



Virtual Learning: A Paradigm Shift – ONGC Experience

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Summary

Virtual Learning System (VLS) is an effective tool for management of knowledge in a knowledge organisation. It requires a very efficient change management to ensure acceptance and utilisation of the system. This paper presents the valuable experiences gained in this regard by ONGC during implementation of the Pilot and company wide roll-out of a VLS. It also brings out the issues regarding VLS and its potential application in competency development of the employees and creating a company-wide best practices database.

Key word: Virtual learning, Knowledge

Introduction

Virtual learning or e-learning is a knowledge transfer framework that blends multiple electronic channels and interaction models to improve user skills, performance, and awareness in the context of life, work, and learning styles. According to an estimate e-learning provides 30% more learning content, in 40% less time and at 30% less cost than traditional classroom learning (Doane, 2003) . This is all about building a culture in which learning is an ongoing process and employees take responsibility for their own knowledge up- gradation and development.

Better knowledge management is a key determinant for the success of any organization in general and a knowledge intensive industry like oil exploration in particular.

- There is knowledge explosion in the present century. More knowledge has been developed in this one century than what was developed in the last five centuries put together.
- Explosion in the Information Technology has changed the rules of business. Small companies with strong Knowledge Management through I.T. have proved to be more successful than the larger traditionally managed companies.
- 'Easy oil' is over and it is now 'era of difficult oil' from the deepwater and other frontier areas, where the exploration is much more technology intensive and the economics operates at a different level of risk and gain. Companies are working for better risk mitigation through new technologies.
- The technology development in oil exploration especially in the global geophysical technology has been tremendous.

- Geophysical technology experienced the steady and sometimes explosive expansion typical of technologically driven growth industries (Harry Mayne, 1982). These technology growths have enormously mitigated the high exploration risk especially in the high risk areas like deep-waters.

Growth in geophysical technology

For example, over the last forty years the technology growth has been striking in Seismic data acquisition, processing and interpretation. The global seismic acquisition has evolved from seismic reflection profiling, CDP, Vibroseis through 3-D seismic, VSP, Multi-component seismic to crosswell seismic, 4D seismic, Marine 4-C, Q-Land, Q-Marine, Vector seis etc.

The seismic processing evolves from Digital seismic processing, digital migration, 2-D PSDM, Residual statics, through 3-D migration velocity analysis, slant stack, 2D reflection Tomography, DMO to 3-D PSDM, Neural networks, Turning wave migration, Wavelet transform processing etc.

The global seismic interpretation technology has evolved from seismic stratigraphy, 1-D attributes, 1-D impedance inversion, bright spot technology, to IIWS, AVO, 2-D attributes etc.

The growth of geophysical technologies continues with contemporary and future technologies such as:

- 3-D Electromagnetic Imaging
- Cross-well Seismic Imaging
- Geosynthetic Membrane Monitoring System
- Magnetostrictive Borehole Seismic Source
- Subsurface Imaging Using Cross borehole

Electromagnetics etc.

These developments are helping the oil companies reduce risk substantially and guiding them to venture into hitherto unexplored territories like thrust belts and deep offshore. To ensure the exploration experts take full advantage of these developments, oil companies need to ensure quick upgradation of knowledge of these experts as well as free exchange of experiences among them. Virtual learning provides the most effective tools in this context.

Science of learning

Learning spectrum spans the entire gamut of teaching, training, coaching, and mentoring. While at teaching end of the spectrum represents knowledge vending, the mentoring end signifies voluntary acquisition of knowledge by an individual assisted and supported by an organisation. Teaching may be considered as the transfer of knowledge from teacher to the taught and like any process of energy transfer the efficiencies are low and substantial losses exist. Training is teaching through action the skills to accomplish a task. Learning efficiency is better compared to mere teaching. Coaching is to let learner do the task and provide guidance and mid course correction as necessary. The process encourages innovation and personalization of knowledge. Mentoring is the culmination of knowledge transfer system in many ways; it could be providing the learner knowledge, ambiance, motivation and encouragement for learning.

Learning happens through reading, listening, playing, experimenting, and modeling. Different stages of learning involve observing, doing, experiencing, thinking, meditating. Observation involves acquiring knowledge through sensual faculties. Experiencing is the way of internalizing the results of learning within oneself. Thinking proceeds through analyzing and helps the learner evaluate what is learnt. Meditating is going beyond mere experience. Vedic Learning (Upanishad) is the ultimate way of learning. 'Upa' means 'by the side of Guru' and 'Nishad' means 'sit and learn'. Extreme meditative experience gained under the tutelage of a compassionate guru can elevate the cognitive experience of the disciple to a level of enlightenment.

Virtual learning

Virtual learning has its own advantages and limitations in addressing these objects of the science of learning. Virtual Learning system (VLS) is a radical paradigm shift from the traditional classroom training.

- Training to learning – In training the organization decides what, how and when the learners will learn. Whereas in learning, these are a matter of choice of the learner. Here the individual decides what, how and when one wants to learn to prepare oneself for meeting the organization goals and objectives.
- Teaching to facilitating – In teaching chunks of knowledge are handed down on a platter by the teacher to the taught. What the learners consume and utilize is beyond the control of the teacher. Organisations only facilitate learning and learners tune their learning to match the tasks and challenges at hand.
- Assigned to voluntary - In current paradigm, trainees are assigned to certain training module while in VLS it is voluntarily decided by the learners depending on the perception of the competencies expected of him/her by the organization.
- Framed to evolving – Traditional training modules are rigid and fixed while the virtual learning modules evolve with the emerging learning needs of the individual.
- Broad based to tailored – Traditional learning is broad based to address the need of a group of trainees whereas Virtual Learning is individually tailored.

It is really astonishing that how Virtual Learning happen when there is

- No physical interaction with Guru
- No separate environment – ambiance
- No schedule!!!!
- No target!!!!
- No Monitoring!!!!
- No Checking!!!!

In fact some of these could become the weaknesses in a virtual learning environment unless adequate system support is provided by the organization.

- Virtual Learning System (VLS) provides,
- Access to extensive knowledge on the desktop
 - Learning at your own pace and in your own style
 - Learning what you need and when you need it
 - Learning and application of knowledge in real time
 - Access to cross disciplinary knowledge
 - Access to basics and fundamentals without embarrassment of exposure
 - Self assessment of your knowledge and post learning effectiveness in privacy
 - Learning by doing real data simulated assignments (Action learning) without the risk of causing damage/loss to the organisation



Evolution of e-learning

With the market growth, the VLS also grew through the evolution of e-learning. E-learning involves the use of technology to enhance learning including digital collaboration, satellite broadcasting, CD-ROMS, video and audio conferencing, mobile technology, interactive TV and web based technologies. Many successful implementations have used combination of learning with face to face delivery (blended learning).

The technology evolution related to e-learning can be divided into following four phases in the last twenty years:

Stand alone software: 1985 - 90

Client server network: 1990 - 95

Internet – Intranet: 1995 - 2000

Wireless connectivity: 2000 -2005

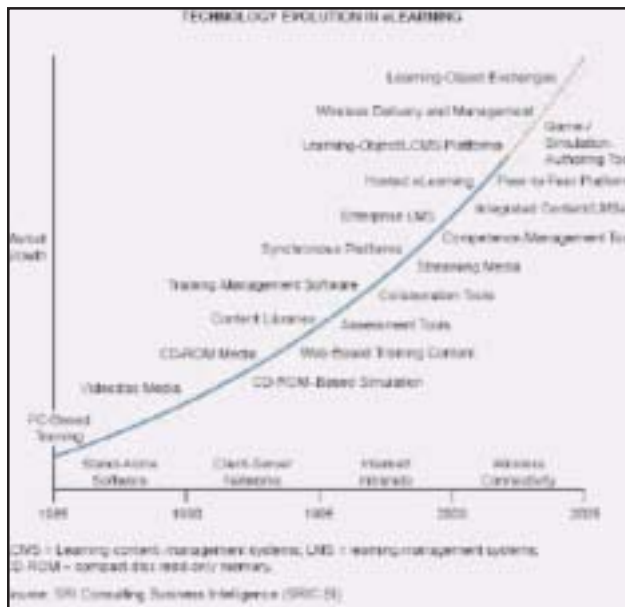


Fig 1. The technology evolution of e-learning from PC based training, through CD-ROM media (server based) through synchronous platform with learning management system (Internet / Intranet) to wireless delivery and management system. (Source: SRI consulting business intelligence (SRI-BI),www.sric-bi.com.

Salient features of VLS

Evaluations

The evaluation of the learners can be made through dialogue with the learner and informing the management about the same. Learning management system is a very

effective tool for proper evaluation (integrated within the system)]

Learner's time online may be a measure of evaluation. This evaluation may be made a part of key performance indicator (KPI). Some validations may be made by the supervisors regarding the usefulness of learning.

- Real commitments from learners and mentors
- Learner's motivation
- Learner's Feedback
- Reasons for failure to complete the course

Time for learners and mentors

Learners and mentors are to be given dedicated time slot for accessing VLS by: Cubicle's with engage sign on while learning is in progress, so that learners do not get disturbed easily. Stand alone Computer room for providing proper learning environment

Motivation

Learners are motivated to learn when they perceive that the knowledge gained will help them perform jobs more effectively. To ensure relevancy, all learning should be linked to job expectation. Managers should provide each worker with Key Results Areas (KRA). A KRA is made up of tasks that work collectively towards achievement of a goal. A learning plan includes the main headings like timeline, activity, resources status follow-up etc.

Recognition system for the Learners, Mentors and System Administrators are the most effective way of motivation. What's in it for the learners should be made clear to them and they should be clearly advised about the benefit of training.

In the mentoring system sometimes the learners may also be allowed to rate the mentors.

Feed back

Feed back system from the learners and mentors are the most effective part of learning. Feedback from users as well as from their supervisor should be obtained regarding the effectiveness and usefulness of the learning. Successful completion should be celebrated by giving token award to the learners. Newsletter from organiser to all users: About the latest or new contents developed in the site.

ONGC's initiatives

The importance of Knowledge Management (KM) was recognized and actions were initiated in ONGC in 1990s. Virtual Learning system (VLS) was identified as one of the KM initiatives to be introduced in ONGC. ONGC decided that the International Petroleum Industry Multimedia System (IPIMS) developed by IHRDC, USA would be a suitable vehicle to implement Virtual Learning system (VLS) within the Company.

International Petroleum Industry Multimedia System – Exploration and Production (IPIMS.ep) is a knowledge learning and communication virtual learning system (VLS) developed by M/S IHRDC, USA, devoted to the upstream petroleum (exploration and production) sector for the international energy business. The IPIMS.ep provides a structured, self-paced learning facility through online text, animated graphics and videos for all aspects of exploration and production from geology, geophysics to reservoir engineering, drilling, production engineering and formation evaluation. The whole system is divided into two major parts viz., Background learning and Action learning. The background learning is an e-encyclopedia of basic knowledge in all facets of exploration and production. The Action Learning is learning by doing and it relies on the use of realistic scenarios that reflect the actual work assignments, challenges and supports individuals as they build competencies that the international companies have identified as critical for superior job performance.

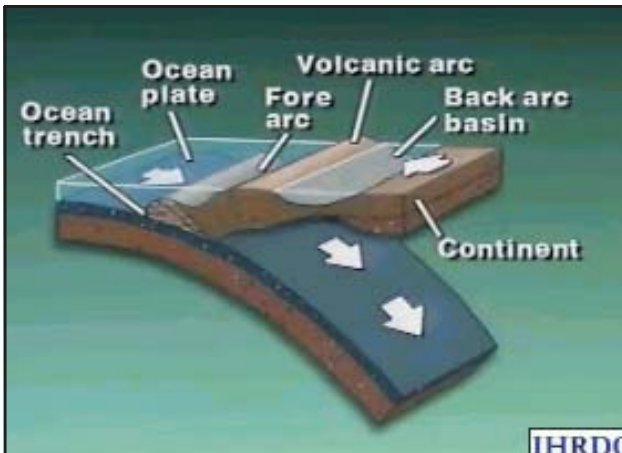


Fig. 2: A still picture captured from animation graphics explaining location of back arc basin with respect to the plate movement – in the Virtual learning system

ONGC Experience

A pilot was undertaken at ten sites of ONGC for a



Fig.3: Video clippings from Virtual learning system: Prof. N.A.Anste delivering a field lecture on seismic data acquisition

period of one year from Feb. 2002 to March 2003 with 10 Background Learning license and 100 seats of Action Learning.

The feedback from learners in the pilot indicated that the system is very useful for:

- (a) Getting back to the basics
- (b) Cross disciplinary learning

The action learning system was well received and there was good enthusiasm to take up the simulated assignments among the learners.

Based on the pilot experience the Executive Committee of ONGC decided to roll out the VLS across the organization. 500 licenses of background learning distributed over 66 sites in ONGC were established for a period of one year from February, 2004 to March, 2005. Thousand action learning plan licenses were also acquired for the same period.

Though the cultural change required for acceptance of a new paradigm was taking time, the Virtual Learning System got established reasonably well in the very first year of its roll out due to the strong support from the top. ONGC usage figures for the nationwide licenses were 7172 hours



during the period from March 2004 to November 2004 compared to the usage of 1134 hours and 2614 hours by M/s British Petroleum and M/s Schlumberger (usage figures provided by IHRDC) for their global licenses during the same period respectively. The total usage for the entire license period (from March 2004 to May 2005) was 13300 hours in ONGC.

During the pilot phase ONGC accessed the IPIMS system through internet connection from IHRDC server at Boston. Though the video files were loaded on the ONGC servers for better access speed, the arrangement was not very effective and users experienced difficulties in the learning process due to slow access and frequent breakdown of internet connection. To eliminate the problem during the roll out phase, licenses were installed on individual LAN servers at different sites. The experience in the roll-out phase has been a mixed bag with some of the sites making excellent use of the system and some sites reporting poor access.

The feed back from a sample group of learners indicated that the learners would like:

- Continuation of VLS in ONGC.
- Self-evaluation through Action Learning Program.
- Formalized programs of specified time period for accessing VLS.
- More coverage of topics in VLS, including advanced topics.
- Since most of the contents are of basic/fundamental in nature, the learners want some advanced content to be developed
- Contents on related technical and engineering (E&T, IT, Mechanical) discipline may be incorporated in it.
- Contents on deep water exploration and Coal bed methane exploration may also be developed.

Potential application

Practical knowledge capturing

Templates have been provided by IHRDC for capturing practical knowledge developed by experts through long experience and best practices within an organization. These knowledge items are stored along with the background knowledge already stored by IHRDC in the knowledge base and become available to the learners during the structured access of knowledge in IPIMS.ep system. This will be a step forward for knowledge distribution and knowledge sharing within the Company. This best practice database is unique as it is hosted in a learning system with all the basic knowledge just a mouse click away.

A process of knowledge capturing and organization for ONGC is being developed as follows:

Domain experts or subject matter experts (SME)

- to be identified and nominated for each subject / discipline / area. They will create the material for the best practice database

Data Base Builder (DBB)

- A young team to be identified for collecting compiling matters from SMEs and loading it into the template

Approving authority or Clearance Coordinators (CC)

- An empowered team (clearance coordinators) of experts who scrutinize and approve / reject the submitted knowledge items for inclusion in knowledge base (also to take care of the confidentiality / IPR etc.).

This best practice data base is much more effective than any other database as the basic knowledge needed to understand any of the advanced process in the best practice is in built in the system and the best practice resides with the concerned categories of the basic knowledge available in the learning system. Through intranet this best practice can be made available for viewing form any installation of ONGC.

Template development for competency model

Competency model is a collection of selected Background and Action learning modules assembled / developed by IHRDC for any Company based on job areas and various knowledge levels (e.g., Awareness level, Basic application, Skillful application, Mastery). The minimum level of competency, a learner should attain, may be fixed by the Company itself.

ONGC requested IHRDC to develop a template to facilitate preparation of its own competency models for different job areas and various levels of learners.

Skill gap analysis

After designing the competency model for any job area and defining a target competency level a Skill gap analysis could be done for the learners as per the formats developed by IHRDC (Fig. 3). Skill map, as desired for different levels of employees, may be prepared by the organization combining the learning modules based on job areas. The levels may be divided into four categories viz., awareness, basic application, skilled application and mastery.

The skilled application and mastery may include an on job training also. As the learning progresses for any learner, the gap between required level and present competency level may be seen at a glance by the colour difference. The employees may also voluntarily upgrade his / her level of skill according to this map and bridge the skill gap.



Fig.4: Skill gap map of learners for a competency model for drilling engineer. Pink is the required competency level and green is the achieved competency level.

Structured utilization

Based on experience so far it is suggested that the utilization of VLS may be improved by introducing:

- Structured learning modules, specific time schedules and strong mentoring support
- Knowledge centers combining the facilities of conventional library, e-library, global database access video conferencing and VLS with online mentoring
- Using VLS (Action Learning) as an assessment centre
- Introducing motivational scheme through recognition and reward
- Making VLS an integral part of the annual assessment process
- Integrating the traditional training system with VLS

Future of VLS

e-learning ecosystem through Learning Management System - An ecosystem is an ecological community that together with its environment, functions as

a unit. An e-learning or Virtual Learning ecosystem can be defined as the learning community, together with the enterprise, united by learning management system (Chris Pirie, 2004).

This ecosystem is used to build a culture in which learning is viewed as an ongoing process and employees take responsibility for their own learning and development.

Learning management system enables the launching and tracking of any e-learning complaints and monitoring and guiding the progress of the learners.

Effective programmes also use feedback to develop the learners ability to self diagnose their problems and eventually correct errors without prompts.

Knowledge management and VLS

Knowledge management and e-learning are converging and organisations are looking for ways to integrate the two, particularly as a customised, individual solution (Norris 2003; Rosenberg 2003). An example is in the **use of mobile technologies**, currently being explored and utilised in industries that either have a mobilised workforce or where the workforce is unlikely to have access to a personal computer at work (Del Grosso 2003).

Blended learning

A clear favourite of many organisations was to use online learning as a precursor to face to face workshops. Staff accesses the online environment to learn theoretical knowledge and practice skill development in a safe, self-paced, learning environment.

Spitzer's study (1939) and its implication illustrates (Fig. 4) the need to develop new training strategies to improve short term, long term retention of information. The e-learning can be tuned as a key component of the blended learning approach to improve retention results and lower training cost.

Obvious benefits to the organisation include a significant cost reduction in training and staff replacement. For the individual staff member the reported benefits included:

- Less stressful learning overall
- Ability to learn at own pace
- Flexibility in being able to choose own learning time and place



Typical Learning Experience		
Time From First Learning	Percentage of Material Remembered	Percentage of Material Forgotten
After 1 day	54%	46%
After 7 days	35%	65%
After 14 days	21%	79%
After 21 days	18%	82%
After 28 days	19%	81%
After 63 days	17%	83%

(Spitzer 1939)

Fig.5: Spitzer (1939) study for retention rates vs. time for typical learning. After 63 days of typical learning only 17% of the material remembered.

- Time off in lieu of time spent on the online component.

Cost benefit analysis (CBA)

The cost benefit analysis should be one of the initial steps taken for any virtual learning venture. This is of course a front loaded project. Most organizations are shocked at the initial cost of implementing e- learning, particularly if the basic technical infrastructure is lacking (dedicated server, high speed bandwidth etc.). However, for a company like ONGC where most of the basic infrastructure like excellent I.T. back up, high speed and high band width connectivity to all company installation throughout the country, easy accessibility to the computer system, with reasonable level of computer literacy for most of the employees of the company, virtual learning will show a positive RIO. It should also be kept in mind that once Virtual Learning System is implemented, the course can be taken anywhere, anytime and as many times as desired.

Conclusions

E-learning or Virtual Learning is an important and valuable tool to achieve the overall business goal of any company. Organisational knowledge can be managed without disrupting the flow of business, while yielding powerful and documented improvements.

Virtual Learning System is a very effective tool for transfer of knowledge.

It is a strong paradigm shift and it requires a very efficient change management.

Future scope of Virtual Learning System appears to be very broad and it has many new trends and high potential.

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