

**WHITE PAPER -- A VISION FOR GIS**

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**WHITE PAPER -- A VISION FOR GIS**

Date: 04/03/2020

Page

2

of

9

**TABLE OF CONTENTS**

<b>1.0</b>	<b>EXECUTIVE SUMMARY .....</b>	<b>3</b>
<b>2.0</b>	<b>INTRODUCTION .....</b>	<b>4</b>
<b>3.0</b>	<b>GIS WAY FORWARD FOR ADP.....</b>	<b>6</b>
<b>4.0</b>	<b>CASE STUDY: THE ADP WELL PLANNING LIFECYCLE .....</b>	<b>7</b>
<b>5.0</b>	<b>CONCLUSION.....</b>	<b>9</b>

**WHITE PAPER -- A VISION FOR GIS**

Date: 04/03/2020

Page

3

of

9

**1.0 EXECUTIVE SUMMARY**

Generally, it is difficult for large organizations to make full use of their tools and human resources to give maximum benefit for business in terms of increasing productivity and reducing cost. ADP has the advantage of having access to support, resources and expertise from ADNOC while having the ideal size to set an example in optimization.

GIS (Geographic Information Systems) is one technology which many companies fail to use to its maximum. Perhaps, its greatest asset – the map – is also its greatest weakness. The map is so visually appealing and rich in information that most people fail to consider GIS anything more than a map making tool. In fact, GIS is very versatile and has many facets – a user of one of which might think that that is all what GIS is.

At ADP, GIS can be grown organically starting from cartography, expanding to provide capabilities in data management, spatial analysis, solving E&P spatial problems, streamlining processes, automating workflows, building ADP's GIS software services infrastructure to provide GIS access to all non-GIS users. This can be done organically based on business need and opportunities for optimization such that the whole process would make ADP a very efficient and cost-effective organization that espouses innovation.

This white paper describes in some detail how this would apply to a particular case – the well planning lifecycle at ADP. In time, potentially all spatial processes can similarly be streamlined and automated by GIS. By optimizing processes rather than results, ADP can get efficient, consistent, error-free and relatively effortless results allowing ADP resources to be spent on more critical challenges. This is in-line with ADNOC Oil & Gas 4.0 initiative and ADNOC's goals of applying in-house technical innovations to its business.

To realize this vision we already have access to the needed GIS software, support, technical infrastructure, best practices and in-house expertise. What we need is for ADP management to understand this vision and make it part of our strategy so that we can realize it organically over the years.

## WHITE PAPER -- A VISION FOR GIS

Date: 04/03/2020

Page

4

of

9

## 2.0 INTRODUCTION

Why do we need a GIS vision? Is GIS not just a tool to make maps? Then, what is this obsession about its vision? It is true that the first thing that comes to mind when we mention GIS are maps. They are rich in information and help solve so many of an oil company's problems. In fact, they are used across the enterprise in all business units as the need of maps is universal. Their need arises from the fact that almost everything has a location and we regularly analyse problems based on a spatial perspective.

Interestingly, the map making capability of GIS is its most basic capability. Someone who uses MS Excel to only manage their monthly home budget, might mistakenly think that MS Excel is only built for that purpose. The truth is that GIS is very useful and versatile tool that can be used strategically to achieve great efficiency while saving money. When it comes to GIS, our attitude to this technology can be compared to the perspective of a group of blind men examining an elephant (Figure 1).

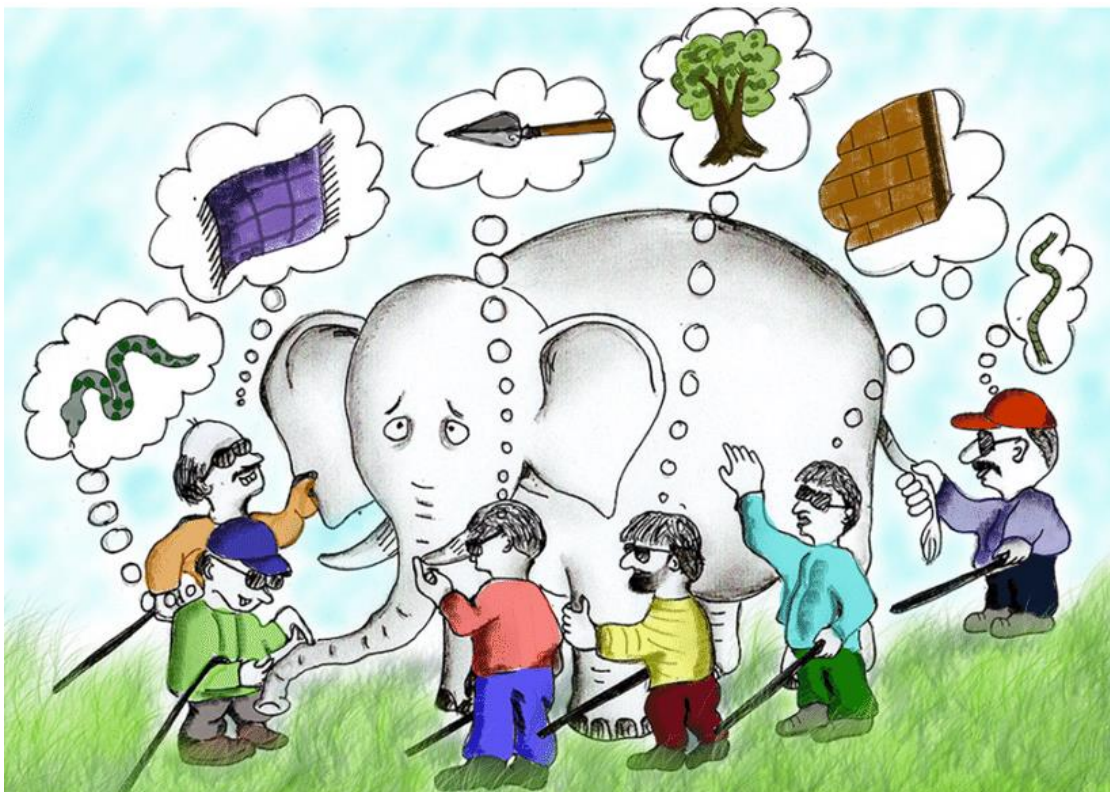


Figure 1. Blind men and the Elephant Representing Common Perspectives of GIS

Each blind person feels a part of the elephant and concludes that the whole elephant is just the part that they felt. Thus, they are all right in their specific contexts but are wrong from a holistic perspective. GIS is like the elephant. Some people know it for making maps and conclude that GIS is just a map making tool. Some people know how GIS helps in data management and conclude that GIS is a data management tool. Some people know how GIS is used to solve spatial analysis problems and conclude that is a tool for just that. Some people look at GIS from a management perspective and consider it to be a tool to only make map-based management dashboards. Some people look at GIS as a visualization tool and only consider it to be system to work in 3D Visualization Centres. Some people look at GIS from a business analysis perspective

**WHITE PAPER -- A VISION FOR GIS**

Date: 04/03/2020

Page

5

of

9

and consider it just a tool to just streamline processes. Some people look at GIS from an IT perspective and consider it be just a tool for optimizing workflows. Some people look at GIS from a system integration perspective and consider it to be just a tool to create map-based software applications based on a comprehensive GIS services infrastructure. Some people look at GIS from the perspective of the whole organization and consider it a means to provide GIS access to all non-GIS users.

I used this analogy to make a point. In reality, most people have two or three perspectives of GIS. Nevertheless, to make full use of GIS, we need to deliberately develop all those aspects of GIS which provide business value and not just consider it a map making tool.

Do we use our smart phones just to make calls? Then, why limit using GIS just for making maps.

## WHITE PAPER -- A VISION FOR GIS

Date: 04/03/2020

Page

6

of

9

### 3.0 GIS WAY FORWARD FOR ADP

GIS services are just established in ADP. Before August 2019, all GIS requests were being handled by ADNOC on behalf of ADP. Initially, the focus for GIS development was on acquiring, processing and organizing data to provide map making services. Today, we have firmly established GIS with services being provided to the CEO Office, Exploration, Development, Drilling, Engineering, Operations and HSE.

It is now time to expand the scope of GIS to address other spatial business needs. Figure 2 shows a possible manner of expansion.

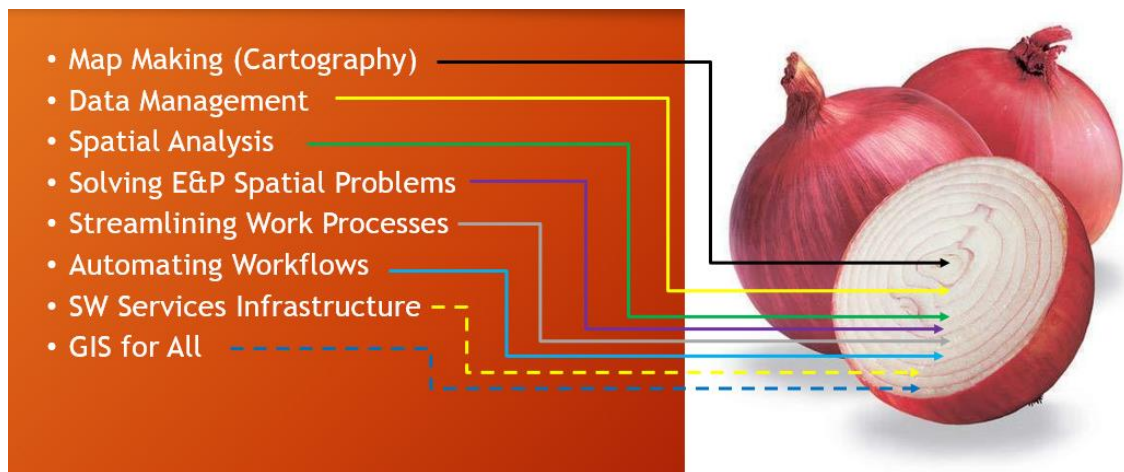


Figure 2. The ADP GIS "Onion" Representing Recommended Stages of GIS Development

GIS development starts from the core of the onion with its basic service of creating maps. As the outer layers of the onion grow, the inner layer stays relevant and is strengthened by the newer outer layer. On the core, we can build data management service, whereby data is made accessible to people through a GIS map interface. The next layer of the onion is spatial analysis using GIS built-in or custom created tools for such tasks as finding shortest path, analysing best pipeline routes and best locations for building facilities. As business in provided more and more GIS services, it become possible to analyse the business problems that the services are addressing. By working closely with the GIS clients, it is possible to use GIS to make their work processes efficient through GIS's IT capabilities. These can be used to automate the workflow and make the process efficient, error-free, effortless and consistent. This will allow resources to be used more strategically and will free up time to deal with bigger challenges rather than routine tasks. This is not only according to the ADNOC Oil & Gas 4.0 initiative and focus on innovation, moreover it is essential for a nimble organization like ADP to thrive and lead the way on how this is done in the OPCOs.

When such GIS automation is done is various different parts of the organization that use location maps in its workflows, we will get a library of GIS software services which can be managed in an infrastructure capable of using them as building blocks to combine different sets for GIS services to create different types of GIS services for the whole company. Thus, we can provide GIS access to all non-GIS users enabling them to work productively without the need for them to wait to get the required information from a specialist.

#### 4.0 CASE STUDY: THE ADP WELL PLANNING LIFECYCLE

To give a taste of how the proposed ADP GIS vision would work, consider a specific application area – the well planning lifecycle. Well planning at ADP involves several disciplines who work on one common shared asset – the geographic location of the well. Figure 3 shows their typical workflows.

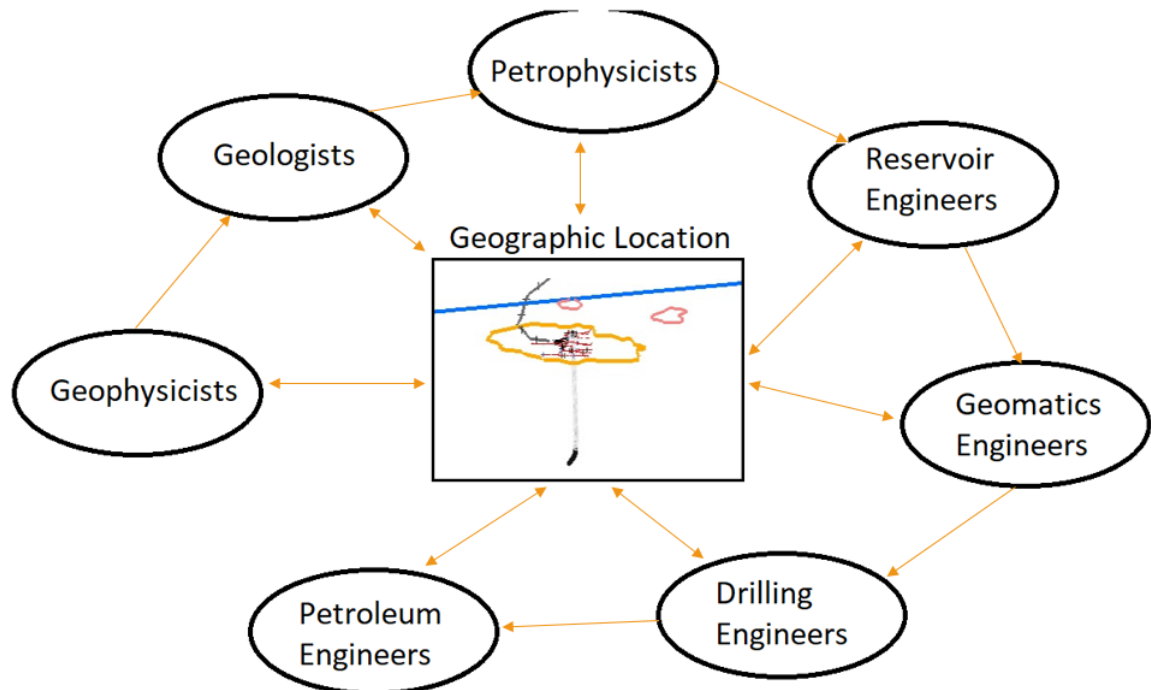


Figure 3. An Overview of the Interdisciplinary Well Planning Process

A well exists at both the surface and the subsurface. Well planning starts from seismic interpretation by geophysicists who discover surface features looking for dome like structures which can be potential traps for migrating hydrocarbons in subsurface rocks. Thus, geophysicists work very closely with a geographical system to study the subsurface prospects. To do this they use Petrel which is specially designed for this work.

Geologists work on maturing these prospects by ranking the prospects in the funnel that the geophysicists create. Ranking is done on potential volume calculations and economic factors keeping the budget and production target in mind. Hydrocarbon volumes are calculated by making use of hydrocarbon saturation, porosity and net to gross (NTG). They make use of the well lithology of existing wells in the surrounding area together with specific rock porosities in the rock layers to refine the set of initial prospects. They go on to make final prospect polygons and prospect maps. Geologists are the people who coordinate the whole well planning process and they make heavy use of a geographic system.

Petrophysicists are involved in well planning to a lesser extent and contribute by planning rock property measurement logs along the trajectory of the well using electrical, nuclear or acoustic methods. These measurements are essential to better understand the subsurface environment and aids in conducting more cost-effective future well drilling campaigns. Petrophysicists also interact with the geographic context of the well.

**WHITE PAPER -- A VISION FOR GIS**

Date: 04/03/2020

Page

8

of

9

Reservoir Engineers play a part in development or in fill wells, in that they plan new wells and study how effectively they would drain the reservoir of hydrocarbons. Enough wells need to be drilled so that not much hydrocarbon is left behind which optimizing well drilling cost. They work significantly with the geographic context to do so.

The subsurface coordinates of a well that are determined by the Reservoir Engineers are passed onto Geomatics Engineers. At ADP, ADNOC Onshore Geomatics Engineers play this role. They analyze the subsurface location and propose a tentative surface location which is outside the HSE safety distance requirements of all surrounding surface facilities. When this is finalized they stake the location in the field which is finally handed over to drilling when the rig arrives for drilling it. Geomatics Engineers make heavy use of geographic system to do their work.

Finally, petroleum engineers are involved to a lesser extent when the well is being drilled or completed. For example, their input might be needed to make sure that production of nearby wells continues uninterrupted when the rig passes over their flowlines to reach the new well location. They need to be kept in the loop as their perspective in the well planning process is important.

The well planning lifecycle explained above shows how each discipline works closely together with the other in the form of internal and external processes as well as with the common asset – the well location.

Here are some of the many ways GIS can make well planning efficient and cost effective:

- GIS can provide a common standard subsurface/surface platform to form the common shared geographic representation of the well that is used by all disciplines.
- GIS can also provide easily accessible, up to date information and work status to any well planning discipline. The same platform can be used to provide summarized management key information in map-based dashboards for the CEO Office / ADNOC.
- GIS can allow powerful integrated 3D visualization of the well location from all perspectives.
- The current work processes that each discipline carries out can be scrutinized and revised so that they be efficient/effective by removing repetition, waste, etc. These streamlined by automation by GIS service tools. Tools like Petrel can integrate with GIS services with GIS acting like a glue to specific discipline specific capabilities of discipline specific tools like Petrel. The same can be done to inter-disciplinary processes. Thus, all process transition arrows shown in Figure 3 by streamlined and automated.
- This platform can be published to WebGIS and made selectively available to anyone in the company

The well planning lifecycle is just one application area for GIS. All other business processes that use a geography can similarly be analyzed and streamlined by GIS. This includes planning pipelines, rig moves, deciding location of new facilities, roads, etc.



**WHITE PAPER -- A VISION FOR GIS**

Date: 04/03/2020

Page

9

of

9

**5.0 CONCLUSION**

This white paper cleared the misconception that GIS is only a map making tool. It showed the full potential of GIS to help ADP become a nimble and cost-effective organization that is a model for other OPCOs in terms of GIS automation.

In terms of resources, we have everything we need. We have access to all needed GIS software and support from ADNOC. We are collaborating with ADNOC in the OneGIS initiative which synergizes with our GIS vision. Our vision is to use the full potential of GIS to solve business problems – not to build GIS technical infrastructure from scratch to do this. OneGIS provides the technical infrastructure for us to implement our vision. We can use ADNOC guidelines and infrastructure to guide us while working on this vision from the ground up where the work business-driven and organic, growing steadily from the GIS onion core to its outer layers.

We have the human resources and expertise in-house. We have industry connections and access to experts to help us. We do not need feasibility studies or to hire consultants. All we need is for ADP management to understand this vision and make future strategy based on it so that we can realize it organically.