Pro-Active Risk Management: A Perspective in Seismic Data Processing ID: 2004771

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Summary

E&P Industry is too much capital intensive and important from strategic reasons for nation's energy security. The exploration of hydrocarbons involves smooth and meticulous execution of Acquisition, Processing & Interpretation (API) of seismic data. This paper highlights the importance and solution for proactive risk management of seismic data processing.

Any risk management exercise begins with knowing the risk exposure and this is listed out by Risk Audit to be carried out by experienced people. The strategy to manage the mapped risks is customized to the individual risks. A Risk management matrix is prepared. This risk management exercise should involve all users and stakeholders of the data processing. The clear benefits due to such detailed and pragmatic risk management exercise are also presented in brief in a 'Benefit pyramid'.

Introduction

Knowing your risks is
Knowing yourself

-Bill Anderson, Director, Swiss Re New Markets

In today's world of uncertainties, it has become increasingly imperative for exploration companies to monitor and manage risks in its chain of seismic data API and further. This paper is focused upon risks in seismic data processing projects and its management thereon. We are talking of management as all the risk cannot be avoided all the time. The first step in managing any risk is to understand it. Failure to understand the essential nature of risk in seismic data processing can have devastating consequences. This study deals with the need & benefit of quickly identifying risk components & step by step process for managing risk components that are involved with the seismic data processing and applying optimal risk management procedures to overcome or reduce such risks.

Pro-active risk management is the process of identifying, analyzing, planning, monitoring and responding to the well understood risk. It involves processes, tools and techniques that help the project team minimize the probability and consequences of adverse events (threats) and maximize the probability and consequences of positive events (opportunities) throughout the life of the project. Through proactive risk management the project team can get quickly more complete information on the risks they face during the course of processing and can develop ways to minimize these uncertainties as they affect final project cost and schedule. This paper lays out the concept of Proactive Risk Management and discusses how it can be useful in seismic data processing to reduce the risk faced by the processors at various center's. Here a comprehensive risk assessment is done for the processing of seismic data.

Need for proactive risk management

The increasing uncertainty & rate of change in the business environment has led to the proactive approach for any industry. In general, the benefits of proactive risk management can be categorized as A). Hard benefits that Lead to the use of the most suitable type of software, contributes to the build-up of statistical information for better decision making, enables a more objective comparison of alternatives, identifies and allocates responsibility to the best Risk Owner. B). The Soft benefits improves corporate experience and general communication, leads to common understanding and improved team spirit, helps develop the ability of staff to assess risks, focuses project management attention on the real and most important risks, demonstrates a responsible approach to clients and provides a fresh view of the personnel issues on a project.

[Risk in itself is not bad, what is bad is risk that is mismanaged, misunderstood, mis-priced, or unintended]

To use an analogy, if your house is on fire, it's good to find that out as soon as possible, but at that point, it's too late to buy insurance. We take proactive approach like using smoke alarm, having handy extinguishers, purchasing insurance etc.

In seismic data processing, we can follow a similar approach for risks that are well understood. We analyze the past processing errors to understand the future possible errors that can creep up during the course of processing. Through proactive risk management, the project can be better planned & executed. It starts with identifying key sources of risks that can have impact on the seismic data processing. In this paper we have identified some risks, classified the level of risk and given the steps that can be followed to manage such risks. In many cases it is seen that the system is in place to avoid certain risks, but the inadequate implementation of these systems & procedures has created small mistakes that lead to disastrous consequences. Hence there is a need not to overlook the

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minute things that usually we avoid knowingly or unknowingly during the course of processing and try to estimate the risks in advance. The risk can expand unchecked in the absence of adequate awareness, commitment and capacity to address it. This study basically recommends a comprehensive framework for all the processing centers to highlight the risk factors & categorize them as high, medium & low risk. This can be integrated with the existing quality manuals designed for processing of seismic data. Qualitative and quantitative identification and measurement of risk sources and the formulation of plans to address and manage these risks & infusion of risk culture is the demand of the time.

RISK MANAGEMENT BENEFITS PYRAMID
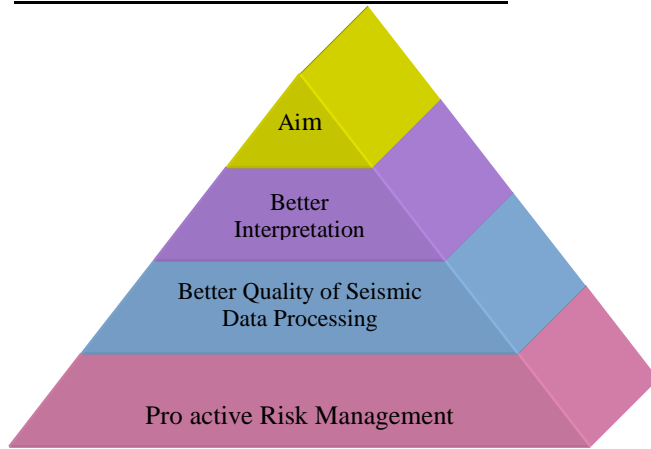
The benefits of risk management in seismic data processing can be explained with a help of a pyramid. Reaching to the top of pyramid starts with the first step i.e. Pro-Active Risk Management. Successful climbing of this step leads to the second step i.e. better Quality in Processing of seismic data. Better quality processed output leads to the third step i.e. Better Interpretation of the processed data and this gives useful hydrocarbon leads which is the ultimate AIM of exploration companies.

Proactive Risk Management Roadmap

The different stages that we should follow in order to have an efficient risk management program and work control are
1.	A risk audit to identify what risks the company is exposed to
2.	Define the strategy and risk management instruments
3.	Defining strict rules for the tactical use of risk management and procedures to be followed to achieve goals of processing project

4.	Finally a proper organization structure has to be created in order to control the use of risk management tools

Risk Audit

Pro-active Risk management starts with Audit of current Risks which the process and system is exposed to. This Risk Audit also measures the likelihood and impact of the various risks.
At present the risks identified by Risk Management Cell, ONGC are as follows:
a). Lack of budgeting, Planning and Expense Control
b). Equipment down time
c). Loss of Data and inappropriate analysis
d). Loss to database library
e). Lack of control in procurement and outsourcing

Seismic data processing is exposed to various kind of risks at different level.

Risk Management Strategy and instruments

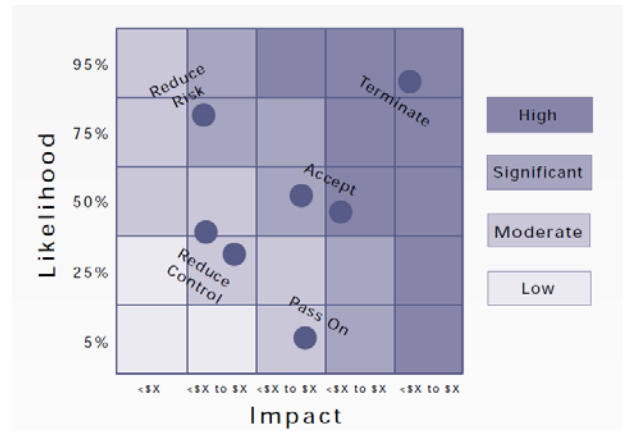The risk management strategy to be decided depends on the risks mapped by the Risk Audit.

Figure 1: Business risk matrix.

The ways adopted to overcome various risks depend on the type of risk identified its likelihood and impact on overall processed data outcome.

Risk management in seismic data processing

Risk entails two essential components – Exposure and Uncertainty. Thus Risk is Uncertainty + Undesirable Outcomes.

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In this paper, we have identified some factors that can have negative impact on the smooth completion of the time bound seismic data processing projects and the possible ways to reduce such risks with proper planning & monitoring of the projects. The amount of risk related to the above factors is classified as low medium and high. The impact of these risks & the ways to overcome, reduce or minimize these risk factors in seismic projects is mentioned.
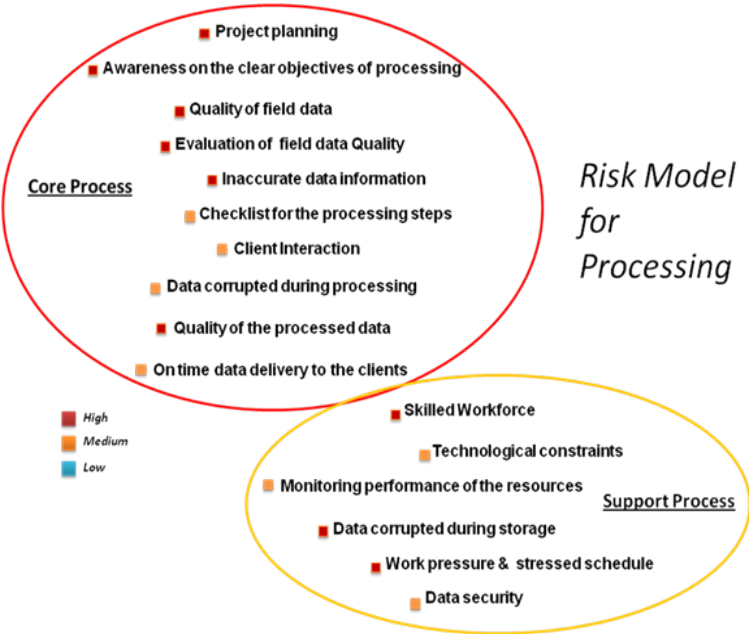

Figure2: Risk Model for processing

In the current case of Seismic data processing we have given the different ways to be adopted for different risks listed out:

Processing Risk	Ways adopted
1. **Project planning**	Bar chart for plan Vs actual
2. **Awareness on the clear objective**	Recorded in project progress template
3. **Quality of field data**	Uniform checklist for QC of incoming field data
4. **Wrong evaluation of field data Quality**	Deployment of best skilled seismic data analysts
5. **Inaccurate data information**	QC procedure in-place to check the input data
6. **Checklist for the processing steps**	Independent QC team and checklist
7. **Client Interaction**	Periodic review and client feedback
8. **Data getting loss/ corrupted during processing**	Software features enabling to control this risk
9. **Quality of the processed data**	Independent QC team and checklist
10. **On time data delivery to the client**	Periodic review meetings
11. **Skilled Workforce**	Training, OEM interaction and mentoring by domain experts
12. **Technological constraints**	Regular technology updation
13. **Monitoring the performance of resources like hardware & software**	System performance reporting and close monitoring through regular MIS reports
14. **Data getting corrupted during storage**	Back up recording and maintenance recorded in project progress template
15. **Work pressure & stressed schedule**	Proper planning and manpower pooling
16. **Data Security**	Physical and software administered controls with fail-safe mechanism

Project planning

The success of a project will depend critically upon the effort, care and skill we apply in its initial planning. A high amount of risk is involved with inappropriate project planning that leads to late delivery of product, demotivated staff by constant pressure deteriorating product quality & hence company's image

For proactive project planning the ways can be as follows. Identify the materials, equipment and manpower which are needed, a precise understanding of the extent of any intermediate stages of the task, particularly those which have to be delivered, the interfaces: between your team and with clients i.e. a constant communication process, Activities should be planned in advance, Bar chart for the project reflecting meticulous planning should be made to Avoid duplication of work. Best of the team comprising of experts for that area can be engaged to get best of product, external dependencies can be taken care in advance

Awareness on the clear objective

Unclear Objective i.e. what the project is trying to achieve, is unclear can become leading cause of project failure

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giving it a high risk factor. The final deliverables will not be able to satisfy the goal for which the processing is done. A clear objective will help in selection of processing parameters and to some extent processing flow as well.

It is required that objective of processing should be made very clear to the processors in advance and is recorded in project progress template. Good Communication with clients, proactive attitude for processing, strong management may lead to clear objective.

Quality of field data

In seismic industry the field data quality is one of the most crucial factors. If data quality is not good the end result can never fulfill the objective.

Before processing starts, its mandatory to ensure the quality norms for acquisition is followed or not. The signal to noise ratio, bandwidth is good enough to achieve the objective.

Evaluation of field data Quality

High risk comes if we don't evaluate the quality of seismic data properly at the processing centre. Sometimes we are unable to judge that the input seismic data meets the requirement of processing or not. Now this actually depends on the processor how they are interpreting the quality of the data. For example it might happen that the data acquired, following all quality norms with best skilled manpower & resources, is still noisy. The judgment just based on looking at the seismic data and not considering the other factors like geology of the area where data is acquired will tend to wrong evaluation because it can happen that data is acquired in rouged terrain. The evaluation is very important in the light of set objectives for processing for which experienced skilled processors is the requirement.

Inaccurate data information
Sometimes it is seen that the information provided for processing is not correct. Along with the seismic data, other information which is important for accurate imaging is navigation data and the correct description of geometry for each shot especially for land data. For example there is a problem with the navigation file, shot point numbers etc. Now here risk comes if a processor overlooks this mistake. This can give a wrong processing output with inaccurate information for interpretation.

What need to be done is to QC all the input data very thoroughly and try to correct the wrong information or get the correct data.

Checklist for the processing steps

Processing steps/ flows may have some variations from data to data. Poor and erroneous processing gives erroneous interpretation.
A list of steps necessary for processing is available with the team experts. Periodic review of the data & steps involved during processing is done by team called "QC team" that checks the data at various stages. Tests results can be Quality checked at every step before production runs.

Lack of Interaction / coordination with client

Interaction with client, in case of processors interpreter is a client, is a must for successful completion of the project. Poor quality of data output leads to poor interpretation. Moreover the duration of project completion may increase leading to delay in output. Timely input from interpreter helps processors to achieve desired output.

Periodic review of the project can be taken up from the start till the end of the project. Customer feedback system should be in-place through Client interaction meets at important steps of processing. Availability chart of the inputs for the projects is made before project starts.

Data getting loss/ corrupted during processing

The data lost due to disk crash or system problem leads to delays, time money & manpower loss. Project completion gets affected leading to late product delivery to the clients and dissatisfaction among the working level. The level of risk is medium here because the seismic data can be regenerated from the raw data that we usually get in cartridges
This has to be prevented and all precautions should be taken by taking project backups at every stage. Software features enabling to control this risk.

Quality of the processed data

The data quality is good or bad that depends on the many factors. Poor interpretation leads to poor reserves prediction & loss of faith of the clients on the processing Centre. All efforts, at every stage, are to be done to avoid bad quality outputs.

Adequate Quality control procedures made in-place to ensure good quality of data output- Quality team with filed experts other than the people involve in the project, reviews the project at various important steps. Team work should be emphasized to get best of product. Timely interaction meet within the processing analysts of the project & with client can be done to ensure the desired output.

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On time delivery to the client

In the fast pace business time is money. A product not delivered on time causes heavy loss to the clients (interpreters) that creates dissatisfaction among clients and affect company's reputation.
Periodic review meetings ensure timely progress of project

Skilled Workforce

Man behind machine is the most important factor everywhere. Having the necessary skilled workforce is the key constraint in the E & P industry.

Existing workers move between companies or get internal transfer from one centre to the other leaving a gap in at that place. Less experienced processors having best seismic data, equipped with best resources & technologies will fail to deliver the quality output .Hence there is a good amount of risk involved as Poor quality of products leads to Poor imaging & Poor interpretation.
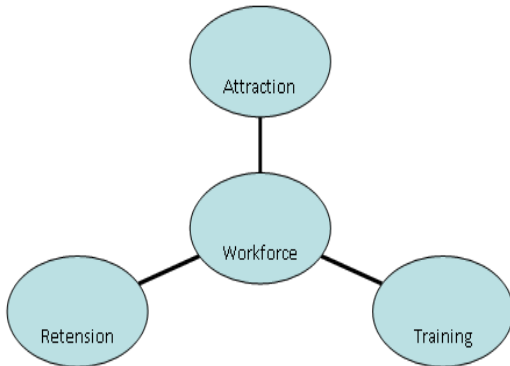

We can use a MAKE FIX & BUY Model

■ **MAKE** Grow professional and trade/technical skills for new entrants to the industry

■ **FIX** On-the-job up-skilling for those already in the industry.

■ **BUY** Immigration – source skilled labour on the world market.

A proactive approach to this is to forecast our future demands in the context of the seismic data processing process to get the right people, with the right skills, in the right place at the right time." In case where management wants to make a team of skilled talented processors they can adopt "Benchmarking Method"
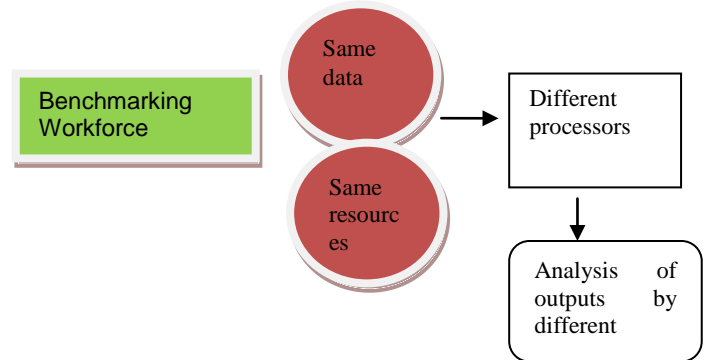
Technological constraints in processing

Hydrocarbon industry relies heavily on seismic data processing packages & hardware resources to facilitate the discovery of new oil and gas traps. Significant investments in procuring or licensing seismic data processing softwares & hardware are done.
Ability to collect, find, edit, manage, and transfer data quickly and easily, allowing them to provide the right information to the right people at the right time in support of their business processes. Medium risk is involved with technological constraint. Quality of product lags to compete with international standards - Dissatisfaction among employees working
Regular technology updation needs to be taken care. Processing centre should have state-of-the-art technology for softwares, Hardware's and other resources for data processing. Latest development in the technology included by the vendors should be updated timely by the processing centre's.

Lack of process to monitor the performance of resources like hardware & software

The performance of resources has impact on the execution time of the project as well as on the quality of processed output. Best skilled processors feel handicapped without proper hardware and software resources.
Close monitoring of the resources, a 24 hour support from Hardware & Software side, dedicated people to monitor system performance, Monitoring of System performance through weekly/monthly reports prepared by Processing team experts and adoption of proactive system administrators can be adopted for diagnosing problems before they can cause a loss & gain insight into potential performance bottlenecks and establish baseline performance values.

Risk of data getting corrupted during storage

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Data corrupted during storage means one cannot read the information properly. Unavailability of information if required in future - time and money loss to reprocess the data or gather the information again

This may happen if storage area is not properly maintained. Temperature and humidity are the two important parameters which should be maintained strictly as per the set norms.

Special division established to take care of the data storage. Monthly physical checkup of the place where data is stored- proper maintenance of the area of data storage. Back up recording and maintenance recorded in project progress template**.**

Work pressure & stressed schedule leading to deteriorating work Performance

With time number crunching machine have become very fast. Difficult job requirements affect everyone differently. A challenging event for one person can be highly stressful to another. Stress from doing the job can be caused by many factors like boring or repetitive work, or too little to do; too much to do, too little time; to little/too much training or support for the job; confusion over, or too much, responsibility for managing others; confusion over priorities, timeframes and standards; or sub-standard performance resulting in disciplinary action such as dismissal, retrenchment, demotion, discipline, transfer or redeployment; a worker not being promoted.

Excessive stress can interfere with your productivity Poor communication, low levels of support for problem solving and personal. These risks can be identified by the managers & steps can be taken to minimize it. We classify these risks in the medium category.

Ways adopted can be providing training in interpersonal skills; consultation with staff over restructuring plans, providing opportunities for employees to contribute ideas and to be consulted establish open and non-judgmental communication free from the fear of retribution between management and employees; encourage consultation and cooperation between employers, employees, feedback from employees, Activities should be planned in advance, Bar chart for the project reflecting meticulous planning should be made. Best of the team comprising of expert

Data security

Data is invaluable and its cost cannot be evaluated only in terms of money. Even a small portion of data , if stolen or lost, can make the remaining data useless especially in case of 3D seismic data volumes. A high risk is involved with the data. threat to data means threat to business, threat to brand & reputation of the company. To reduce this risk identify security and operational weaknesses in the data

centre's. Physically security can be made active-Entry inside processing centre's should be restricted to employees only - Access to the workstations restricted to the users only - Internet not available on work stations where data is kept. Physical and software administered controls with fail-safe mechanism can be taken care.

Conclusions

Proactive risk management in seismic data processing helps the project team to get quickly more complete information on the risks they face during the course of processing and can develop ways to minimize these uncertainties as they affect final project cost and schedule. ,We have used the concept of Proactive Risk Management in seismic data processing and discusses how risks can be identified by different processes like risk audit etc possible ways to reduce such risks with proper planning & monitoring of the projects. Here a comprehensive risk assessment is done through Risk Model classifying as low medium and high. The impact of these risks & the ways to overcome, reduce or minimize these risk factors in seismic projects is mentioned.

As such Proactive risk management in seismic data processing is a transformative process. Fully implementing a risk management culture will take time.

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