lifetime. Some of the respondents were aware that interpretations that influenced major

decisions should be available for future scrutiny. However even where it was acknowledged that this need existed there was an awareness that it is not currently being met.

Company Size

Oil companies range in size from a few people that can sit in a single room to some of the largest organisations on the planet. It is not surprising to find that they take different approaches to managing their data. In selecting which companies to talk to and who to talk to within them, this study deliberately attempted to sample as diverse a range as possible.

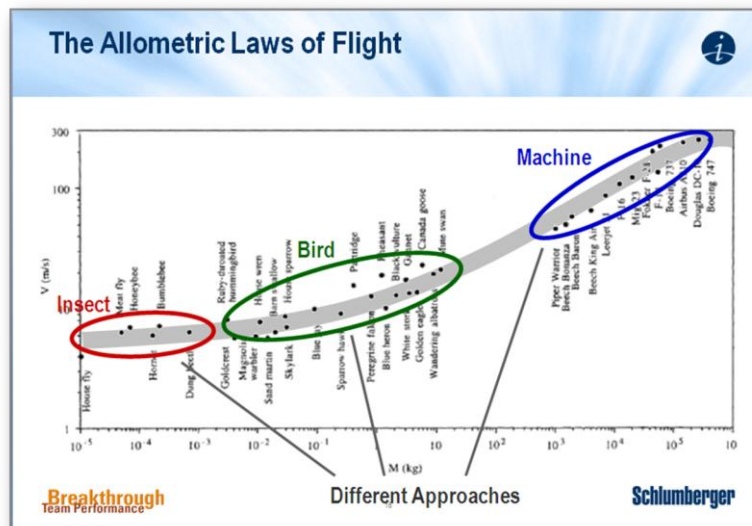


Figure 12: Distinct approaches enable flight in different size ranges⁴

Insects, birds and airplanes all employ different technologies to allow them to fly, a bee scaled up to the size of an Airbus A380 would collapse under its own weight. Similarly the best implementation of data management obviously varies according to the size of the company involved. A small organisation can take a more flexible approach that would result in chaos in a larger group, a large organisation can invest in defining precise practices whose imposition would paralyse a smaller one.

These radical differences meant that this study focused on the resulting performance metrics, rather than on individual implementation details. With flight the underlying laws of aerodynamics mean that despite the radical differences in implementation all flying things cluster round a single curve, similarly the realities of data management mean that all these organisations have some underlying dynamics that allow us to compare different sized organisations.

The Data Management function

Within the organisations involved in this study the data management function is carried out by groups with a wide range of positions. In some companies the management of petrotechnical data is carried out within the asset teams, in some it is considered to be part of an "Information Services" department, in some it is a distinct group and in many it is a mix of these.

When interviewing senior staff there was an unsurprising lack of interest in exactly who performed data management. However based on extensive prior experience our suspicion is that the vast majority of data managers qualified in other domains and have little formal training in data

⁴ From Kozman, J. and Hawtin, S. "The Main Sequence: Matching Data Management Change to the Organization" (2008) presented at PNEC12 - Houston

management. It was noticeable that none of the senior executives interviewed had a data management background. This is exactly in line with our initial expectations.

This “Cinderella” status of data management is something that has been widely recognised in the industry. CDA and other organisations are working to remedy this by establishing a set of data management competencies which will become a framework for independent certification, career development and recruitment.

The current absence of formal qualifications and lack of executive interest typically combine to ensure that there is no widely agreed definition of exactly what “data management” entails. Does it include publication of interpreted results such as geological models? Does it manage all data delivered to partners? What about application support for E&P software? In most E&P organisations these important topics are almost never discussed.

Cost v Investment

We have argued that spend on data management should be considered in relation to the benefits that it delivers. Any potential additional costs should be weighed against the benefit they will bring and only acted upon if the business case is compelling. However a small but significant number of the participants viewed data management in a slightly different way.

Their picture was that data management was a required activity, somewhat like having electricity in a building, and that the company’s interests would be best served by identifying the least expensive way to provide this service. Under this model data management is seen as a commodity, so the organisation should obtain it from the least expensive supplier. Indeed if all the data interactions involved had been documented this might potentially be a viable way to reduce costs.

Of course, any aspects of the role that can be delivered by less expensive resources should be. But since data delivers a significant proportion of an E&P company’s value, selecting a suitable third party to be responsible for it should take into account more than a simple question of who is the lowest bidder.

Literature Search

As part of the research for this study a number of specialist oil industry consolidated sources, professional societies and libraries were accessed. These included OnePetro⁵, the Lyell Collection⁶ and personal collections. The authors have unlimited access to millions of articles from many of the leading societies, journals and publishers relevant to our industry. While a number of interesting and informative items were identified in these sources, very few provided insight into data management issues, in particular, very few discuss the ‘value’ of data management especially considering how important it is to E&P projects. The most interesting articles have been listed separately in the “Related Literature” document.

One conclusion was that until very recently the data management community has most often published and presented their methods and challenges to themselves. Users and the budget holders have not been involved in the discussion of data management challenges or potential solutions.

⁵ OnePetro.org is a multi-society library that provides access a broad range of technical literature related to the oil and gas exploration and production industry, not least the Society of Petroleum Engineers and World Petroleum Congress. The site indexes more than 85,000 E&P related documents.

⁶ Launched in 2007 to celebrate 200 years of the Geological Society of London, the Lyell Collection is an online collection comprising of the Society’s journal titles, Special Publications and key book series containing more than 18,000 items

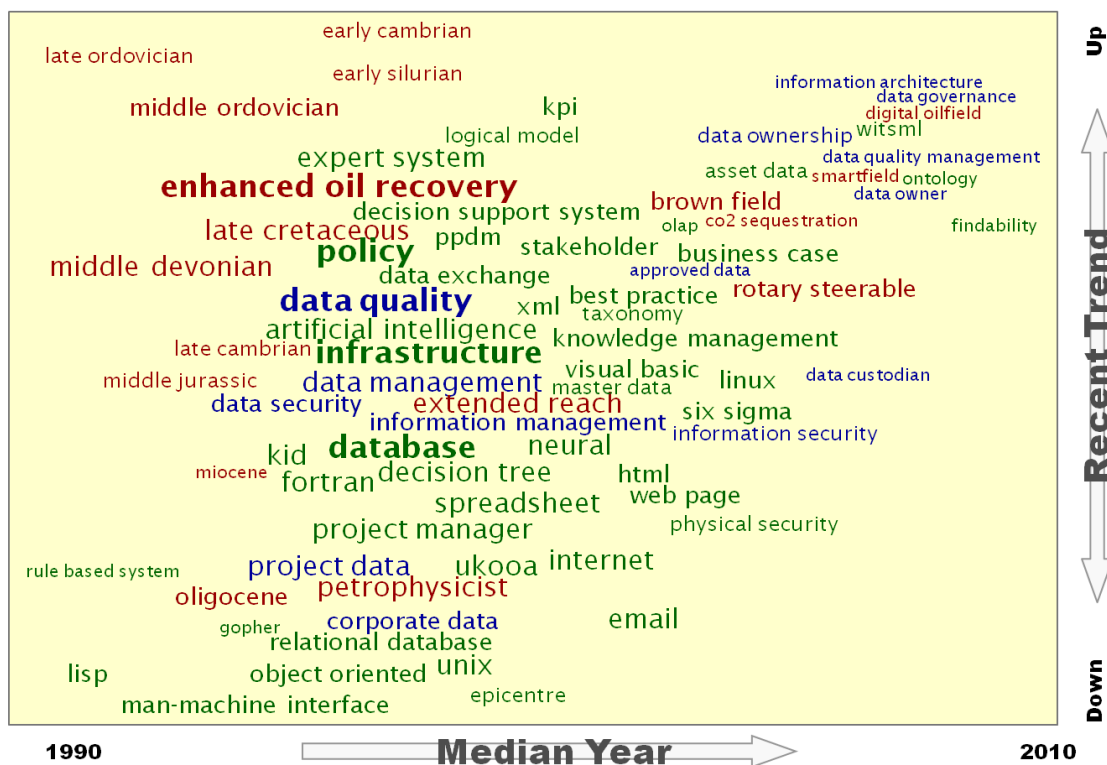


Figure 13: Summary of trends for terms in OnePetro

In addition to using the OnePetro site to identify particular articles of interest it was decided to analyse the terms being used across the whole range of publications they index. In order to do this the number of items returned for each year from 1980-2010 for a range of search term was noted. This data was used to identify the years when terms were most active and how usage of each term has varied over the last few years. A more detailed description of this process can be found in the “Related Literature” document. The results are summarised in the figure above.

The terms listed in the top right hand corner are those which are both recent and growing strongly in usage. Many of these are related to data management. This would appear to show that the importance of data management is receiving growing recognition in the journals and conferences dedicated to E&P business issues.

Value of Data Management

Data brings a significant value, often more value than one might have initially guessed. This value can be increased by effectively managing the data, or conversely, the potential of data can be eroded significantly if it is not available to those who need it when they need or it is of a quality that is unacceptable. However, these two factors together don't necessarily prove that data management improvements are amongst the most attractive investment opportunities in the majority of oil companies, to demonstrate that it is necessary to accurately estimate the costs and benefits and compare those with the alternatives.

What is Data Management?

Before the value of “data management” can be assessed it is crucial that the meaning of the term is agreed. It was clear that most of the senior oil company executives interviewed for this study had a similar view of “data management” and what it entails. They perceived that the main goal of data management is to hold and make available the raw or unprocessed data in a form that can be used by geoscientists. They include categories such as seismic and well log data that are obtained from outside the organisation, and exclude interpreted data such as simulation models and static geological models. In addition while production data has been incorporated in recent years it is still rare for the drilling information to be.

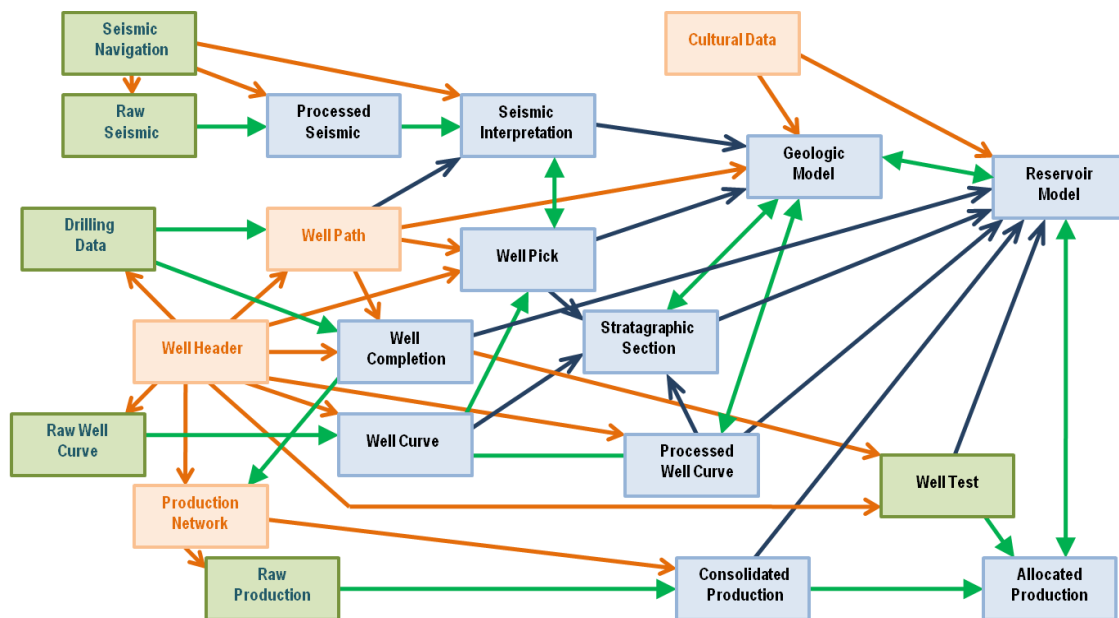


Figure 14: An oil company uses many categories of data

In our experience the best data managers don't usually share this restricted view. They perceive that the goal of data management is to enable all the data flows required to support the business. They believe that keeping track of the interpreted information is at least as important as tracking the initial measurements. After all it is the more refined data items that influence the key business decisions. Tracking the data that is sent to partners and the government is also crucial, since that delivery is tied to corporate legal responsibilities.

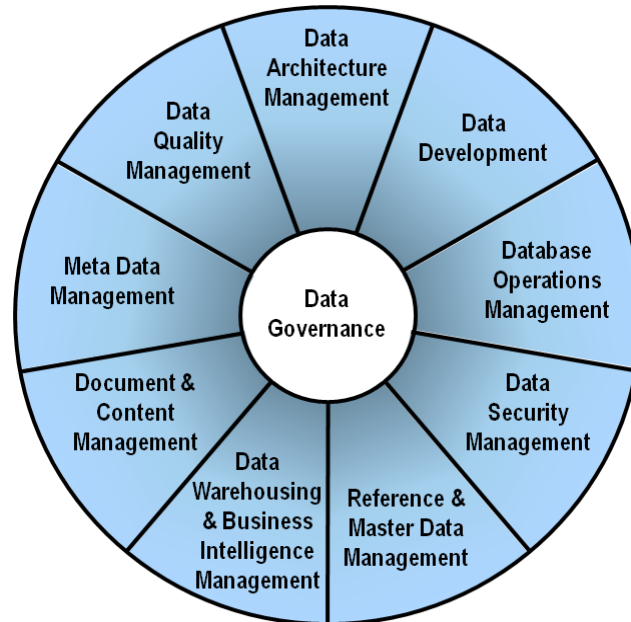


Figure 15: The 10 DAMA Data Management Functions⁷

The most widely accepted description of “Data Management” is probably that provided by DAMA, an international association. In their “Data Management Body of Knowledge” the subject is defined in relation to the 10 functions shown above. Any complete review of data management would need to touch on all ten of the functions, however in this study will focus on the four that have the clearest financial impact on the business:

- Data Governance
- Data Security Management
- Reference & Master Data Management
- Data Quality Management

Data Governance

A consistent approach to handling data is the key to effective data management. As explained in the section above about company size, in a small organisation this can be achieved by allowing an individual to control the processes, however as soon as a larger team is involved it is crucial that important assumptions and principles are documented and shared.

Within the companies surveyed it was uncommon to find any evidence of the systematic definition of data architecture, ownership roles, data strategy discussion or coordination of investments in improving data handling. There was not even any awareness of formal groups tasked with agreeing on these topics.

⁷ DAMA (Data Management International) is an independent association of information handling professionals that work in a range of industries. This picture comes from their “Data Management Body of Knowledge” (DMBoK) published in 2009 in ISBN 978-0977140084

Data Security Management



Figure 16: Data Security Management starts by understanding the risks

All data is subject to a wide range of risks. In this case two obvious ones stand out, risk of losing data or of competitors acquiring access to it. There was a case of a company who were bringing on stream a satellite field with two production wells; two days before production start up they could not find the completion drawings for either well. What chance would there be of finding those drawings five years later?

The potential valuable life of different groups of data has already been discussed. However one doesn't need to wait for years for data's valuable life to end, it can be cut unduly short simply because it is misplaced or even if it is not available with what the geoscientist would consider a reasonable effort.

The North Sea has seen an influx of smaller operators acquiring the assets of many of the major oil companies that dominated up until the 1990s. Many of those companies are willing to look back over past data, often buried deep in storage warehouses. There are many examples of companies who are struggling to get the data together they need, but on the other hand are willing to do so as they see that their ability to extract additional value from old data as the key to their continuing success.

Reference & Master Data Management

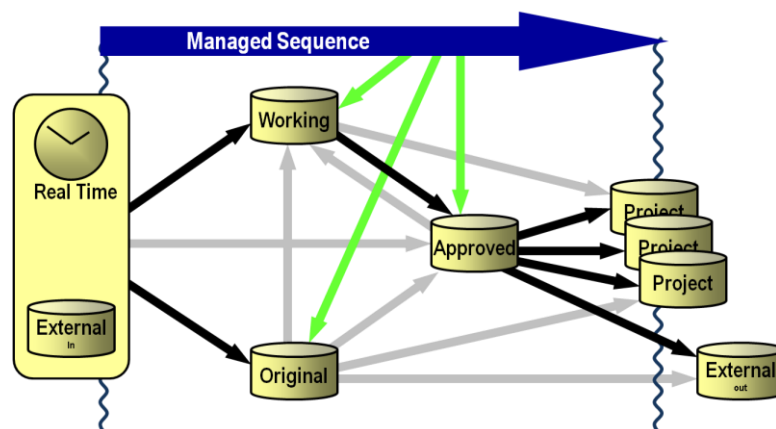


Figure 17: Data plays a number of roles as it is processed

As each category of data is acquired, edited, interpreted and distributed it moves from one repository to another. Each of these locations makes the data accessible to different groups of potential users. One of the most important roles that is played is that of "Master", or "Corporate" or "Approved" data,

this is typically the most long lived and widely accessible version of the data, and should be the highest quality version. As a result, in a well run organisation, it is the most widely used.

Ensuring that the key data categories have a clearly defined, widely used and well managed set of these roles is one of the most important tasks that data management have to carry out. There are no oil companies that reach this high standard for all their categories of data.

Data Quality Management

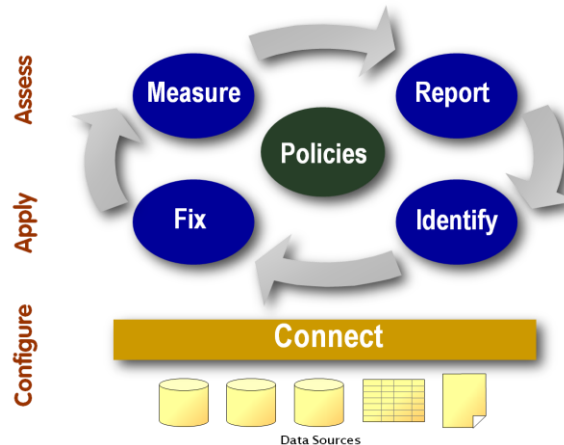


Figure 18: Data Quality Management is a continual process

If the users don't trust the quality of the data they won't use it and it might as well not be kept. As with the Data Security Management the usual key here is the widespread adoption of straightforward processes and procedures.

When data is available from multiple locations and each copy is liable to be "fixed" by different sets of users data quality issues are almost guaranteed to arise. If data quality is not monitored in a systematic way then it is easy to fool yourself into thinking the data is "good enough" when any objective review would show it clearly isn't. The best judges of current data quality are the users, not the data managers.

A variety of tools can be employed to measure data quality, the most effective of these the ones that have been specifically built to support E&P data. These tools are most valuable when they are used to identify where quality problems originate. Finding ways to fix the offending data manipulation processes so that quality is maintained requires input from data managers and the active participation of users.

In a mature basin like the North Sea there are few factors that bring about competitive advantage. The initial data is often shared, the same tools and personnel are available to all. However one differentiating factor is the relative quality of the corporate data, a small improvement in data quality can have a disproportionate effect on overall company performance.

Conclusion

The business benefits available to E&P companies from the management of subsurface of data are rarely quantified and are therefore widely unappreciated. This study shows that effective data management policies and practices have a direct and significant influence on the value that a typical oil company generates each year and that improvements in these areas will surely lead to overall company performance improvements.



The business value case for data management - a study

Roundtable



The Roundtable

As part of the study of the business value of data management a “Roundtable” meeting was held at CDA’s Aberdeen office on Wednesday 12th January 2011. A complete description of this event and the other activities within the study is provided in the “Process” document which can be obtained from the Oil & Gas UK web site. The following oil company executives attended the event:

Klaas Koster	Development Apache	Manager:	Simon Hendry	Exploration & Appraisal Manager: BP
Colin Percival	Exploration Dana Petroleum	Manager:	Brian Brown	Contracts Fairfield Energy
Dave Kemshell	Asset Leader: Shell	Development	Ton Ruijgrok	Information Total

We would like to thank these individuals for providing their time and input to the study.

This document is an edited transcript of the conversation that took place. The questions that are inserted into the text had been sent to the attendees in advance. In this text the name “Dave” refers to Dave Kemshell, while “David” is David Lecore who was acting as the moderator.

The Conversation

Value based management

The available budget is always limited. Managers must decide how to balance spend on things like buildings, staff, infrastructure and facilities construction. This means they have to estimate the value that alternate possibilities will deliver.

Question: *How do you compare the value that different possible expenditures deliver to your organisation?*

Simon: For exploration, appraisal, production there are global forums that decide how much BP, as an organisation, is going to spend on their exploration effort, their appraisal effort and their development effort. If I come down the spectrum for each one of those bits and pieces of business you typically have a value of information study that pertains to gathering data for that piece of business. So if you bring it as far down as a single exploration well you will have to justify the formation evaluation programme and the bits and pieces of data you gather throughout that. That's where it gets to in terms of the nitty gritty. In terms of archival data that resides with the individual businesses they are the data owners. We've changed our business model over the past 2 to 3 years so we've gone very functional, so essentially the North Sea is a production division now and the North Sea in Norway own that piece and all the data that comes with it.

David: Most people are familiar with the “value of information” process because it's not just BP that have it. It takes into account the value of acquiring the data. In BP does it take any form of account of the value of managing that data

afterwards?

Simon: I'd say not. There is a lot of account given to how you will set it up, how you will then move it through the data storage system but long term retention, my gut feeling is there isn't.

Colin: I don't think there generally is.

Brian: That is a key issue.

David: You mean there's no consideration to the cost of managing data or to the value or benefit of managing it beyond the point where you have returned your investment in that data?

Simon: That's right. So the in-perpetuity cost of the data, I'd say, is not accounted for other than as an ongoing cost of running the business.

Colin: Yes that's the way we work.

**Brian Brown**

Brian: From Fairfield's point of view we've got oil and gas development projects, we've got opportunities that we assess on whether they meet our return on capital employed, if it does we will invest in it. We use a systematic economic model for that. When we do any kind of initiative in relation to data management or data storage it's a much more ad hoc justification. Somebody may come up with an idea but the economic rigour that's applied is nowhere near the same as it is when assessing the potential returns that we get from a field, or developing a field or activities in that area. So I would say it's very definitely a poor relation because the operators always view the value in producing the oil and gas and they don't fully see the value in effectively managing the data to lead to those things.

Klaas: Another way to say more or less the same thing is to say that the cost of data management is so small compared to all the other expenditures that we have, like drilling wells, that we're really not cost limited in our data management. It's not a cost that's preventing us from doing an even better job than we are already doing. Its time, people and recognising what should be done but it's not a dollar cost.

David: Is it recognised that the people who create and consume the data are part of that process or is it the concept that the data management is to be done by the data managers?

Klaas: In our business model the data manager is expected to take the lead on this, recognise that and propose the things that need to be done. We don't have people on our management team that necessarily are aware, or familiar with, or have strong opinions on that but there is a recognition that we need to hire the right people to do data management for us and then rely on those people to come up with recommendations on how to do this appropriately.

David: If there is no cost limitation then does that suggest that you aren't getting the value you expect?

Klaas: I wouldn't necessarily conclude that, I'm just saying that it isn't a cost constraint, it's a people constraint and recognising what should be done and having the resources in terms of people to actually do it.

Brian: Senior Managers also don't have the attention on data management because nobody is coming to them to say "do you realise you are losing this money through poor data management, do you realise the opportunities that have been missed or that the value you have eroded into your company through not having this properly assessed, managed and controlled". If somebody said "do you realise you are losing 50 million a year", that would suddenly become the top of their radar screen but it is hard to link poor data management with the impact it has on the business. A dry well for example, might not be attributed to something to do with data, it might be assumed that we're a few million years late.

Klaas: Adding to that Brian, of course most managers don't like you to come with problems. You need to come to them with solutions, it would be even more powerful if, as a data manager you said "hey guess what, here's an opportunity to prevent loss of value by doing these things and this is what it will cost". I would like to think that in our organisation there would be a nod and a question "yes of course, why haven't you done this yet?".

**Simon Hendry & Colin Percival**

Colin: It can be very difficult to quantify what that loss might be.

Ton: This is the point of trying to find business cases that clearly show that losing money is related to poor data management. We have tried to find those business cases over the years, but they're difficult to pin point.

Simon: I think we've changed our position over the past few years, at one time there was a lot of focus on cost reduction, like rationalisation of databases. Now it is starting to come to the attention of the senior management that the efficiency of a limited subsurface staff is hindered by the access to data. So the sales point for good data management practice is more around the bench time that the interpreters get on a day to day basis where they're not chasing data. If they can get more time thinking about the subsurface issues rather than spending 20% to 40% of their time looking for data, that's the business case that we use.

David: If you were an interpreter and you were going to go and look for some data and it was immediately available when you anticipated taking longer to find it, how would you reinvest that time? Would you continue to look for more supporting data? Would you do more interpretation or would you bring the end of the project forward and start your next project early? A lot of interpreters would consider looking for even more details rather than putting more time into the interpretation.



Dave Kemshell

Dave: There is a risk of that happening within an organisation. This is incumbent upon leadership within the organisation, we want to try and drive efficiency and get less people to do more. So when it comes to managing wells and reservoirs one thing that we're trying to put into place is exception based surveillance. That is systems to really highlight something that's not going according to plan. If an individual is looking after 50 wells straight away they can see the one well that is not behaving, and they can focus their attention on that. With that sort of system in place you're basically putting in some forcing mechanisms to expand an individual's scope of work.

Colin: In the smaller organisations like Dana, the idea of a project just running on and on and on is much less likely, once you've got to an acceptable

solution the project will stop and we will move on to another one.

Brian: What you say is a classic example where if somebody saves a significant amount of time the question is do they just waste it. If you look at engineering CTRs it's very often that an engineer will estimate 400 hours to do something and he'll take 399 hours to do it and that's just a human nature thing and maybe there's a bit of an Aberdeen thing in there, in that you want to look accurate in relation to your estimate. If you took half the time then, then next time you have to do that job you'll only be given half the time.

Dave: Also in the North Sea the targets are becoming ever and ever smaller and therefore the manpower time is actually becoming more and more significant. So we have to drive down life cycle times and hence that the cost of maturing up these activities. There's a huge focus on maturing up a well in a matter of months rather than years.

Klaas: But spending the same amount of time on a project for an interpreter, this interpreter will have more time because he gets his data quicker and he can spend more time on details so the quality of his output will rise. Is that not an added value?

Brian: It is because you are reducing your risk.

Simon: You might get to develop different models, different ways of looking at it may mean you don't do the spend, whereas if you'd only developed one interpretation of that you might, get into a hole and come up with the wrong solution.

David: How do you compare the value that different possible expenditures deliver to your organisation?

Dave: The cost of managing your legacy data is typically an operating cost rather than a capital cost and indeed it is budgeted in a different way. Quite often the default approach to budgeting would be to take last year's budget and reduce it by, say 5% for a cost and efficiency saving. That's the reality. It requires some other intervention to change that approach. That may be a high profile data incident, for example, that triggers a realisation that we've got an issue here or it may be some sort of more senior management realisation of a need to check that trend or do something different. We have put in place a number of data management improvement projects. Indeed one of the challenges is always trying to first of all quantify the benefit and justify it.

David: So why do you start those projects?

Dave: One of the things we try to do is to try and make more visible the “as is” situation with our data management, how easy is it for engineers to access that data, if they're spending an inordinate amount of time to access it then there is a big prize there in terms of a time saving on engineers to access the data. If we're wanting to make decisions much quicker, particularly in the real time domain, there's a business case to be made for setting up so that you can make snap decisions and optimise production on an hour by hour basis. The data is important. It's also important to have a means of turning that data into information, so it's important we've got the right models to do something with that data and to evaluate different options. You also have to have a decent execution capability it's all very well if you can analyse the data and model it, but if you can't do anything about it, if you can't execute out in the field then that sort of value loop gets broken. I'm somewhat wary of assigning percentages of value to the data. You are only as good as the weakest part of your overall chain.

Simon: With the events of last year there's obviously a new focus on compliance and data management and holding data for these have become refocused by the Macondo Event and post Shell's reserve crisis in 2004. Those were both jolts to the industry which focused attention on data and its retention in the organisation. So I would say they have a certain influence on how senior management in the organisation would view retaining data.

Colin: That's really it isn't it? I mean it's giving your chief executive or board members some reasonable focus on data management otherwise it's not really there. Has our CEO ever asked me about data management? No.

David: But do dry wells ever trigger discussions about data management?

Klaas: That happened a few years ago, Schlumberger was heavily involved in one project. We saw that after a few years of taking over Forties from BP, the success rate overall of our drilling campaign started to splutter, so there was a rethink of what we could do to make the next step. As part

of that effort it was recognised, that airing out all the data and establishing quality control and organisation the data was worth doing. That initiative was triggered by some disappointment on the return that we were getting from the asset. So not so much a single well or a single incident but more like an underperforming asset, we asked what can we do to make this go better and data management was seen as one of the contributing factors.

The Value of Data Management

The value that petrotechnical data generates is substantial. Data in all its forms, at all stages of the E&P value changing from licence / basin entry to mature field rejuvenation is therefore an important company asset.

Question: *Do you think your company is doing everything it should do to preserve and realise the value of all data?*

David: Do you think your company is doing everything it could to preserve and realise the value of data?

Klaas: There's a big difference between could or should. You can always think of other things that you could be doing. If it was flagged by somebody in the data management discipline that there was a shortage of people that prevents us from doing things that really should be done, then we'd act.

David: With no disrespect to data managers, they're not often the people who are best placed to talk in business terms to the business managers about the benefits of doing data management.

Colin: Not at all I would say. That's one thing you don't have a conversation about. It really is, as we've been discussing, the value of that data. It's mainly about the organisation of getting the cost involved in it.

Brian: Yes, it's kind of a Cinderella function. A lot of senior managers are subsurface geologists, so they are obsessed with that data, looking at it and the access to it. But once you've done what you needed to do, or once you acquired the field or whatever, the management of it is left to somebody else. It's assumed that it will get looked after, but they move on to the next, what are the other rocks that we need to look at, the other data we need to acquire. You know there's always certain bits of data that people are obsessed with at certain times but they are not really worried about what happens to the stuff from the previous project and if that is managed in a systematic manner. We're just a one

asset operator and so when you go to try and acquire something or to develop something you're very interested in that. After you've finished with that, it kind of fades away and nobody is checking that it is systematically filed away for the next time. This is a major issue, because of what senior managers see as adding value to a company, the data management isn't high on their radar screen it's not seen as something that's really going to assist the company to grow.

Klaas: True enough but if Cinderella says that she wants a new broom or vacuum cleaner she can get it. It's not typically management that would suggest "hey here's a new broom for you". We rely on data management to suggest, "if we could get this, then we can do all of this for you".

Colin: But that sort of conversation doesn't really happen, does it? Does a data manager come along and say actually you know if you relook at this data you'll discover X million barrels or cut costs by one million dollars.

Brian: A newer bit of technology to reinterpret, to give you a clearer picture, you know they'll always do that.

Klaas: So from that point of view, I wish we had a data manager that could make that connection.

Dave: It has to be a partnership between the data management function and the business function. Coming back to what we call the value loop, we're looking at physical assets, it could be that the hardware offshore or it could be data, data is an asset. You've got your asset so you have to do something with it to come up with decisions and plans to execute out in the real world. You have to look at the whole of that process and build it up to where you can see the value. When it comes to data management, the first thing that we want to try and do is make the status of our data visible. For example, well testing data, if we're not getting well test data on a regular basis we want to make that visible so that we can get management attention on making sure we're acquiring that data and doing something with it. You also need to resolve data quality issues. By making the status of your current data set visible you realise you've got gaps in certain areas or you're not storing it particularly well. You look at projects to fix the legacy issues and as well you also want to make sure that you've taking a sustainable approach to maintaining. You don't mop up the floor until you've turned off the tap. So if you fix all your problems but at the same

time make sure you've got the right controls and people in training and procedures in place to manage the acquisition of new data.

Ton: One of the problems is in the data management community there are a lot of people that are, let's say, "reactive". They expect the business to tell them what it needs which is a bit contradictory to what you said because what the business expects is for the data management teams to raise issues and to propose new solutions. It's a kind of a chicken and egg situation in that the data management community is waiting for the business to tell them what they need and the domains are waiting for the data management to come up with solutions. There are always people in data management teams with a proactive approach, but it can be difficult to energize everybody in the data management domain and to have this approach adopted. Historically, some data management staff have a 'librarian' background and putting changes in place can be challenging.



Ton Ruijgrok & Dave Kemshell

Dave: But when you get a data manager who is vocal and dynamic it's fantastic. We had an example where we were running a data cleanup project, the woman in charge of it turned up with some pink rubber washing up gloves and said I'm here to clean up your data and it was a great start to a very good working relationship.

Simon: I think it depends on where you are in the life cycle of your organisation as well. BP squirreled away data and have been gathering it for some time but in the last two decades we also outsourced a lot of our data management, so it was seen as an operating expense. At one point it was under the "property and management" area. All the data was housed, but the folks looking after it weren't, for the most part, staff of the organisation, and so couldn't be proactive, couldn't say "this is

how you need to treat your data and this is how I can improve it for you". They could happily store it for us and keep giving us a bill at the beginning and end of each year. Now we've gone full circle on that and brought the data management discipline back in-house and given it a seat at a leadership table so they can represent their views forcefully and say this is what we need, for the license to operate, or to improve the efficiency of our staff.

Colin: Integration with the business that's key. I mean it's relatively straight forward for us as a smaller organisation. In that there isn't a full time data manager he's kind of part time and sits with us so he's fully aware of the business needs. So there is that conversation. Soon as you outsource it, or even move it to another building or down in the basement it can get lost.

David: Is outsourcing something that's a negative thing for data management?



Simon Hendry

Simon: I'd say it's. If you continue to have a hand on the tiller and know what you're expecting and continuing to set the expectations of what is required then that's fine. But if you're outsourcing it, in a sense, you're absolving yourself of responsibility then it can be a bad thing.

Colin: I would say treat it carefully.

Brian: There's that old chestnut that outsourcing a problem never ever solves the problem it just moves the problem to somebody else. Fairfield being a small operator we're currently not big enough to invest a huge amount in the control of data management, then all of a sudden it will be too late because we'll have 3 or 4 or 5 fields and everybody will have managed that data in a different way and trying to pull it together will be a real headache. So there's kind of an opportunity for the small operators to do it right. This is how we should start it off and keep it going but it's not a big enough part of what we're trying to do at the moment, and then all of a sudden it goes beyond

there and you've got to spend a large amount of time and effort bringing it into a systematic approach.

Klaas: I have a bit of a problem seeing data management as something you would outsource big parts of. Maybe the storage of boxes in a warehouse, surely you don't need to do that yourself. But I think we've discussed this morning plenty about how important the data is integrated in your workflows. It's very hard to imagine how that can be done by an outside organisation.

Simon: From my experience, speaking personally rather than on behalf of BP, outsourcing is started with the best intentions, but as it becomes a commodity and a service line we get to the point where you're looking at budgets year on year. I think we mentioned, the drive to reduce it by 5% next year, and so the service line and the level of delivery starts tailing off and you realise then that you don't have anybody with the skills and even the competencies in that discipline to keep tabs on how that is managed.

Colin: Nobody is looking to derive more value, everybody is looking to reduce the cost.

Brian: As a contracts manager I would be very interested if a company came to me and said look, you know, we can solve your data management problems, we've developed a model that we can take your data and actually a couple of other independents are already doing the same thing and it will run really nice and smooth, I would be very interested in that. Then if I went to speak to all the subsurface guys they would probably go "you don't want to be doing that, that's going to cause a major issue, we want to keep our hands on our data, scruffy though it may be, at least I know it's sitting on my big H: drive". I think there are certain people that look for a different solution and to the small independents that might be quite good, but the technical experts who are processing and interpreting that data are very protective about what happens to it. Obviously senior managers will listen to those people, rightly so.

David: Are they protective for their own personal reasons? From a corporate or organisational point of view, other potential users aren't necessarily aware of where that is.

Brian: That's absolutely the point, the individuals are very protective of their data.

Ton: It's also a time issue, during his project the interpreter wants to have his data in his "C:" drive. When the project is finished, he will move on to something else and the data and added value will remain on his "C:" drive. This added value needs to be captured and a combined effort between the interpreter and data manager would be the thing to do. Unfortunately, we see too often people moving on without taking any action, so some of the value that they have created is lost.

Brian: Absolutely, that happens a lot, where an individual will move on and nobody quite understood what he was doing in that area, there may be a real nugget sitting there but because he's moved on to other projects its lost.

Dave: We use outsourcing, I mean sending data to CDA is a form of outsourcing. As well as providing a backup facility, in case of a business continuity incident, so you've got an alternative source or safe place for your data storage.

Ton: You can outsource a lot but you cannot outsource the responsibility. I think that's the main thing, you need to remain responsible for what is happening on the process and the concept that you want to put in place around your data.

David: So how in Total do people understand what their individual responsibilities are?

Ton: Well, over the years more and more. Over the last decade, interpretation teams and asset teams have, more and more, taken up the responsibility for "long term" data management. This was not the case before. So things are changing and people become aware that something needs to be done at the end of the project. The data management team should pick this up and store the results so they can easily be re-used rather than "putting them in a library somewhere and locking the door".

Data Ownership

'Data ownership models' assign various responsibilities to senior managers - who sign the POs, users - who create and manipulate data and to data managers - who manage data. These roles have names such as data owner, data steward and data custodian.

Question: In your organisation who is the data owner?

Ton: When new people come in, they get an introduction on how to deal with their data but we do not have a fixed process or model for this. On

the 'training passport' for new personnel, an information management session is included.

Simon: Data Ownership is coming back into fashion at BP, by establishing data management back as a discipline that competes with the geoscience and engineering disciplines. That's arrived along with a change in the organisation which has defined, "this is where the data is stored for you in that field, this is a naming convention and the guideline that you are to follow and this is what we expect you to do with the data when you're finished with it". Is it significantly enforced? I'd say no, but I know someone who is trying to enforce it, hence the pink rubber gloves.



Colin Percival

Colin: We have a transparent data ownership model at Dana but we're a smaller organisation so it's easier. We've essentially got the management team of nine people each of the asset managers is responsible for the data within their areas. They may manage it between those areas slightly differently but they are the responsible person, in terms of the structure, where things are stored, any outsourcing and so on.

David: Are there any other roles than "data owner" related to that?

Colin: Well I mean the asset manager is responsible. I have a part time data manager within my organisation, there are other things he does, who would actually be responsible for putting it in various places and the discussion is between him and the asset manager about the overall structure.

Dave: We have what we call a "data atlas". We also have something called "group records management" which applies across the Shell group, that is around defining what we call "file plans" –

the foundation for Shell's Group Records Management system, which describes which pieces of information are actual records to be kept and therefore have to be "published" and which repository they are stored in. The ongoing maintenance of those controls presents continual challenges, with the flux of people coming into the organisation, but the intent is certainly there.

David: So what's the main reason why companies try to preserve their data?

Brian: I think there's absolute understanding that the data has got value. If you've just completed a well and everything is working that's great. You will record everything that's been done in relation to the subsurface interpretation and the development of that well because you know you'll need to go back to it at some point. So it's definitely recognised that that's important and that's kept accurately and efficiently and systematically because there's going to be valuable later. Each of the asset managers in Fairfield has got that responsibility, and has got a dedicated data/IT manager to look after it, and so that will be done slightly differently. There's not the rigour of audits and cross checks done on how asset managers maintain and control their data. There's not a significant consequence to the asset manager if you can't find something because nobody can prove you had it in the first place, but the value is definitely something that's recognised and that's why it's stored. We wouldn't keep anything if it didn't have a perceived value.

Dave: One key thing you need in your controls process is definition of a retention period for the data and somebody has to make that call.

David: The retention on petrotechnical data types in the UK is in perpetuity.

Colin: For raw data but interpretation type stuff might not be the case.

Dave: Some data, particularly some of the real time data is coming in such volume, terabytes a day, that the cost of just maintaining and storing it is quite prohibitive so you also want to be thinking about means of filtering out the key data and actually discarding the rest.

Simon: That also depends on where you are active and the regulatory regime you find yourself in. For Norway and the UK there is a directive and you have obligations, as the operator, to keep the data in perpetuity. Data has a very short shelf life here in the UK and in Norway. So there is less incentive maybe to retain that as kind of an asset.

David: What is your own personal attitude towards data management as a discipline?

Simon: I find it a constant struggle at the minute to get access to good quality data and have it validated so I'm fully supportive of the moves that we've been making to essentially bring back some control and standards to the data that we maintain. For example ownership, I'm one of the owners with responsibility for a large portion of the data that we maintain outside of the fields that we've produced from.

Dave: I think it's important to consider data as a valuable asset which can help you to maximise business value on the data management discipline. Particularly in a large organisation, this is a means to ensure a sort of functional excellence in data management and standardisation of replication across a large organisation. I think it's important that there is a close working relationship between the data managers and the other sorts of business functions. You want the data management discipline to have that strong relationship with the business but also to have a strong relationship back with their function. It's also important to manage the relationships at a number of levels within the organisation. We try to give the end users of the data a voice as well, we've set up what we call a "data management forum" which is a bit like a Toyota style work group where the users of the data meet with the data managers, where issues are brought up and hopefully solved. So it's a very important part of the business.

The 'Data Manager' role

It is common for Data Managers to say that their role is under appreciated; it is not a well respected career choice, training and development plans are not commonplace and career road maps don't lead to senior positions.

Question: *Is this true? If it is, why? If not, in what way is it not?*

Colin: Data management is absolutely critical. I had it banded into me at an early age that the accessibility of the data is absolutely fundamental.

It is the building blocks of the value that we create. It is the cornerstone of any interpretations, right from the individual interpreting seismic to the person storing the data. Having some clear way of doing it so that everybody buys in is the key. Going back 5 years ago, it was very easy for us to organise our data, in fact you could probably ask several other individuals and they'd know pretty much what the database was. As the organisation grows it becomes more and more of a problem. So the structure that we had then is no longer fit for purpose we've had to grow it through time. It's always slightly out of sync with where you are. I would say, if anything, our structure at the moment is a bit too complex for where we are but it's got some room for us to grow into it. Your database gets bigger, problems get bigger.

Brian: I think from Fairfield's perspective we're recognising that not having the right data in the right place can cause us significant problems quite quickly. One is just focusing on the opportunities and being able to boil down those opportunities as to where we spend our limited resources. We actually took on a data manager who after about 8 months left again, he was one of the quieter types of data manager and just couldn't cope with the flood of data that was coming in from what we acquired. We're going to be spending about £2M this year on a critical document review because the data that we acquired from Shell for Dunlin was of an age and a type where we almost had to say we needed to start again. That's not a criticism of Shell, it's just that over 30 years they have probably applied 2 or 3 different types of data management to the technical data for a platform. We don't know whether there is a flange there or not, we don't know if that's been coded, so we've had to re-audit all that data. So we recognise when you're acquiring things the importance of the analysis of the data, getting it right, getting it structured and then being able to use it effectively. I don't think we, as Fairfield, have got a systematic answer to what we need to do next to move forward and get a really good grip of it. Now we are fortunate that Amec are our duty holders so Amec have got a rigorous kind of data control methodology which we have paid for and which we

are getting them to use from a technical side, not from a subsurface side but from a technical execution side. That's helping us a lot but the cost of data and the consequences of not having the correct data is quite a big thing in Fairfield at the moment. Especially in relation to what you pay for an asset.

David: So when you're acquiring assets do you, as an organisation, give consideration to the value of the associated data and its quality?

Colin: In a deal, I'll tell you from Dana's prospective, no. They'll be down on their headline matrix on that deal and, yes, somebody will pick up all the baggage in due course because of the data which may, or may not, come across and probably all won't come across cause people can't find it.

Brian: Yes that's right, that's how it works.

Changes in attitudes towards Data Management

The 'data environment' has changed over the decades, with a move from physical to digital data, the ever increasing volumes and types of data, while at the same time peoples' attitudes towards the benefits and needs for data management has also had its ups and downs.

Question: *What is your own current attitude towards the data management discipline?*

Ton: I'm a bit biased concerning the data management discipline, it pays my bills. But overall, within Total, more and more attention is paid to data management. The problem we still have is not so much the storage of raw data. It is fairly easy to put in place tools and procedures to capture that. One thing we are still struggling with is capturing the 'added value' created by the interpreters: horizons; markers; faults; geological models; reservoir models; analysis, reports and so on. A data management team cannot decide which model, horizon or report is the correct one to store. A problem could arise if the business teams expect this from data management. Another thing that we're struggling with is the link between the static data and the dynamic data. The static data like geological or geophysical data needs a different approach than reservoir data that is more dynamic over time.

Colin: On the interpretation side, it's become worse through time as we've stopped reporting things really.

Ton: Things go quicker and quicker.

Colin: And nobody writes reports anymore.

Klaas: My personal attitude to data management, love it, hate it, uneasy about it. I love it in the sense that I like data. I want it and need it and recognise the value of it. And I hate it in that often I can't easily access whether the data I have is good quality and complete. Because of that I'm kind of uneasy about it always thinking, well should we be doing more, are we doing what needs to be done, why isn't my data manager more proactive, why isn't he picking this up, why isn't he asking for something to be done. Does it mean that we're in a good place, does it mean that he simply doesn't think that?

Colin: Do data managers have the background to actually see where they can create value from their data? Historically that hasn't been there. It hasn't been their role.

David: And the role of the geoscientist isn't necessarily to manage the data so the person who benefits from what the data manager does isn't the data manager.



Klaas Koster

Klaas: Some of our core interpretation tools, like the wonderful Petrel program, from a data management point of view, are about as bad as could possibly have been invented. Maybe you would like to comment on that?

David: This is not an appropriate forum for defending the capabilities of specific software, but that particular tool was originally developed by people who focused exclusively on interpretation.

Klaas: For the data management discipline, it's just as important to realise how that data they are custodians of can be used to add that value. It's not good enough to just ensure, here I have great data and this is where it is sitting, it has to be useable.

David: Geoscientists are more focused on the functionality of the software from an interpretation point of view than from a data point of view maybe

we'll see the data integration catching up with the interpretation power. Is that something that you would disagree with?

Simon: The software tools that are available to us on the market, by the time they reach senior management they tend to have gone through an evaluation period. It's presented as "this is the piece of software for the integrated system that's going to solve all our problems". My senior management talk about, "well the data's all in Landmark isn't it", and it might be but we once had a corporate data store where it was all actually supposed to be stored as well. So that's a bit of shared responsibility in that when it is sold as a new piece of kit it's because it has all this functionality, not because it does the mundane data work. The other piece which comes more from the data side, from the people that data management is outsourced to, is the battle about can we solve it by organisation of the systems, by defining a place for everything or is it so far gone that we're into data mining. Maybe you can get to everything quickly by mining and having a clever system to get to it. I think that idea's lodged at some point in the higher echelons of many organisations. Well data management is just too hard to solve but we can find a way to mine to it quickly.

David: Except, even with data mining, it still needs to exist and you still need to know where to look.

Simon: You know, I think that's something that still causes a little bit of conflict. In the past decade some people have come to believe that solving your data management problems is too hard, therefore, we'll mine for it.

Brian: As an independent operator who has just acquired somebody else's data my question is do we start from scratch and re-audit everything or do we have a system that can hopefully get the right links into the rough data summaries so we can pull that information out? But that requires that the indexes need to have already been created.

David: So if you didn't know that Staffa oil was where it was you would never have...

Brian: You're absolutely correct, what level do you go and cross check and redo things that have already been done in order to validate the data so that you've got a good active set to start on.

Ton: When we started thinking of digital data management 20-30 years ago, initiatives started in

the individual domains. Geologists started building well data bases, geophysicists came up with ideas how to handle seismic data and reservoir engineers worried about the production data. There was no common approach. Over two decades these initiatives have become 'silos' with dedicated tools, procedures and data managers. You can still see this with several data management service companies. When the CEO is a geologist, their focus will be on well data, when the CEO is a geophysicist, the focus will be seismic. These types of silos do also exist in Total. Data management nowadays has become a much more "transverse" domain and should integrate the different disciplines: geology; geophysics; reservoir; and IT as well. This is, and will be, a challenge in the coming years because it is difficult to find or train people with this transverse skill set.

Colin: Within Dana I look after all the data and all the stages of the life cycle.

Dave: If we look at our control framework for information management, we've divided it up, across the business, into 20 to 30 work streams and that covers everything from the technical data to legal, finance and HR/ personnel data. So we have to look at data management across the entire business and every aspect of it. When it comes down to the more technical domains we then subdivide that up so we have a work stream for development, for example. There's one for wells, there's one for project engineering. So that's creating the silos which can be a good thing because it gives you strength and focus, but then the other thing is to manage the integration across those, and that's also something that we try to do. So, for example, we have one data management group that's addressing subsurface and wells.

Brian: In our organisation we have a policy for how we look after our data, a definition of the IT capability that we've got, where things will be put and how things will be stored. That provides the basket for where the data is to be put but it's the individual data managers that you just mentioned, like the drilling guys, who will be responsible for their drilling data. We wouldn't have a stream of all the data associated with a particular well in a

certain place, it's basically "what data are you looking for?". Our data manager gives the framework as to where data can be housed and the IT capability to house it, but whether that's rigidly adhered to or not would be a big question. Whether the policy has teeth to say when things are going in the wrong place, or ever whether we audit to make sure people are putting things in the right place is the big question.

The 'scope' of the Data Management function

Traditionally the 'data management department' has focused: More on raw and original format data - Less on interpreted and results data; More on the Exploration phase - Less on the Production phase; More on G&G - Less on Production and Drilling

Question: *What is the scope of those you consider 'data managers' within your organisation? Should it change?*

Colin: Obviously it depends on how your organisation is structured. For instance, in Dana we don't do drilling, we outsource all that so we'll have a provider who will look after all the data that he needs to drill the well. Obviously the well data will come to us in due course, to our data manager who sits beneath the asset manager. He will get that data eventually but on a day to day basis, the drilling service provider looks after it. We, as a company, just focus on the subsurface and commercial data.

David: Is there a career development path for data management?

Simon: As I've already said in BP it's been recognised as a separate discipline again, there were times when it was subsumed into IT, it's now been created as a separate discipline. Within BP, for the most part and historically, it has been subsurface focused disciplines that have become data managers. I'd say that's again broadening out to cover all of the functions now, so specifically drilling and HSE. We're looking at creating career paths and plans that will help focus to move to be a data manager for either an asset or a whole organisation. So that's it, that's evolving.

David: Geologists and the geophysicists have domain training yet you'd be hard pressed to find domain training that is E&P specific data management. What's your experience?

Ton: In Total we have a clear career path for data managers, we try to hire young geoscientists or IT people and give them all the appropriate training.

For example a geophysicist will get all kinds of IT training and training in the other geosciences domains. We aim to create transverse orientated people who can discuss with all the different metiers on a professional level, including IT. As for geology, geophysics and reservoir engineering, within Total, geo-information is one of the four metiers with a complete career path.

David: In some organisations you will have a particular E&P process they follow to go through, for example generating your prospect to a drillable state. Have your organisations embedded data management requirements into those?

Dave: Yes, we have. First of all our approach to data management is a risk based one so you're looking at where you've got your biggest exposure

Data Governance

DAMA, the premier organisation for data management professionals worldwide define Data Governance as 'the exercise of authority and control (planning, monitoring, and enforcement) over the management of data assets.'

Question: *What sorts of controls have been created within your own organisation and how well have they been adopted?*

David: What about data governance? Have you put in place mechanisms that control data by introducing quality standards, naming conventions, even communication standards?

Brian: I think probably everybody has. We have policies and procedures but I would say currently that's about as far as it's gone. It says how we would like things to be done and what naming conventions are. The company has hired a lot of people with a lot of experience as to what they've done in previous organisations so I don't think has been rigorously applied. The policy and procedure has been considered, thought about, developed and handed out to people when they come into the organisation, but then there are other things which take higher priority. As long as an individual gets his job done, there's not an audit. That's probably something that's lacking in the company, but that's back to this perception of data managing and data control.

David: So can you give me an example?

Brian: Naming conventions and drive conventions. We've got redundant servers for business interruption and the policy will say that, as well as saving it in this drive, it will be copied and replicated in this drive here. So if you have a crisis or a crash in your software at this location you can go back to the previous version. We started off with a few servers and then you suddenly find the amount of data that you can now acquire from even modern subsurface tools is such a volume now, you can become overwhelmed with the data.

or opportunity and focusing the efforts to those areas. For a major project, for example, one of the deliverables of a concept select gate, might have an information management plan. It would say how we are setting up this field of

development to maximise the value of the information. Potentially we could check that the data looks right, the model is located appropriately, named appropriately and so on. We have what we call a Petrel health check, in the lead up to a gate meeting. The gate meetings are typically looking at the project in its entirety, what you want to do is to have focused discipline reviews first and provide the outcomes of those to the gate meeting. We have processes whereby we're doing a health check on a Petrel model and as part of that check list is looking at the quality of the data and whether it's properly documented and filed away. For me it's about looking at where your risks are, if there's not a lot of risk in, for example, misnaming a data attribute, you will obviously try and correct it if you come up with the error but you're not going to lose sleep over it.

Colin: But it is good to get people to behave so they're aligned with doing something a certain way. So you don't end up with utter chaos in terms of file structure and file names.

Brian: If the field was one that we were looking at, we would probably ask the question, but beyond that I don't think that most managers consider the data management and rigour of what's been presented to them as all being linked together. That's not on their minds. They're not asking questions about that.

David: Are you confident that in your organisation you can go back to the original data and model when you revisit an area?

Brian: I would say no. Let's say you throw a duster, I think everybody involved wants to get as far away from it as possible, as quickly as possible. So you don't spend any more time and effort in relation to what happened, you probably should do, but what happens is you say "right well we've got to get passed that one and on to the next one".

Dave: One of the first steps is indeed getting that visibility on where the issues lie, to highlight where we have data quality or even model quality issues. You then want to prioritise your efforts on fixing the big issues.

Brian: I think that as an industry we're very bad at closing out. Incredibly bad in all aspects of it, well the aspects I've had experience of. Because there's so much on the plate and so many opportunities that if something gets parked, even a big project, if the project didn't go, we move on to the next project. The discipline of actually closing out everything effectively is missing. Most of my career is with the North Sea, quite often you'll find you'll go back to a project and a lot of stuff isn't in the right place, isn't in the right sequence, isn't in the right order, because people have just moved on to the next thing very quickly.

Ton: Or what happens is that you will find something back but two years later you're not sure what it is, so what actually happens is that you've just got to do it over and over again.

Simon: We're pretty good at adhering to the stage gate processes, guidance and data frameworks. As you pass through a stage gate you'll find documentation management, certainly in BP, is very good. That will be the thing that you have version control on, that will be the thing that points to another thing and within it, it might have a very good definition of what data set was used, what horizons or the key horizons, what were the key maps. Whether that data can be accessed over time, I would say we could certainly improve on that. Because data structures change behind it, data will be on the server at one time, but 5 years down the line it might have moved.

Klaas: I think our governance model is not very well suited for large gaps between doing the work and let's say drilling the well. What we have works fine if the person who actually worked it up gets to drill it but it would be very inefficient for us to have that person move away and two years later try to drill that well. We wouldn't really have much confidence in where we were, or if we were

looking at the right horizons, or the right well paths.

David: Any last comments?

Klaas: I do think though that in Apache it's having the right person in a data management role that's critical for us. I don't see any limitations on how good a career that person could make, if he had the right attitude, how well he would be rewarded, the budget that he would have available to himself to do what needs to be done. We would rather heavily rely on the individual with the job and not have all kinds of written procedures, policies or governance models in place that ensures that the right thing gets done regardless of the person that is there. I do believe that the managers have the sense that they are ultimately responsible for the data but are quick to delegate day to day actions that come with that.



Ton Ruijgrok

Ton: I think a partnership relation between data managers and the business units is key in solving a lot of issues. A relation based on confidence, which means a proactive approach from data management teams and the will of the business unit managers to take responsibility and invest, is very important if we want to change data into information. To get there, we need "transverse thinking" data managers and interpreters that understand their responsibility concerning the data and information they own and use.

Brian: I think the key issue is linking the value lost or the value to be gained with the effective data management. That's how you get management to pay attention and invest in it. What they understand is the value of oil in place, what the cost is to extract it. It's more difficult to show that if you develop the system, put these processes in place and it will save you 15% on your bottom line or whatever. That's where that link is very difficult to do, but if we don't do it we won't actually get them to start making the right decisions.

Colin: Yes similarly we'd focus on the value rather than the cost of data and that linkage between the data managers and the business managers is critical. We're small enough not to have an issue with dealing across departments. We don't have a procurement department so the contracts lady kind of works for me, so I tell her what happens and it's easy. Obviously in bigger organisations it could be a problem.



Klaas Koster & Brian Brown

Brian: I think effective data management has got a value in all aspects, the subsurface is the bigger aspect for an oil company because that's where the volumes of data actually lie, but the value of effective data management is important because of what you do in all aspects. Poor data management means you're reinventing the wheel again. Something that's been done before gets done again, so you've just completely wasted resources. It's hard to find the people who can articulate that, or even the model which will show you the link.

Dave: One of the key things is to recognise that data has to be managed as an asset like the other assets in our business, like the wells, the facilities and the platforms. In terms of maximising overall business value, it's looking at the whole value chain through from the asset data there to turning it into information. Being able to evaluate different actions that you could take in terms of where to drill new wells or how to modify facilities and then being able to execute those. It's important that you've got the strength of expertise being applied to

data management but at the same time integrating across all the other parts of the business. I think it's important to recognise that data management is not an end to itself. To quote an article that I read recently, "you've got to make the data dance".

David: So do you think data suffers from that fact it is intangible?

Klaas: Probably, it's an interesting concept.

Simon: That was going to be one of my closing points as well. First and foremost, for the bigger organisations where data management happens and happens well at the minute is where it's HSE critical and where it's regulatory and compliance, that is tied to the licence to operate. After that it's a value for immediacy so, if you need a piece of data to make this decision and then after that it's an asset. In parts of the world where you may be able to sell or trade your data for a longer period, that's when people will hold it tight and keep it very well because it has some shelf life. When we're in an intermediate position, like we might be here, it's going to sway with the wind and the whims of the budget cycle, who's in charge and, as you say, fronting that up. I think that's where it's going to happen and where it happens very well, like reserves reporting where you have to report in a certain format. Where do I hope it goes? I can see that it does have more latent potential, we want to get information to the people who are going to gain value from that more readily and to maintain some knowledge within the corporations. But as someone who also pays taxes in the UK, I want that data available to other folks who can see the value from it that's buried at the minute. I hope that data management and knowledge management disciplines can continue to work to pull that a bit further forward and, that the data that we have stuck in our archives when we do sell it finds its way to the next data owner.

Published material

A significant amount of literature exists on all the key issues related to the oil and gas industry, this is in the form of published papers and conference proceedings from a range of societies and other sources. Some of this material is related to Data Management; however, considering the longevity, the complexity and the impact of data management related issues, the volume of this literature is relatively small.

There are many excellent conferences and journals that focus specifically on data management in the oil industry⁸, for a variety of reasons these tend to be by, and for, E&P data managers. This means that the budget holders and data users are not involved in these discussions and are often unaware of them. In order to reflect the non-specialist's view of the subject this survey of related literature deliberately ignored the many sources that specialise in covering data management issues.

A number of oil industry consolidated sources, professional societies and libraries were accessed. These included OnePetro⁹, the Lyell Collection¹⁰ and personal collections. The authors have unlimited access to millions of articles from many of the leading societies, journals and publishers relevant to our industry. While a number of interesting and informative items were identified in these sources, very few provided insight into data management issues, in particular, very few discuss the 'value' of data management especially considering how important it is to E&P projects. The most interesting articles have been listed later in this document.

When petrotechnical societies do cover data management it is often in isolation, for example the SPE have a separate group that covers digital energy and when in 1995 the Geological Society covered data management it was in a special publication written by and aimed at data managers.

This isolation has two negative impacts, first of all the managers and budget holders are uninformed about potential opportunities to improve making it more challenging to create convincing business cases. Secondly the data managers themselves are less familiar with the key concerns of those holding the budget.

However there is some evidence that awareness of data management is growing within the wider E&P communities. The "Trends in phrases used" section in this paper explains the evidence that "data governance", "data ownership" and "data quality management" are currently amongst the fastest growing terms within the literature.

⁸ For example, Petroleum Network Education Conferences (PNEC) are held in the spring of each year in Houston, the Expert Center for Information Management (ECIM) hold an annual conference in Norway, the Professional Petroleum Data Management Association (PPDM) publish a wide range of information and the Oil Information Technology Journal (OilIT) publishes a monthly newsletter

⁹ OnePetro.org is a multi-society library that provides access a broad range of technical literature related to the oil and gas exploration and production industry, not least the Society of Petroleum Engineers and World Petroleum Congress. The site indexes more than 85,000 E&P related documents.

¹⁰ Launched in 2007 to celebrate 200 years of the Geological Society of London, the Lyell Collection is an online collection comprising of the Society's journal titles, Special Publications and key book series containing more than 18,000 items

Notable Papers

This list of papers, from general oil industry sources, provides an introduction to the state of the literature. These papers include material that the authors found valuable, historical references that illustrate the level of progress over the last few decades and some papers that present contrasting views that the authors would disagree with:

1. Arango, G., Colley, N., Connelly, C., Greenes, K., Pearse, K., Denis, J. and Highnam, P. (1997) 'What's in IT for Us?' in Oilfield Review Autumn 1997
2. Balough, S., Betts, P., Breig, J., et al (1994) 'Managing Oilfield Data Management' in Oilfield Review Jul 1994
3. Bamford, D. (2009) 'Everybody needs digital technology - but only if it works' in Digital Energy Journal Jun 2009
4. Brown, D.A., Allen, L.R. and Neff, D.B. (1994) 'Teamwork and Technology: Successful Reservoir Management' WPC26150 presented at 14th World Petroleum Congress
5. Dardon, S., Gillespie, J., Geist, L., King, G., Guthery, S., Landgren, K., Pohlman, J., Pool, S., Simonson, D., Tarantulo, P.Jr. and Turner, D. (1992) 'Taming the Geoscience Data Dragon' from Oilfield Review Jan 1992
6. Duller, P.R. (1995) 'The quality assurance of geological data' from Giles, J. R. A. (ed.) 1995, Geological Data Management, Geological Society Special Publication No 97
7. Dunn, M.D. (1992) 'A Method To Estimate the Value of Well Log Information' SPE24672 presented at the SPE Annual Technical Conference and Exhibition
8. Fattshi, B. and Okita P.J. (1994) 'Management of a Declining Field' SPE28341 presented at the SPE 66th Annual Technical Conference and Exhibition
9. Garbarini, M., Catron R.E. and Pugh, R. (2008) 'Improvements in the Management of Structured and Unstructured Data' IPTC12035 presented at the International Petroleum Technology Conference 2008
10. Hawtin, S., Abusalbi, N., Bayne, L. and Chidwick M. (2002) 'The Data Integration Spectrum' presented at AAPG Cairo 2002
11. Kozman, J.B. (2005) 'Data on Demand: The Emerging Business Case' SPE93625 presented at 14th SPE Middle East Oil & Gas Show and Conference
12. Kozman, J.B. (2008) 'The Value of Data in Multiple Repositories' SPE118451 presented at SPE Gulf Coast Section Digital Energy Conference and Exhibition
13. Kozman, J.B. and Gimenez L. (2004) 'Maturity Models for E&P Data and Information Management Organizations' SPE88666 presented at Abu Dhabi International Conference and Exhibition
14. Lowe, D.J. (1995) 'The geological data manager: an expanding role to fill a rapidly growing need' in Geological Society, London, Special Publications 1995
15. Marechal, A. and Robert, A. (1998) 'The Road to Information Management in the Oil Industry' from 15th World Petroleum Congress
16. Marks, L. (2008) 'IT Doesn't Matter - Or Does It?' from SPE: Journal of Petroleum Technology Dec 2008
17. Miller, R.G. and Gardner, J.S. (1995) 'Geoscience data value, cost and management in the oil industry' in Geological Society, London, Special Publications 1995
18. Neri, P. (2010) 'Data Management important when choosing software' in Digital Energy Journal Dec 2010
19. Smith, A.H. (2002) 'The Economic Advantages of Managing Data, ONCE!' SPE78337 presented at the SPE European Petroleum Conference

Trends in phrases used

In addition to using the OnePetro site to identify particular articles of interest it was decided to analyse the terms being used on it, in particular to identify terms that are being used more frequently. In order to do this the number of items returned for each year from 1980-2010 for a given search term was noted. The number of references returned can be used as an indicator of how prevalent that phrase was for periods of the past.

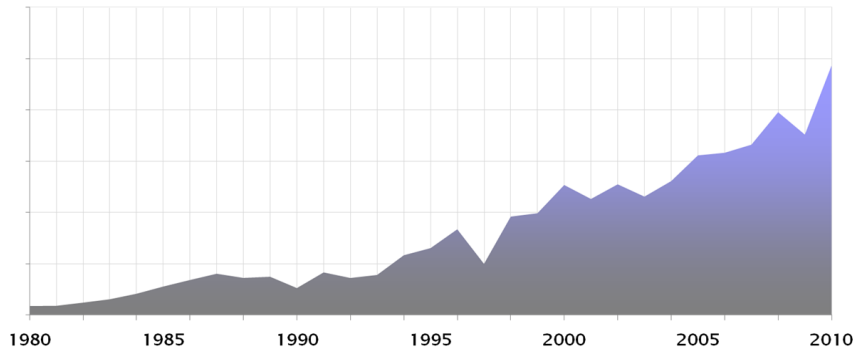


Figure 19: The number of available items grew from 1980 to 2010

Of course the number of items held by OnePetro grew considerably over the period examined, so the raw counts cannot be used. In order to ensure that each year's results could be compared the values were scaled by a factor estimated from the average number of items returned for a range of search terms.

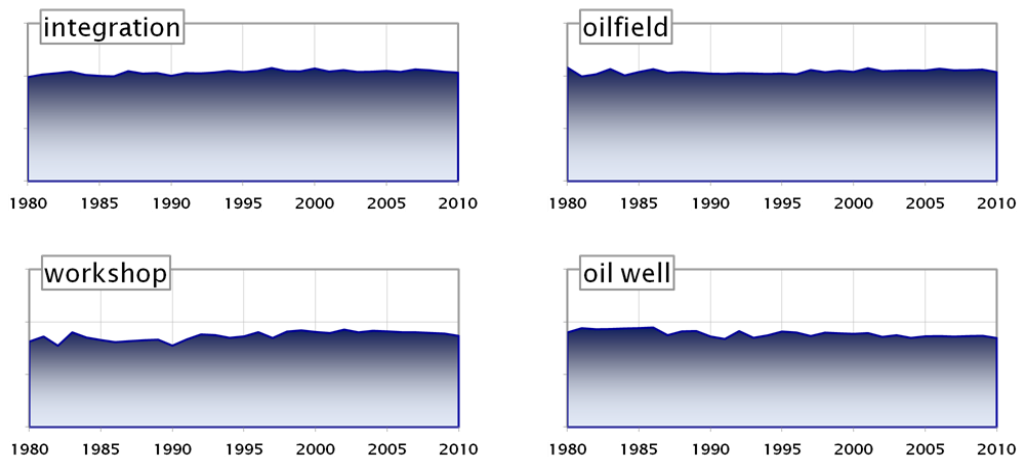


Figure 20: Demonstrating that normalisation functions correctly

In order to check that this correction factor has the desired effect it was tested with a number of generic terms that would not be expected to vary greatly in popularity over the period in question. The plots above show the profiles over the time period for some general terms.

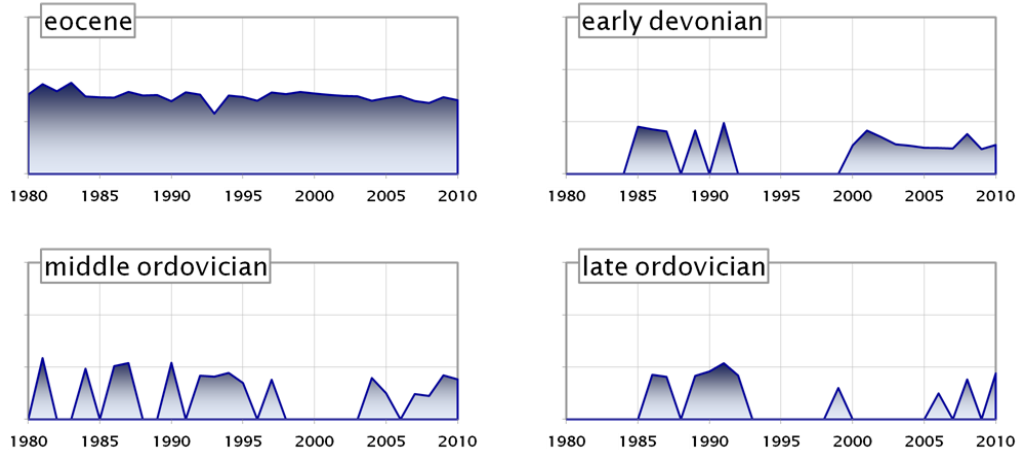


Figure 21: Historic frequency of papers containing geological terms

The names of geological time periods are one good example of a set of terms that are unrelated to data management and whose frequency varies over the time period. For example if particular formations are depleted, or if new plays are tied to chronology.

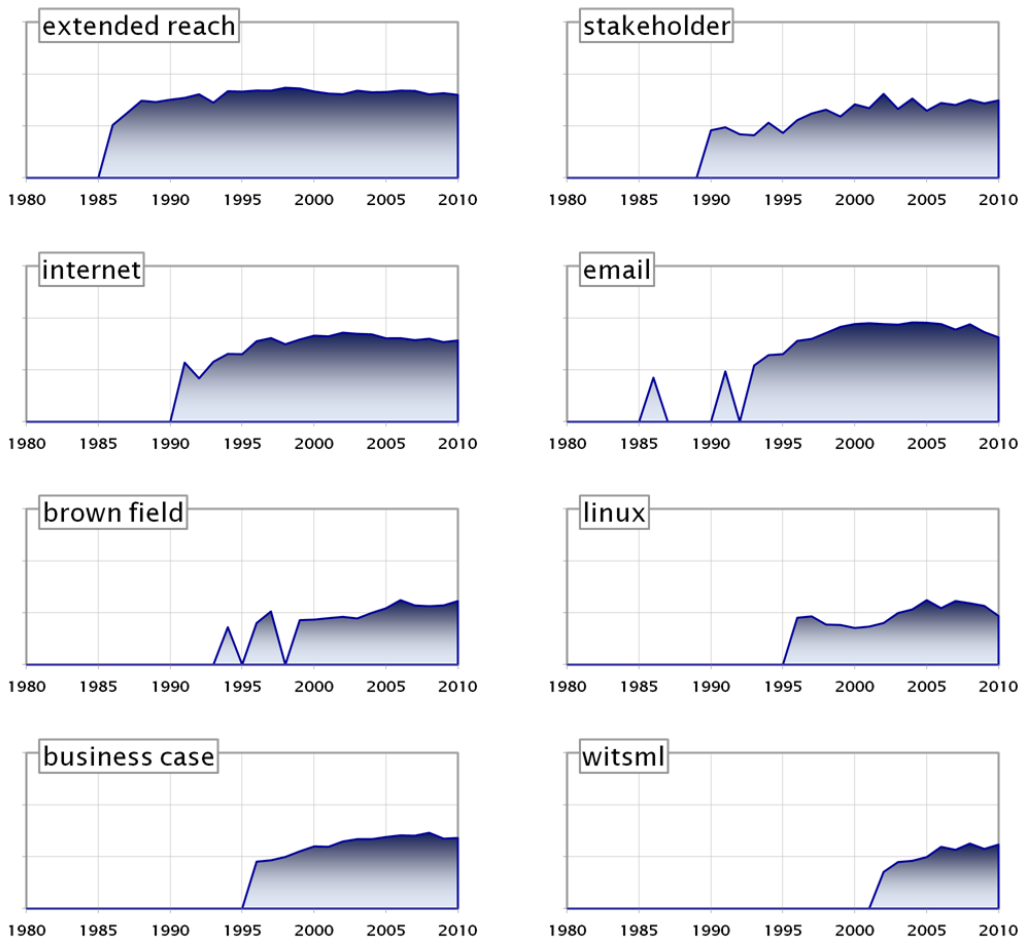


Figure 22: Some terms have clear introduction points

There are some terms, unknown in 1980, that currently are widely used. The frequency plots of these terms shows the point in time where they were first introduced and how they have maintained interest since that time.

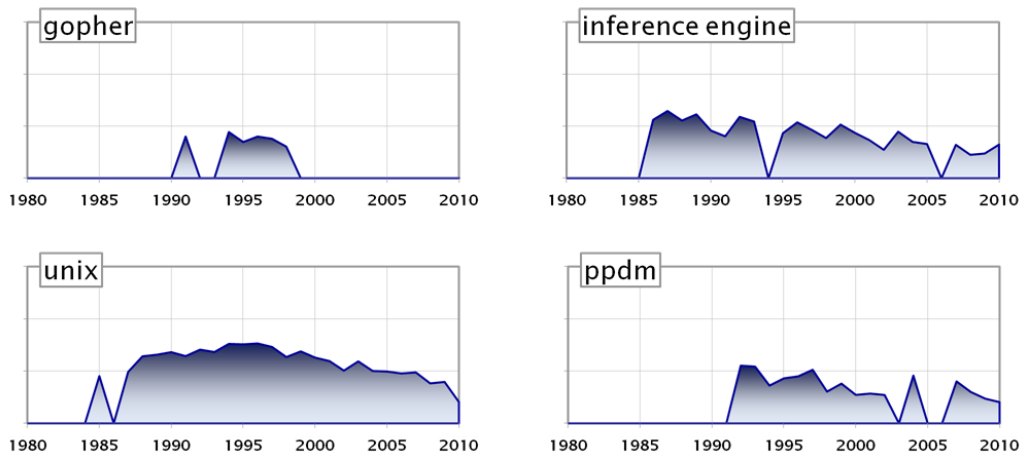


Figure 23: Some terms illustrate recent declines in usage

Other terms, particularly those related to particular technologies or techniques show clear indications of both their introduction and subsequent decline in usage.

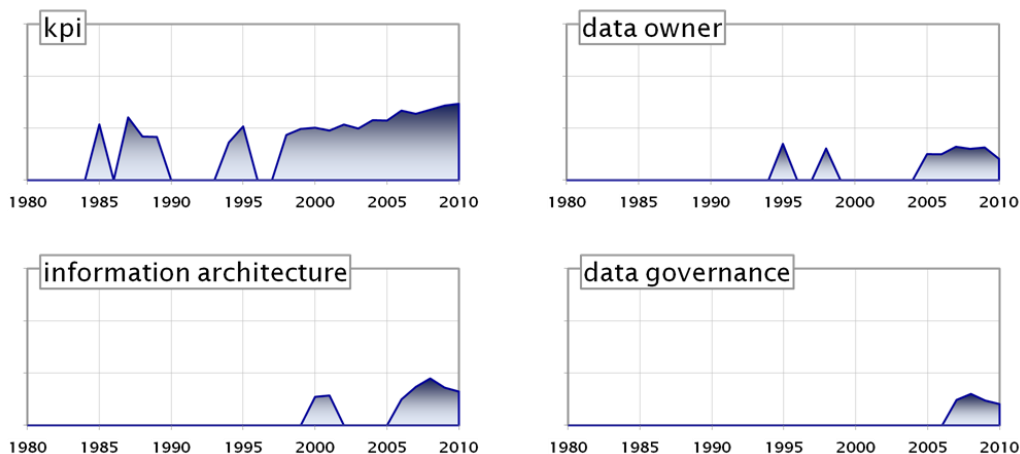


Figure 24: Terms that have an upward trend over the last 10 years

When the results are analysed to reveal the terms that have the strongest growth over the last 5 years terms, such as “witsml”, “middle ordovician” and “KPI” are amongst the most prominent. Within the top terms an unexpectedly high number of data management related terms seem to be at the beginning of significant growth in usage.

Terms such as ‘data governance’ are now being adopted, past papers have covered these topics without necessarily using the specific term ‘data governance’ for example a much quoted model was presented in 1992¹¹ and could easily be put forward today as a framework on which to found a data management strategy. However the use of a common language within the industry to discuss and debate these topics is an important requisite. So if we have been discussing data management issues for so long, even outside of the data management domain, in places such as at the SPE and at least some show that they have an understanding of the problem, why have we not progressed further? Is it that not all those that need to help are listening? Other vital terms such as ‘data ownership’ seem to have struggled to emerge but have more recently gained traction.

¹¹ Feineman, D. “Data Management: Yesterday, Today and Tomorrow” (1992) presented at PETEX '92 Conference London

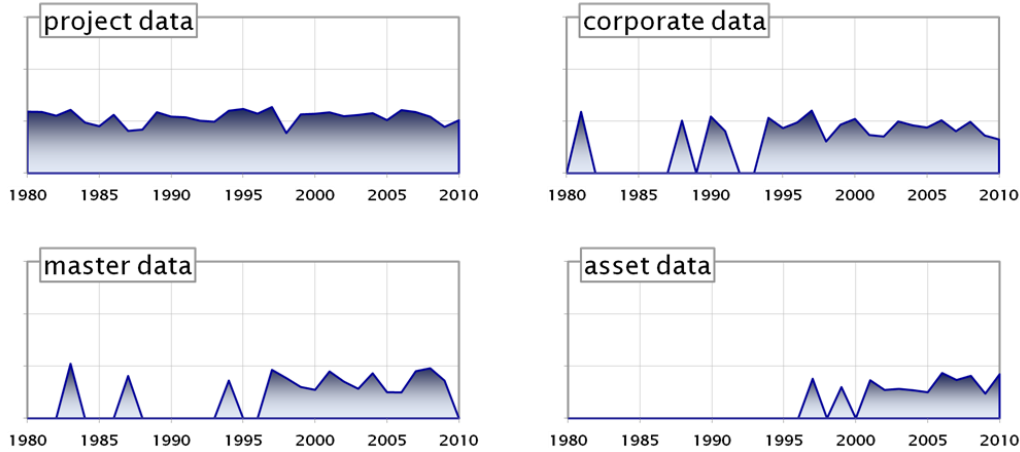


Figure 25: Roles that data plays in the corporation

The different roles that data plays have distinct profiles, “project data” has been the most used form ever since 1980. The terms “master data” and “corporate data” which both became prominent in the 1990s now seems to be in decline. The emerging term seems to be “asset data”, perhaps a recognition that data belongs to the asset?

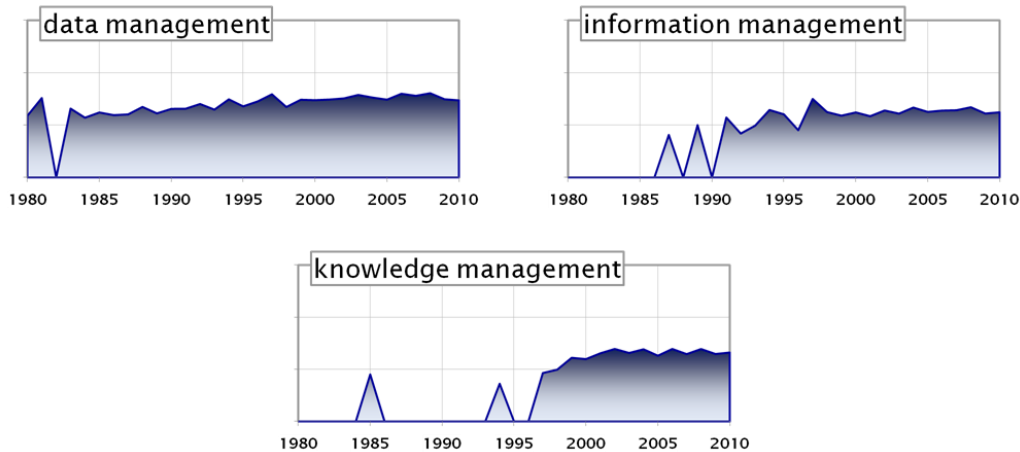


Figure 26: Differences between Data, Information and Knowledge

It is also interesting to note that while “data management” has been prominent since 1980, the term “information management” did not emerge until the late 1980s and “knowledge management” became prominent in the late 1990s.

Summary Plot

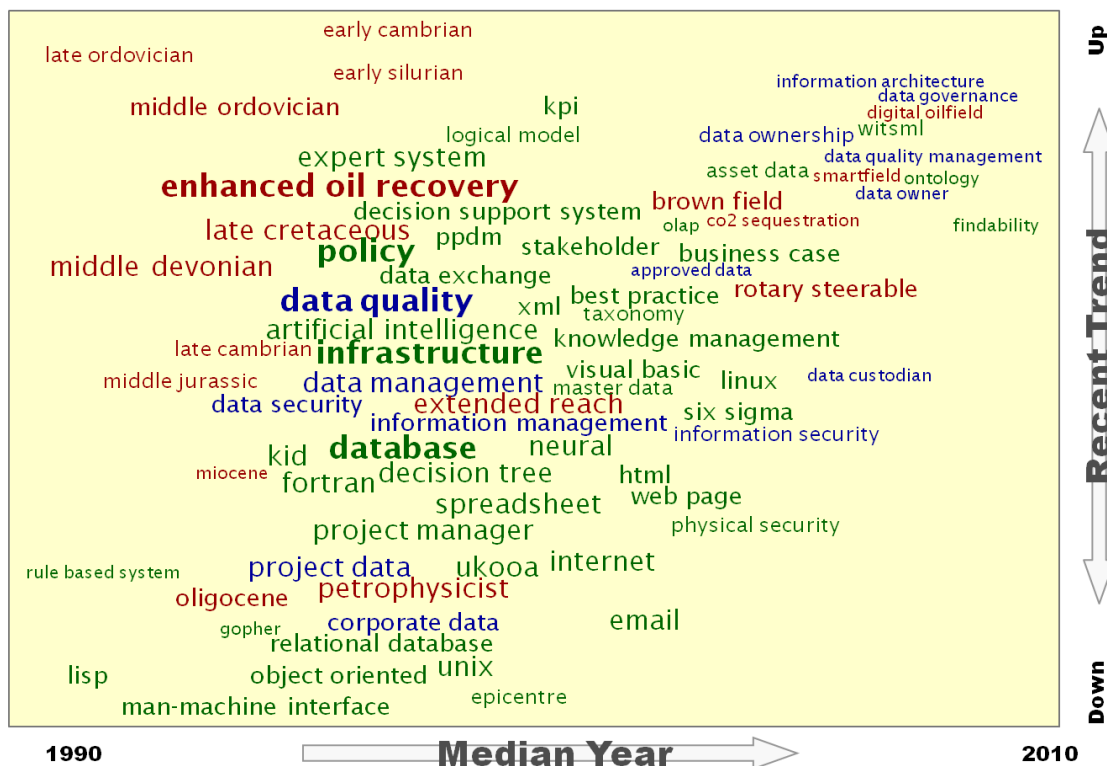


Figure 27: Summary of trends for terms in OnePetro

It is interesting and informative to see how the use of different individual terms has waxed and waned over the last three decades. However to provide a more holistic view the trend for each search term has to be summarised in some way. In the plot above the horizontal position is determined by the median year that results were returned, so for a term like “data management” which was fairly consistently used from 1980-2010 the median year was 1996. The vertical position was determined by the trend over the last five years.

This plot demonstrates the fact that many of the terms that have recently been introduced and are growing most strongly are related to data management. A concerted effort was required even to uncover the few geosciences terms that fell into the same region.

The data gathering process

An important strategic objective for CDA is to “Collect and publish anecdotal and other evidence supporting the case for the positive impact of good data management practices on the business”. Following a competitive process Schlumberger Information Solutions were commissioned to conduct a study to provide evidence for this statement. The initial scope of the study specified that it would include input from UK and non-UK companies and from CDA members and non-members.

This work has resulted in a set of documents including a report that summarises all the findings. The aim of this document is to outline the way that these results were obtained. The goal of the study was to document the current perception of the management of petrotechnical data. This was achieved through a series of interviews, research into existing literature, a roundtable and extensive analysis of these inputs.

Interviews

The approach that was taken was to interview a number of oil company technical managers with roles such as Exploration, Asset, Subsurface or Production Manager. It was felt important to focus on the users of data rather than those involved with the managing it.

Over the course of the period September –November 2010 twenty two interviews were conducted in Norway, the UK and Kuwait. We would like to thank all the companies involved who are listed at the beginning of this document.

Each interview involved two consultants who alternated between directing the conversation and noting responses. The checklist used to structure these interviews has been included in a later section of this document. Most interviews were scheduled to last an hour, although some overran as the interviewee explored some of the topics raised.

Roundtable

In January 2011 a roundtable was organised with participation from the following:

Klaas Koster	Development Manager: Apache	Simon Hendry	Exploration & Appraisal Manager: BP
Colin Percival	Exploration Manager: Dana Petroleum	Brian Brown	Contracts Manager: Fairfield Energy
Dave Kemshell	Asset Development Leader: Shell	Ton Ruijgrok	Information Manager: Total

We would like to thank these individuals for providing their time and input to the study. The resulting discussion has been transcribed in the “Roundtable” document.

Literature Research

A wide range of potential sources were explored to uncover existing papers that were pertinent to the topic. These are listed in the “Related Literature” document. In addition a number of terms were researched and the results have been included in the report.

Other Research

A range of other techniques were employed including Monte-Carlo simulation and automated crawling of web sites. These activities are described in full elsewhere.

Questionnaire

In order to ensure consistency between interviews a “checklist” of key topics was prepared. The conversations allowed each senior executive to address the various topics in the way that they felt was most appropriate. The checklist was mainly used towards the end of each session to steer the discussion towards topics that had not been sufficiently explored.

Overview

- What is your role in your organisation?
- Is your primary focus on issues that affect the business today, this week, this month, this year or this decade?
- What is the expected ROI on investments that you make today?
- What metrics do you use to compare your company’s performance to that of others?
- How do you treat data assets in the company accounts?

Value Generation

- With the benefit of hindsight what action had the biggest impact on your company’s value in the last 5 years? What part, if any, did the petrotechnical data have in that?
- If the company did nothing what would be the effect on your market capitalisation in the last year (accounting for external influences). And therefore what impact did your decisions have on the value of the company?
- Of the total value added last year by corporate actions what proportion comes from increases in production, what from identifying new reserves, what from increasing the company’s assets and what from other activities?
- What corporate activity, other than production and reserves increases, has the biggest impact on shareholder return? How does that compare to production and reserves changes?

Value of Data

- What proportion of the change in the value of reserves comes from understanding the subsurface?
- How much of the difference in production is due to understanding the subsurface?
- If a company was to want to purchase all of the data you have for a particular asset how would you value it?

Value of Projects

- How much is typically spent in one year on activities to increase reserves?
- How much is typically spent in one year on activities to increase production?
- What proportion of project spend is allocated to information studies?
- To what level are you responsible for initiating internal studies?
- Does your company measure a) the cost of doing interpretations b) the ‘value added’ by the interpretation work?
- Have you ever analysed the quality of your corporate data? What impact would you expect your level of data quality to have on the levels of risk your projects have?
- Has your organisation ever attempted to benchmark the time spent performing value added work vs non-value added support activities?

Data Process

- Which categories of data do you have some responsibility in purchasing (Seismic / Log / Drilling data / Production data / External Studies)?
- What would you anticipate would be the productive life of the data your company purchases? What about data you generate?
- What would the productive life of the data be if you invested zero in interpreting it?
- If you were to invest nothing in the maintenance of data, what would be impact on its expected productive life?
- When acquiring data (seismic, well log etc) how do you anticipate the costs to manage it throughout the 'E&P Value Chain' and the 'Data Lifecycle'?
- What is your data management budget?
- Is the data management budget dependent on the data volumes?
- What do you do to demonstrate that you are able to 'realise value' from a new data acquisition?

Wrap-up

- Do you spend enough on data management – relative to the cost of data acquisition / creation and the impact it has on business drivers?
- Do you have any examples that you are willing to share in any way where data was applied to a decision that resulted in reduced costs or additional revenues?
- Do you have any examples that you are willing to share in any way where data was poorly applied to a decision that resulted in additional cost or delayed revenue?

Roundtable

A roundtable was held on Wednesday 12th January 2011 at CDA's Aberdeen offices. The goal of this event was to:

- Validate existing material gathered through interviews and research
- Gain additional information on a similar theme
- Get quotations that could be used to support the study report

The event was initiated by having the attendees participate in a multi-player "game". This divided the group into three pairs of players, each pair competed against the others to balance between exploring and interpreting data as they attempted to identify "payout squares" in a new area. The goal of this activity was to demonstrate that finding an optimal business strategy is challenging even within a simplistic game world.

Once the game had been played and discussed the participants moved on to the main conversation. This was transcribed and is available in the "Roundtable" document. The conversation was steered towards addressing the following list of questions that had been sent to the attendees in advance:

Value based management

The available budget is always limited. Managers must decide how to balance spend on things like buildings, staff, infrastructure and facilities construction. This means they have to estimate the value that alternate possibilities will deliver.

Question: *How do you compare the value that different possible expenditures deliver to your organisation?*

The Value of Data Management

The value that petrotechnical data generates is substantial. Data in all its forms, at all stages of the E&P value changing from licence / basin entry to mature field rejuvenation is therefore an important company asset.

Question: *Do you think your company is doing everything it should do to preserve and realise the value of all data?*

Changes in attitudes towards Data Management

The 'data environment' has changed over the decades, with a move from physical to digital data, the ever increasing volumes and types of data, while at the same time peoples' attitudes towards the benefits and needs for data management has also had its ups and downs.

Question: *What is your own current attitude towards the data management discipline?*

The 'Data Manager' role

It is common for Data Managers to say that their role is under appreciated; it is not a well respected career choice, training and development plans are not commonplace and career road maps don't lead to senior positions.

Question: *Is this true? If it is why? If not, in what way is it not?*

The 'scope' of the Data Management function

Traditionally the 'data management department' has focused: More on raw and original format data - Less on interpreted and results data; More on the Exploration phase - Less on the Production phase; More on G&G - Less on Production and Drilling

Question: *What is the scope of those you consider 'data managers' within your organisation? Should it change?*

Data Governance

DAMA, the premier organisation for data management professionals worldwide define Data Governance as 'the exercise of authority and control (planning, monitoring, and enforcement) over the management of data assets.'

Question: *What sorts of controls have been created within your own organisation and how well have they been adopted?*

Data Ownership

'Data ownership models' assign various responsibilities to senior managers - who sign the POs, users - who create and manipulate data and to data managers - who manage data. These roles have names such as data owner, data steward and data custodian.

Question: *In your organisation who is the data owner?*

