Which acreage should you pursue?

Oil companies might be better thinking in terms of which play to enter, or which acreage to pursue, rather than specifically which prospect to drill. UK company Exprodat has developed software to help them do that.

By Gareth Smith, managing director of Exprodat

In 1996, Peter Rose stated that "the most difficult and critical decision in petroleum exploration is not which prospect to drill, but instead, which new play to enter".

We would argue that this is even more so the case in today's climate of decreasing reserves replacement rates, renewed focus on exploration and increased competition for quality assets.

We would also propose that the next most critical decision is what acreage to pursue after the play has been identified.

Exprodat's Team-GIS™ Acreage Analyst application has been developed specifically to support this process.

Current practise

Acreage analysis forms a key part of the exploration cycle, but is generally the most poorly defined from a process point of view.

Decisions are often driven by subsets of the large volumes of data available to an exploration team, and by personal or historical bias, based on past experiences or exploration strategies.

Quantitative acreage analysis and the ranking of opportunities using all available information require data integration on a massive scale. It is usually seen as too time consuming to carry out on a regular basis, if it's ever carried out at all in a structured, repeatable way.

Many companies apply different processes to acreage analysis, varying between countries, assets or even individuals.

This makes it very difficult to objectively review opportunities on a company-wide scale, and leads to greater uncertainty in opportunity ranking and portfolio management. It is also rarely seen as an iterative process, where new data is fed back in on a regular basis to refine the model.

Technology vendors have traditionally focused on the prospect analysis part of the exploration process, then down in to the earth model and the 'Digital Field'. There are also several innovative technologies associated with basin analysis, often driven by academic research. However, there is very little technology support for the play and acreage analysis components.

Geographic Information Systems (GIS) technology has been used increasingly in this area in recent years, with some success. The problem is that 'out of the box' GIS, being a horizontal technology, is not 'tuned' to this analysis work.

Most of the few commercial tools that have been developed for this purpose are tied to specific vendor data sets. In reality, most companies try to integrate many vendor data sets plus in-house data for their analysis.

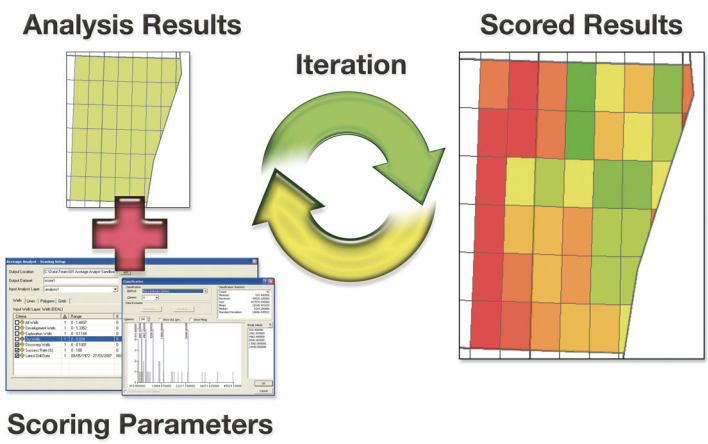
In our experience we see companies developing many different methods using GIS to address essentially the same processes.

Many companies also only use GIS as a data integration and visualisation tool, and don't exploit its full spatial analysis capabilities.

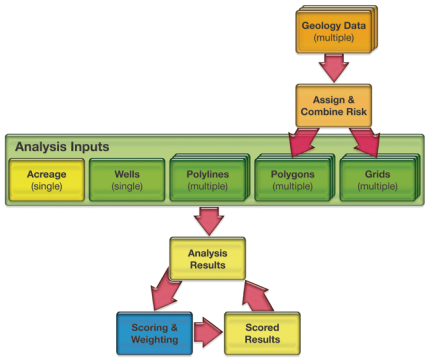
Once data has been collected in the GIS, it is often exported for analysis in Excel, where the rich spatial trends and relationships inherent in the data are lost.

Ranking opportunities

Exprodat Consulting has worked with GIS technology for over 10 years, first as a data management and integration tool, but then exploiting its spatial analysis potential. We started to develop our first tools to support acreage analysis and block ranking in 2000.



The scoring process



How Exprodat works out which acreage should have the most to offer

One of our clients had established a small multi-disciplinary team to evaluate the remaining potential of the North Sea basin system, and to evaluate the many opportunities to farm in to or acquire acreage in this area.

It quickly became clear that they would not be able to review everything available to them, and wanted to systematically rank the opportunities they had using the large regional database they had compiled. A prototype analysis system was developed in GIS.

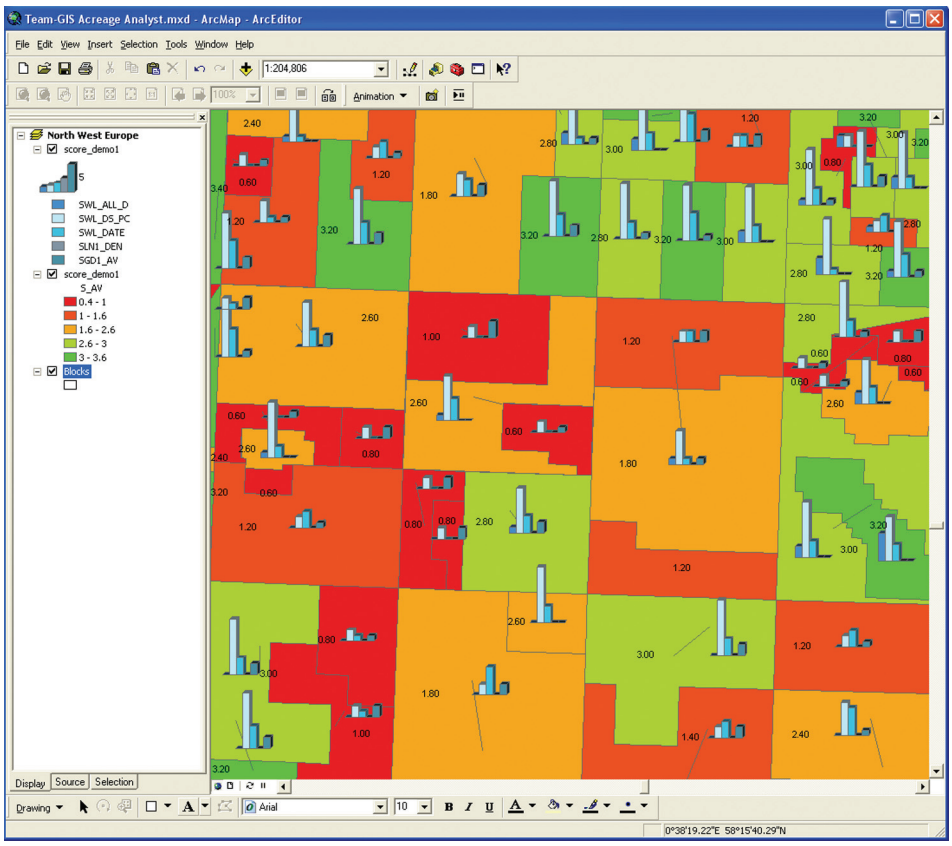
They immediately were able to focus on the most valuable opportunities and present these to management in context of an integrated regional model. Experiences in this area with many clients over the past 8 years have been synthesised in to Team-GIS™ Acreage Analyst.

Team-GIS Acreage Analyst is a play fairway and acreage ranking extension for ArcGIS. It enables you to rank acreage based on large volumes of GIS-based data. Acreage ranking workflows can be standardized, automated and rapidly iterated in order to reduce decision cycle-times, improve decision quality and reduce risk.

Time-consuming and complex manual opportunity ranking workflows are transformed into rapid, repeatable and consistent processes that can be iterated, shared across whole organisations and compared through time. The application is data independent, and can use any vendor or in-house data available in GIS format.

Acreage Analyst consists of three modules:

The **Common Risk Segment** module



Ranking different acreage using Team-GIS Acreage Analyst. Green =high ranking (good), red = low ranking (poor)

allows the user to create Common Risk Segment maps of basins and play fairways. Multiple input layers from disparate sources (e.g. depositional environment, paleogeography, etc.) can be easily combined to create component risk maps for key petroleum system elements such as reservoir, source and seal.

The **Analysis** module is the engine of the acreage ranking process. It allows the user to input multiple GIS datasets (including Common Risk Segment components) which are then analysed with respect to their spatial relationship with the base acreage layer, e.g. by calculating how much of a license/basin/play is covered by a reservoir unit, the average depth to the reservoir or the average play risk in each component of the acreage layer.

Almost all data developed in the Basin and Play modelling processes can be used in the Analysis module.

The **Scoring** module enables the user to score acreage based on the results of the analysis. This allows the input areas of any type of acreage to be ranked according to a user specified scoring schema e.g. the presence of reservoir may be more important than distance to kitchen in ranking a of licences in a particular area. In others, distance to facilities may be a crucial factor.

Speed

Team-GIS Acreage Analyst allows rapid grading and evaluation of potential opportunities at basin, play and licence level and improved portfolio analysis, including competitors acreage positions, farm-in opportunities and licence rounds.

The time taken to carry out this work is reduced from weeks or months, to hours or minutes, and it also becomes an iterative process.

Different models can be quickly generated and calibrated to basin statistics, known discoveries and the prospect portfolio, ensuring consistency and reduced uncertainty across the entire Exploration life-cycle.

For the first time, the Exploration team can use all of the data available to them to develop quantitative models for a key part of the Exploration cycle.

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Definitions

Basin: A region of prolonged subsidence and sediment accumulation in the Earth's crust.

Play: A group of geologically related prospects and fields with a similar petroleum system (reservoir, source, seal, structural style.)

Acreage: An area within a basin or play, usually defined by one or more licences to explore or produce hydrocarbons.

Prospect: A potential oil or gas field.