2002-03 AAPG Distinguished Lecture
Funded by the AAPG Foundation

Ways of Working and Organization in Exploration

Gordon Knox

Exploration Consultant
Balzan, Malta

Good Morning (Afternoon, Evening). It is with great pleasure that I find myself here in (LOCATION). Right at the start I would like to thank the AAPG Foundation for making this lecture possible and sponsoring my tour through New Zealand, Australia, Thailand, Vietnam, Brunei, Indonesia, China, Japan and South Korea. I would like to also thank the organisations here (LOCAL SPONSORS) who have been involved with the AAPG in sponsorship and the local logistics and arrangements.

What I would like to talk to you about is organisation in exploration. These days change is all around us and very rapid. As a consequence much

Contents of Lecture

- Global change
- Organisational types
- Mapping of organisations
- Transformer concept
- One example of exploration organisation change
- Learning

I would like to structure this talk by considering the topics as shown on this slide. The first four topics are by way of introduction and are intended to set the scene. The last two topics consider the process of change and learning from a specific example.

I would like to emphasise at this point that I will show simply one example of an organisation developed in a specific unique situation. It is not an exclusive solution and other solutions would arise in different business or operating environments. Indeed, the general principles may be applied to any field of endeavour. I am grateful for permission to talk about the example which was granted under condition of anonymity.

Changing Worlds

- **Communications revolution**
- **Breakdown of economic monoliths**
- **Deregulation of industries, many new entrants**
- **Take over shake outs**
- **Removal of experience from industry**
- **Resource constraints**
- **Industrial agility is vital**

Let us encompass the last 40 years. Huge changes have taken place in political and business environments.

The communications revolution has resulting in transfer of information that is rapid and crosses barriers easily.

Break up of Soviet Union into successor states.

Seven Sisters are no longer there, large state oil companies have major share of reserves and have extended themselves across the supply chain (e.g. ARAMCO Saudi Arabia, PEMEX Mexico. Russian enterprise has entered international competition. Indigenous companies, already strong in some locations (Australia) have appeared in niche settings (Nigeria).

Service companies have taken on much of technology development that major companies used to develop in house. One that I am familiar with is the estimation of volumes and risks in prospects. Once only available to large companies with punched card input some 25 years ago, there are now many vendors on the open market with PC based software.
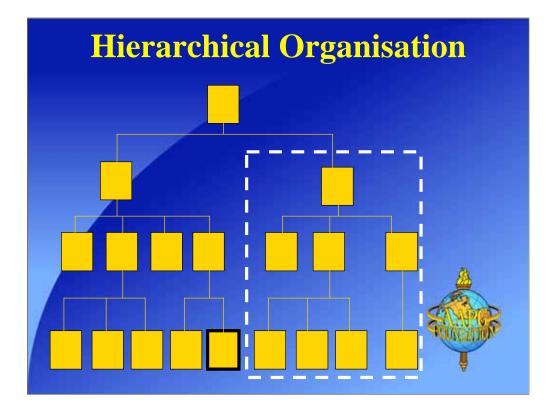
Rigidly structured organisations have found it difficult to compete with flexible organisations.

Many mergers and acquisitions have happened as way of increasing reserves particularly in low price scenarios.

Exploration has been finding it hard going to add new reserves.

In turn mergers and down cycles have led to significant removal of expertise from petroleum industry.

Strong technological emphasis in exploration (and production) and staff reductions have led to heavy work load.

Hierarchical Organisation

Consider a traditional and common form of hierarchical organisation. The structure is vertically orientated, has a branching structure and goes up through increasing seniority of managers which may consist of section/team heads, department heads, division heads, up to general manager etc.

This type of organisation is not restricted to private industry but exists in government bodies, state organisations and academia. For simplicity I use the term manager, but other job descriptions are equally appropriate in different organisations.

Hierarchical Organisation Characteristics

- **Command and control**
- **Lateral working relationships across departments and sections can be impeded**
- **Information sharing is hindered**
- **Subordinates look to boss**
- **Glass houses development**
- **Many informal processes developed**

Certain types of generalised behaviour have been associated with such structures, though this does not mean that a particular hierarchical organisation would exhibit any or all of these features.
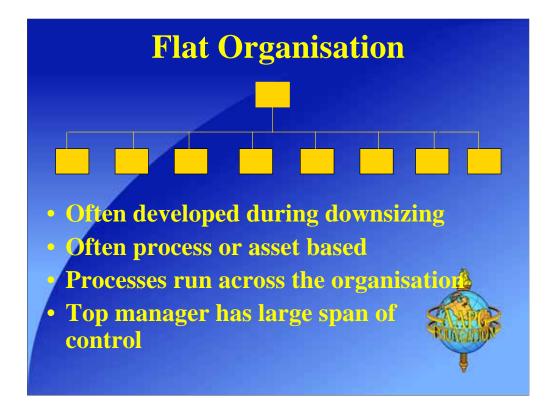
There is a command and control structure which branches downwards from the top manager. Formally, information is passed up and down the hierarchy, in a rule rich setting, lateral sharing is often adhoc or informal or even accidental.

Subordinates look to their manager and career progression depends on their manager's view.

A glasshouse mentality can developed which is vertical in orientation.

Many work flows require lateral passage across the organisation and these can be hindered by the vertical chain of command.
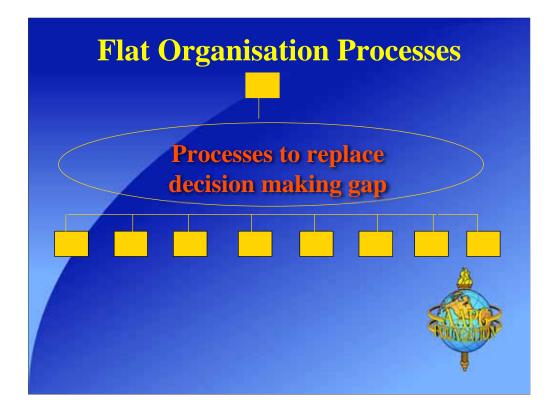
I recall an occasion where I was involved in the design of a business process which was to be implemented in software. The problem was that this process ran laterally across the hierarchy, and though essential from a business point of view, required several meetings and much time before departmental managers would approve it.

Flat Organisation

- **Often developed during downsizing**
- **Often process or asset based**
- **Processes run across the organisation**
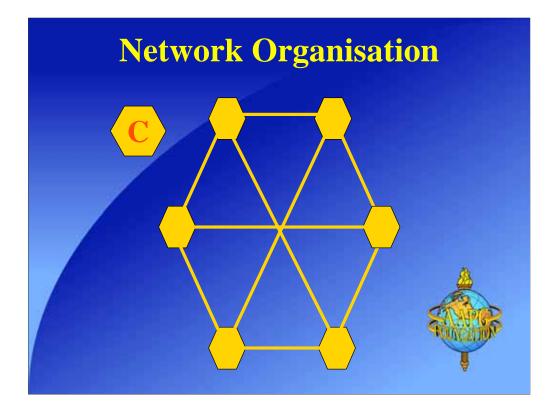- **Top manager has large span of control**

Structures have often changed from a hierarchical to a flat organisation during periods of contraction and downsizing. Structure will then migrate from a functionally based organisation to one based on assets or processes. The ghost of the hierarchy may be present if the teams are functionally derived, but more thorough going reorganisations result in multidisciplinary teams/units.

In either case, processes operate laterally across the organisation.

The top manager instead of a limited number of subordinates now has a large span of control and a gap has developed in decision making.

Flat Organisation Processes

Processes to replace decision making gap

This is replaced by formalised processes which must operate to guide the organisation in decision making.
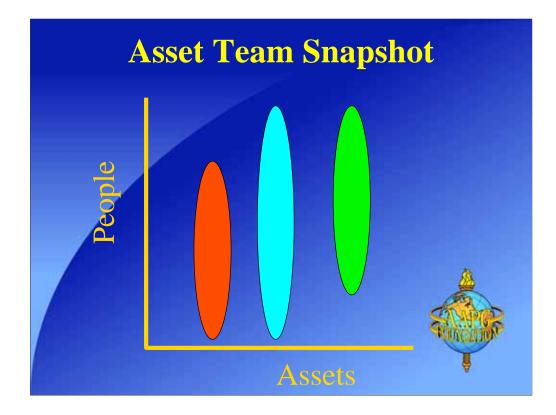
Network Organisation

A network organisation is difficult to describe in two dimensions as it has a three dimensional structure with a variety of interfaces.

It is frequently represented by self managing teams (including a coach C) which network with each other.
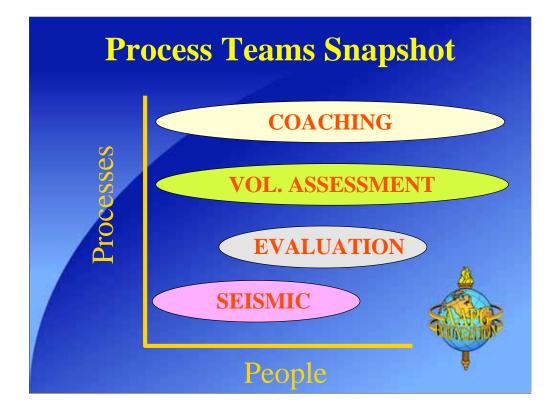
It can be represented from different perspectives and each case a different organisational structure would be drawn. (An example to be described).

For example an exploration exploration organisation might be represented by assets, by functions, by processes or by skills.

I am about to show three diagrams to illustrate these concepts. On purpose they do not show any reporting relationships.

Asset Team Snapshot

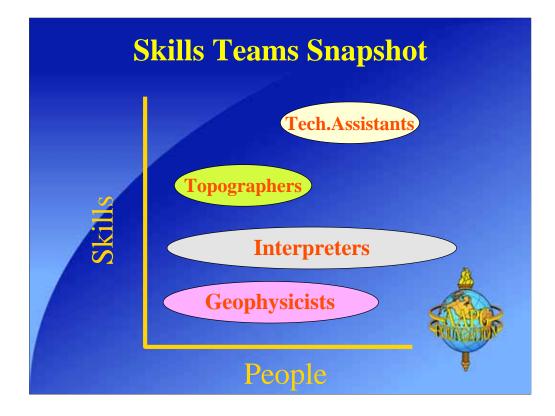If we take a snapshot from the perspective of asset teams, we can imagine three asset teams. The red team may represent an deep gas play, the blue team near field prospects and the green team might represent Palaeocene plays. As this is an imaginary set up and you can define asset team titles according to your own area of operation and portfolio of prospects and plays and particular operational circumstances.

An organisation at any moment is operating many processes. These may be technical, or administrative or related to skills development. I have shown here three technical processes which in themselves can be divided into subsets. For example the seismic process may in divided into planning, acquisition processing and workstation display and interpretation.

Administrative processes may include personnel planning, budgeting, absence management. Skills development includes coaching and mentoring whereby experience is passed to the relative novice.

Skills Teams Snapshot

There are a variety of skills in an exploration organisation, of which I illustrate a few here. You will recognise them all as jobs common to such organisations, but perhaps will not consciously thought of technical assistants as a skill group with their own particular expertise. The size of the ovals is representative of relative numbers of each skill.

We could also show a functional team snapshot, this would reflect the division of departments which can be observed in any hierarchical environment. For example one can imagine the ovals defined by technical departments such Geophysics, Evaluation and Geological Services. Finance, Planning and Personnel Services would occupy other ovals.

A diagram illustrating the organisation can be drawn in any of the above ways. However, the use of one diagram reinforces behaviour in a certain way, as we have already mentioned in the command and control behaviour in a hierarchical organisation.

And it works to the disadvantage of other ways in which the organisation organises itself.

The diagram illustrated would represent moments in time. If the organisation does not change it will become fossilised and be unable to cope with change. Ideally one would like to achieve an organisation that is in tune with its time. Whatever forces and changes occur in its business, economic and social environment it is able to change its structure, and deploy its skills to meet those challenges. I like to call this ideal the 'Transformer Organisation'.

Transformer Organisation

A   B   C

Capability to rearrange people and resources in new patterns to meet new challenges

Some 20 years ago I lived in Bangkok and my young sons were very keen on a cartoon series called 'The Transformers' and toys modelled on the characters in the series. These were about the adventures of robots, both goodies and baddies who could transform themselves into any shape or form to meet the challenges of the moment. So one moment they could be a bus, then the next, a strike aircraft. The point is that they were supremely adaptable. What if one had an organisation that could continuously adapt!

The '**Transforer Organisation**' can be viewed as very flexible and which can change to meet new challenges with the changing business environment. In this diagram a change of structure over time from A to B to C is illustrated. This is executed mainly by the rearrangement of individual skills into new alignments, but will also mean changes to processes and ways of working and to other resources.

For example let us imagine that an organisation is made up of several teams with different skills mixes. Rearranging or regrouping would be considered a transforming ability.

In a resource constrained environment a transformer organisation would be particularly adept at using the skills of its people. People would carry out a number of roles, effectively wearing more than one hat.

I would like to now discuss one example of an exploration organisation which was developed in response to internal and external pressure for change. Let us first remind ourselves of a typical purpose for an exploration outfit.

Exploration Purpose

Basins/Petroleum Systems/ Plays

Leads/Prospects

Discoveries

$$

We often describe the exploration funnel whereby at a regional level basins, petroleum systems and plays are evaluated for the presence (or lack of) a natural utility (oil or gas) whereby, for example oil is delivered by migration from a mature source rock to a trapping location, a prospect. Promising prospects are drilled up and some turned into discoveries. These are then developed as commercial discoveries which eventually develop a positive cash flow. The outfit I am about to describe was typical of the above. While I have permission to talk about these results I have been asked not to divulge the name of the company concerned. I will simply refer to it as Opportunity Oil.

'Opportunity Oil' Strengths

- **Fast in decision making**
- **Proactive in developing new business opportunities**
- **Technologically up to date with good working level communication with shareholders**

The management positions had been defined during an earlier higher level reorganisation which had taken place some 12 months earlier.

The company had recognised that it needed to change its structure of its exploration organisation and its working practices. It was, however fuzzy about its strengths and weaknesses and therefore it set out to seek the opinions of those who had a strong interest in the companies performance. This included share holders, outside partners and competitors and the people within the company.

Its strengths were: it took decisions fast, it was proactive in seeking new business, it was not bureaucratic and had good working level communications.

'Opportunity Oil' Weaknesses

- **Resource constrained**
- **Reactive opportunity driven decision making**
- **Processes complex**
- **Accountability not clear**
- **Planning and prioritisation required improvement**
- **Learning often unstructured and implicit**
- **Poor communication across hierarchy**
- **Quality control was not optimum**

Various weaknesses were recognised. The outfit was under resourced for the activity it was required to execute. It was reactive to opportunities. Paradoxically, this clashes with the previously cited strength of being proactive. Internal processes were complex and not explicit. There was unclear accountabilities with respect to budget holders, process owners and decision makers. Learning was not shared and data management was not optimum. Communication was poor across teams and communication with shareholders was often unstructured. Quality control needed improvement.

If one summarises the above one can observe that inefficiencies in process, communication, accountability definition and learning would put further pressure on a resource constrained outfit

Targets for Improvement

- Formalise and simplify planning and prioritisation processes
- Clear definition of work requirements for people and resources
- Removing conflicting management roles
- Knowledge capture and learning
- Making links between business plans and individuals tasks/targets

The targets for improvement arise from the previous two slides. The first two were aimed at being able to define clear priorities for work. With regard to management conflicts, team leaders for specific areas frequently had a conflict of interest between their own evaluation activities versus sharing staff skills.

Learning and knowledge capture and dissemination were seen to be vital for improvement.

Much of what I have presented to you was presented to the staff of Opportunity Oil by its management as a case for change and to seek volunteers for a team to develop a design in a period of two months, for a new organisation.

The volunteer team included a geophysicist, two seismic interpreters, a geologist, a technical assistant, a team leader and an evaluation manager. A facilitator joined the team from outside of the exploration organisation.
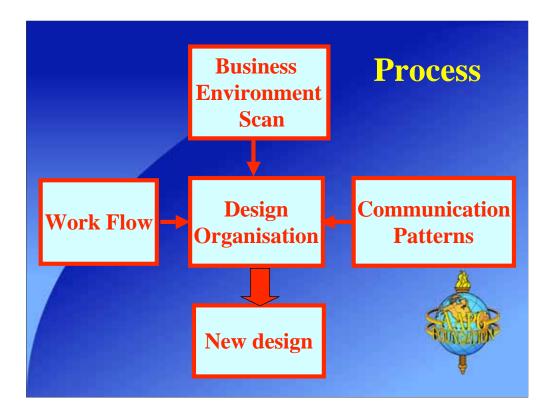
Boundary Conditions

- **Must relate to portfolio of assets**
- **Must be team based network organisation**
- **Self managing teams to be goal**
- **To involve all staff on an inclusive/consultative basis**
- **Take on board new organisational concepts**
- **Higher level asset and functional management positions to be taken as given**

The above ideas were to be played off peer groups and feed back to be presented to management.

Excluded from the organisation team's remit were development of processes other than those needed for design.

And the placing of names on organisation charts.

The process followed by the team was as illustrated in this slide, apart from that they were left to organise their own ways of working. The business environment scan was augmented by the team. Work flow included an examination of key processes.

Team Vision

- **To create a flexible, motivated, team based, network organisation that values learning and open communication as key activities for development and success**
- **With a forward strategy to promote ongoing performance improvement through a series of initiatives**

The team developed their own vision of a future exploration organisation.

This was all within the context of the main organisational targets of adding to the prospect portfolios, adding reserves by new discoveries and optimising the exploration portfolio through acquisitions and divestments.

Exploration Purpose

Basins
Petroleum System

Prospects

Discoveries

$$

Optimise
by acquisition
and divestments

Add new oil

Increase exploration and exploratory appraisal scope.

Develop portfolio based evaluations.

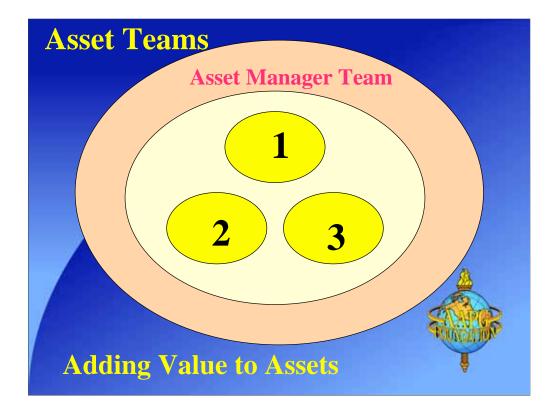Optimise equity holding via acquisitions and divestments of acreage.

Add new reserves and appraise any new discoveries.

New Organisation Aspects

Functions · Assets · Process · Skills

The team built on the idea that an organisation could be viewed from different perspectives: Assets, Functions, Processes and Skills. Each perspective would have its own teams and management or coaching teams.

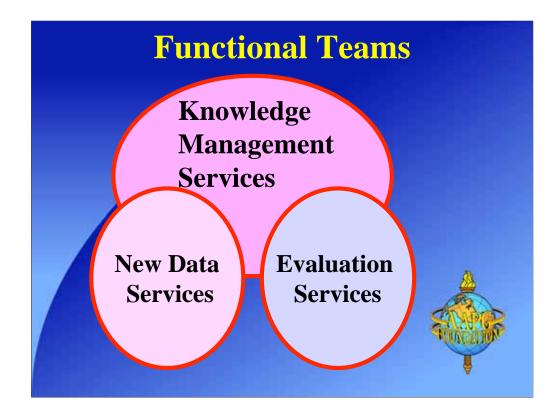Asset management was separated totally from functional management.

People would reside in functional stables and go to work in project teams relating to assets or processes. At the same time staff were to identify with skills groups for making individual knowledge explicit, consultancy and mentoring. Thus, they were not locked into any specific functional silo or group. At any particular period a specific individual would be seen spending time in a variety of teams. The four arrows at the centre of the slide illustrate that an individual professional would spend most time working on assets, but would also spend some time on other matters.

Asset Teams

Asset Manager Team

1

2   3

Adding Value to Assets

This conceptually illustrates three project teams working on specific assets. Remember that all these team members come from different functional stables therefore we can expect a multidisciplinary mix in the teams. None of the teams are permanent. We will discuss the formation of these teams later. An encompassing oval is a team composed of asset managers.

The assets would reflect particular plays or distinct geographical areas.

Let us now look at the functional group.

Functional Teams

Knowledge Management Services

New Data Services

Evaluation Services

The functional teams were divided into three groups as shown in the slide. The next slides show the detail of each group. Remember that all staff reside in one or other of these groups. In a sense these are the stables for the disciplines.

Knowledge Management Services

- **Administrative support**
- **Data management library**
- **Data management support**
- **Information Management**
- **Drafting**
- **Operations Geology**
- **Scouting**

The knowledge management services could be regarded as the glue for the organisation including all the support services.

New Data

- **Topography**
- **Data Acquisition Operations**
- **Data Processing**
- **Contracts**
- **Systems Support and Hardware**
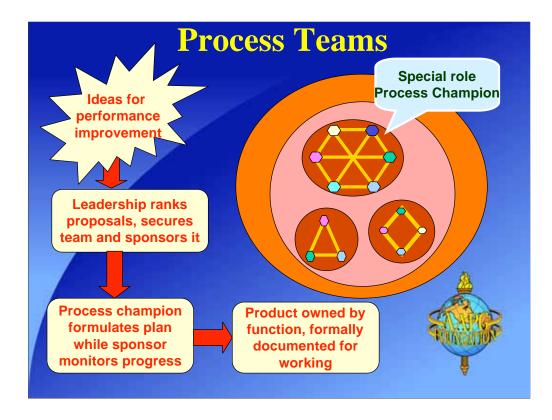- **Hydrographical Services**
- **Geotechnical services**

This largely consisted of topographical, hydrographical and geophysical data flows, but could if so desired incorporate geochemical and geological field work.

Evaluation services

- **Seismic Interpretation**
- **Quantitative Interpretation**
- **Sedimentology**
- **Stratigraphy**
- **Geochemistry**
- **Structural Geology**
- **HC Modelling**
- **Evaluation Support**

This included all forms of data interpretation whereby basic data produced during acquisition and processing was worked upon to provide models of the subsurface. In a small to medium sized exploration organisation, the largest representation of skilled individuals by number will be in seismic interpretation. Other skills such as geochemistry may only be part time.

Process Teams

Much effort was put into improving working processes.

This slide shows three process teams each of a different size. Such teams were relatively short lived. Within each team there was defined a special role, that of the Process Champion who looks after the process when it has been put into place.

The objective of process teams is to improve performance and quality and proposals for improvement could originate from anybody in the organisation. Proposals are ranked by the functional leadership and usually the Asset Manager depending on the process in questions. A team is put together, sponsored with a plan developed by the process champion. Progress is monitored until completion of the work, when the process is documented and put into operation.

Skills Teams

Drafting
Evaluators
Geophysicists
IT
Technical Assistants

Functional management facilitation

Special Roles:
Consultants/Mentors
Technology
Champions

- Promotes skill development
- Facilitates sharing of knowledge and best practice
- Custodian of competence development
- Proposals for quality improvements
- Skills maps and competency matrix

Skills management was given an emphasised role by creation of Skills teams.
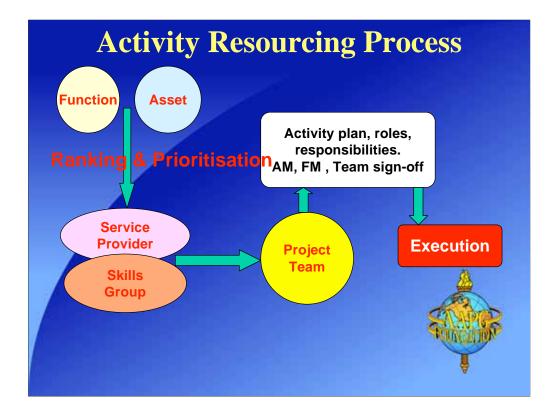
The objective of such teams was to share and foster learning and develop best practice The figure shows the teams as at start up of the new organisation. Each one was facilitated by a member of the exploration leadership, Skills teams were asked to make transparent their individual skills and competences related to the petroleum business and also non technical skills. These included discipline knowledge, applications/ technologies competence and basin and geological setting knowledge. The skills of all individuals were compiled on an explicit web based document.
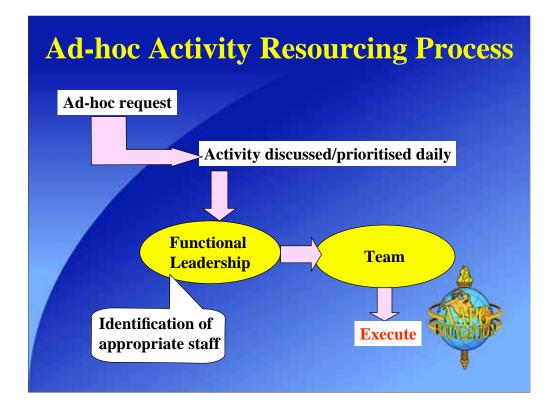
Development Opportunities

I would now like to refer to special roles.

Opportunities for responsibility were developed outside of line responsibility. The concept of focal points or champions was developed. Some were defined at the start of the organisation, but others developed subsequently. Nominated individuals were recognised in discussion between the leadership team and staff and by reference to skills profiles developed by the staff themselves.

The process champion has already been mentioned. A technology champion would be a professional who had say particular and expert knowledge about a specific technology. Consultants were individuals who were valued for their all round knowledge and experience.

Activity Resourcing Process

Function

Asset

Ranking & Prioritisation

Service Provider

Skills Group

Activity plan, roles, responsibilities.
AM, FM , Team sign-off

Project Team

Execution

At start up some processes were needed urgently to deal with prioritisation of projects but also for minor ad hoc activity. All projects were required to be ranked against the internal business plans and strategy. Activity could be generated from a functional or asset perspective or even from staff themselves. On determining the need for a team, the service provider would interact with the skills team to resource a team. The team would then be mandated to provide a plan with roles and responsibilities. Ad hoc requests would be dealt with on a daily basis.

Ad-hoc Activity Resourcing Process

Ad-hoc request

Activity discussed/prioritised daily

Functional Leadership

Team

Identification of appropriate staff

Execute

Ad-hoc activity represents small short term unplanned activity.

Asset Teams

- **Asset teams were put in place for three key studies**
- **Two were successfully completed on time, one was not**

In one case an acreage review was completed on time and received unstinting praise from shareholders and joint venturers.

In another a prospect review team was able to comprehensively document prospectivity and potential. In another area evaluation the project was not completed on time, partly due to under resourcing and competition for resources from other projects introduced by higher management.

Process Teams

- Acreage/opportunity evaluation process
- Seismic acquisition and processing process
- Post activity learning
- Portfolio management
- Skills portfolio development
- Asset reference plans

An Acreage/Opportunity Evaluation Process was defined very quickly in order that project teams immediately had a working process. Essentially, evaluation was defined as a three stage process from initial screening through in depth evaluation to well proposals. Formal assessment steps were in place involving peer groups and exploration management before moving on to the next phase. We will examine this process shortly on subsequent slides.

The Seismic Acquisition and Processing was a formalisation/documentation and improvement of existing processes, but modified in order to ensure a wider ownership of the eventual product from acquisition and processing geophysicists through to interpreters and geologists. Appropriate check points and management approval steps were put in place.

Post Activity Learning was developed to review outcomes of projects; seismic data acquisition and wells to be able to carry learning and improvements into the organisation.
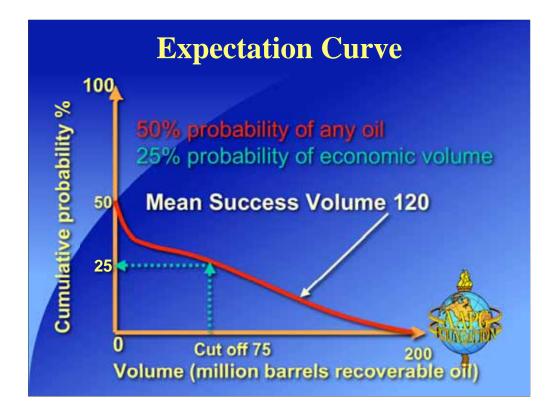
Portfolio management took longer to complete.

Skill pools made very rapid progress towards making explicit and visible individual and group skills. Skill pools coalesced into the following groups:

Evaluators, Geophysicists, Drafting, IT support and Technical (Personal Assistants). Charts were developed showing explicit discipline competences, application knowledge and geographical/geological knowledge.
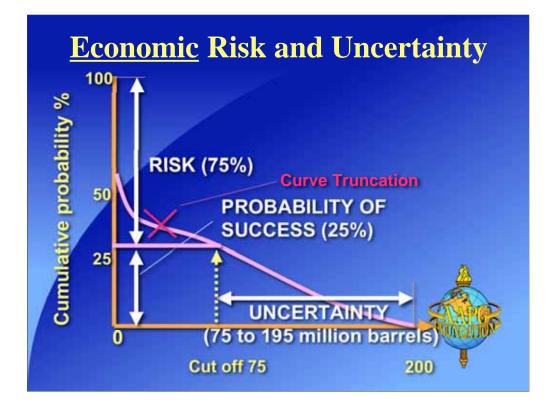
Asset Reference Plans were lacking in the organisation. A team of Asset managers were tasked with designing and implementing a template for the future compilation of such plans.

Linked to all processes was to the requirement to have a clear documented audit trail.
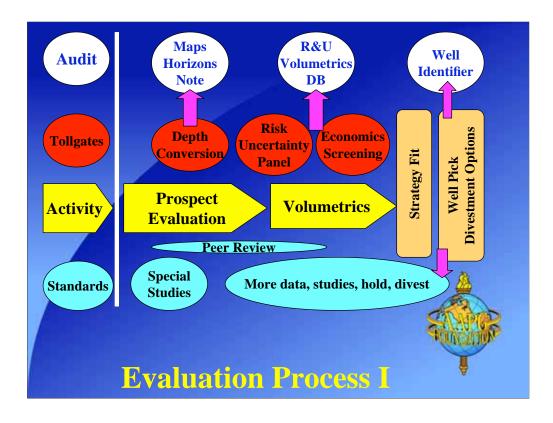
Expectation Curve

A key process in exploration is to evaluate the potential value in terms of hydrocarbon volumes as a basis for economic assessment and ranking.
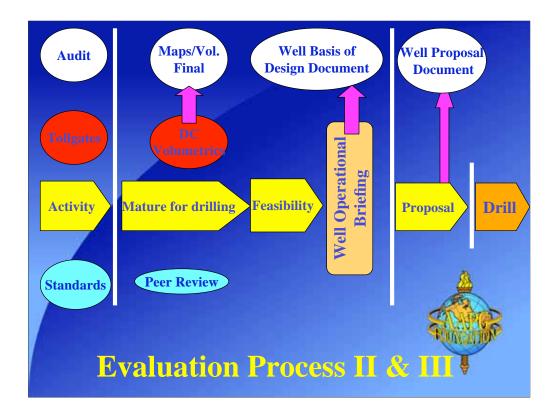
The convention in exploration today is to use expectation curves of volume derived by risked assessments of subsurface geological uncertainties. In this example the possible range of discovery is from a few barrels of oil to around 200 million. Using a greater than convention we say that there is a 50% chance of finding a few barrels or greater. However, a few barrels are not economic and in any area there is a threshold volume at which it becomes economic to develop and produce. In this example the threshold is 75 million barrels and there is a 25% chance of finding 75 million barrels or greater.
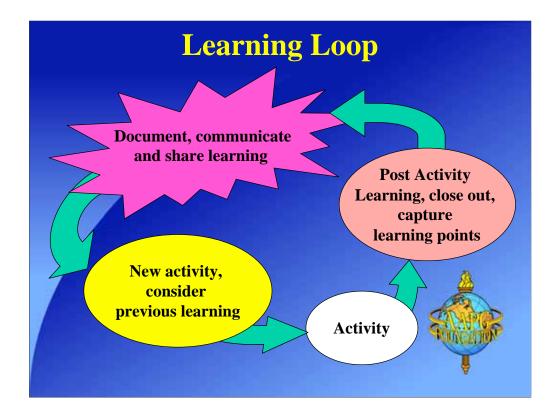
Economic Risk and Uncertainty

Factoring in the cut off there is a 75% risk of failure or not finding an economic deposit and, in the case of an economic discovery, an uncertainty about the range from 75 to 195 million barrels.

Evaluation Process I

The next two slides exhibit key facets of the evaluation process as developed by the process team. The process has four key elements. The activity itself, standards, toll gates and audit. The main activities are shown in yellow. At key points or tollgates the products of activities assessed to determine if further activity should take place. For instance, the lack of a closure would halt the activity. Auditing requires that proper records are kept and curated of the activity products. Standards are defined and required to be met. Throughout the activity peer review takes place as part of the process.
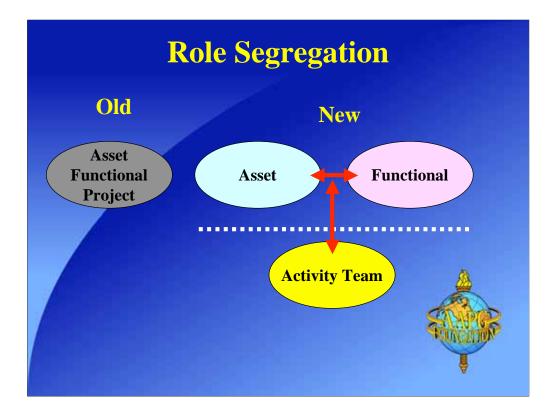
Evaluation Process II & III

I must emphasise that this is only a cartoon or simplified summary of the process.

Learning Loop

A key activity of a learning exploration organisation is to be able to learn by experience. This can apply to anything from the results of a well, examining the performance of a process, or a data acquisition methodology. An activity takes place and a formalised process is in place to examine the results of the activity compared to the aspirations of the activity before it took place. A key aspect was too document and communicate the results in order that the learning is incorporated into new activities.

Strengths

- **Flexible staff/skill resourcing to prioritised activity**
- **Asset based budget and activity management**
- **Quality improvement**
- **Wider responsibility and ownership of staff**
- **Visible skills**
- **Role separation**

What were the strengths of the new organisation after a few months in operation. Elements of a transformer organisation had started to take root. Individuals were actively taking part in various aspects of the new organisation with a wider ownership and responsibility of the staff. Budgets and activities were based on and geared towards the assets. A catalogue of individual skills had been made visible which laid the basis for mentoring and informal consultancy between staff. Role separation had been clearly defined as shown in the next slide.
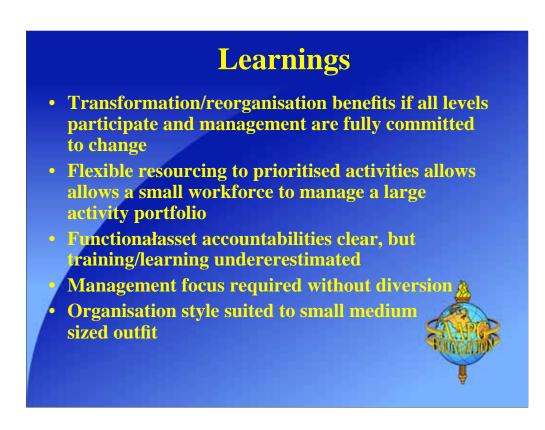
In the old organisation asset team leaders controlled skills which were in limited supply and were not keen to allow them to be utilised in other assets. The separation of the function from the asset freed up limited resources for the benefit of all.

Weaknesses

- **Under resourced for levels of activity and acreage holdings. Mitigated to some extent by flexible approach to projects**
- **Under developed portfolio management system**

Some weaknesses were still apparent. In comparison with similar organisations (in terms of asset portfolio and annual activity levels) it was observed to be under resourced for the planned activity levels. This was improved by a flexible approach to projects and a ranking system. Also, contractor staff were used as buffers to handle variations in the activity levels. The portfolio management system was seen to be underdeveloped and in need of improvement.

Learnings

- **Transformation/reorganisation benefits if all levels participate and management are fully committed to change**
- **Flexible resourcing to prioritised activities allows allows a small workforce to manage a large activity portfolio**
- **Functional/asset accountabilities clear, but training/learning undererestimated**
- **Management focus required without diversion**
- **Organisation style suited to small medium sized outfit**

I am now coming to the end of my lecture. What are the key learnings from this example of organisational change?

It is important that management is fully behind the change and articulates the need for change.

By both formal and informal means all staff should be involved in the transformation. By doing so they develop an ownership of the new organisation.

The flexible approach to resourcing coupled with a prioritised approach related to business plans allows a small workforce to handle a large activity portfolio. Even so, some reinforcement of staff levels was required from contractors to manage peak loads.

The separation of accountabilities was clear, but more time than anticipated is required to help staff adjust to the new environment.

The organisation style is suited to small to medium sized outfits.

Finally

- No single structure
- Several flexible structures inherent to design
- People wear more than one hat
- Maximises use of available talent/knowledge
- Generically appropriate to small medium sized outfit

Finally, there is no single structure, several structures are inherent to the design. Effectively, an organisation can be looked at from the perspective of assets, processes, skills or functions. In a small or medium sized outfit, individuals wear more than one hat. This maximises the use of all available talent and skills especially if the skills have been made formally explicit of all people in the organisation.

To summarise, in this talk I have introduced global change and organisational types. I then looked at the mapping of organisations and the '**Transformer Organisation**' concept

I discussed one example of organisational change including some of the related process aspects and ended with the learning from such an example of change.

I would like to emphasize that this is one example. There will be other solutions for different operational and portfolio situations.

Thank you very much for listening. I would welcome questions on any of the topics I have presented today.