Multi Media Strategies in corporate training 2010

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Abstract

The development of competent human resources is key to survive in today’s business. In era of technological advancements, multi-media course-ware is extensively used in training due to its effectiveness. It eliminates the cumbersome reading requirements and provides an influencing and catchy way to learn a subject. For example, to understand task of pump changeover, high school pass trainee spend hours to go thru SOP, where as a one minute video clip can convey the same precisely. Multimedia Strategies were proven more effective for subjects those are difficult to understand by reading. Replay facility in multimedia training reinforces the learning.

Due to its success in shop floor, multimedia training programs flooded the market. They are costly and provide general training on subjects like pump, compressor etc. Major disadvantage of these programs is that they lose relevance after the initial technical training as they are not customized to cater long term specific need of trainee. An effort has been made through this work to produce, an in-house multi-media based training module for United-Ethylene Glycol Plant, to propel the training & development process. Having the same process this training module can be extended to train Yansab, Yanpet, Sharq, and Saudi Kayan plant personnel also.

This multimedia module includes process description, process concepts, equipment description, interlocks, safety devices and hazards associated with EG Plant. Multimedia strategies like operation activity based interactive videos, video interview library, animated case studies and E Manual, are integrated to make learning more lively. Module also stores lesson learnt from different incidents, it captures video of interviews with domain experts and E manual brings all reference material click away from desktop.

This concept can be considered as a major breakthrough in training and development due to impact on shop-floor personnel and can be extended to other processes.
1. **Introduction:**

The surge of construction projects in the hydrocarbon and petrochemical industry has prompted a new interest in the human resource development. Keeping intact the skilled workforce in a context of scarce human resources (1) and growing concept with safety (2) has become difficult. Therefore Maintaining and expanding an experienced operational team in a short period of time is a big challenge for industry at the time of vigorous economic growth. Thus training requirements has become compelling and demanding in industry. Work is on around the world to improve the effectiveness of training. One survey found that the three top objectives for operating plants are to improve safety, improve process knowledge and improve plant profit (3). None of these can be achieved without ensuring that the operators are skilled enough to properly perform routine operational activities safely and respond to abnormal situations (4) promptly and correctly. In short plant operators must possess a deep and thorough understanding of the process to enable them to safely handle routine activities & abnormal plant situations and to identify potential hazards. In contrast, technological advancement made chemical plants more automated; resulting in widening of gap between operators and processes. Operators’ loose chances of handling real processes as plants become more automated; they manipulate plants through control panels. It is difficult for them to understand the fundamental knowledge of processes and emergency situations. This necessitates customized training to cater the specific process knowledge and skill sets needed to perform various tasks for life cycle of plant. In present scenario when each and every aspect of business has become specialized, the organizations are compelled to develop and nurture skills and competency to cope up with the advancement for their success and survival. In the nutshell human factor is playing significant role for the success of any organization and that is why training and human resource development is gaining ever highest importance in present industrial scenario.

The visions, innovations, and inventions are the building blocks of developing a knowledgeable operational team and humane society. Therefore, organizations of higher learning are constantly venturing into new and innovative training methods and are radically changing the training and educational outlook to be competitive. Training methodologies plays decisive role in success of the training program in an organization. Due to technological advancement in computer and information technology and its application in the field of training the face of training process has changed completely. Earlier training was learning the skills through reading and lecturing the cumbersome training material. A visibly reckonable progress is registered in the training methods in past decade. Reading based training is slowly being taking over by audio visual based training. Computer-based delivery of training and communication has matured into the most cost-effective medium to reach a large audience. The faster computers, combined with high-resolution graphics, audio, and video, make electronic delivery possible for training and communication of many types. Repeatability and Interactivity possible in these new programs allows the user to have a unique, custom experience. This technique is called Multimedia; it is defined as a computer system with the capacity to deliver visual and audio information to a user interactively. Specifically, multimedia is an attribute of a system related to multiple data modalities and interactivity. In the context of training and education, multimedia will provide flexible information, which is usually
associated with instructional design and authoring skills. The use of emerging multimedia technologies in Training is creating a major shift in the training service paradigm that promises major advantages over the analogue learning to face-to-face systems and make the lecture theatres and laboratories much more accessible and effective. A radical change in the computing infrastructure spurred by multimedia computing and advanced communication technology make the transformation in training methodology and is doing more than extending the training system.

Every business has certain specific skills, techniques, methods, processes and activities that are more effective than others thus the training and skill development cannot be generalized with common topics. The system contents need to be very specific pertaining to the individual business and industry in question. Careful thought is required to identify technical skills required to run the business as it may results in loss of precious time and draining of money if not selected rightly. Due to enormous success of multimedia methodology in shop floor, multimedia training programs are leaping forward with the technological advancement and innovations. They are costly and most of them provide general training on subjects like pump, compressor, distillation, heat exchangers etc. The effectiveness of program depends on how far it is relevant to the job in question and fulfilling the skill requirement for targeted job. Here is classic case study, a group of freshly recruited high school graduates having no technical skills and poor English language proficiency are required to be trained. As a recruitment policy they have to acquire the technical skills prior to their employment as trainee operator. A nicely designed technical training course is bought and in place. Organization has spent handsome amount of money to acquire this technical training module form renowned company. The intention of organization was to provide best available system to trainee to fulfill the complete training needs of training cycle of company. After the initial success this program lost relevance. On investigation it was found that training program has not been customized to cater long term specific need of trainee. It was not customized to harness the skills an operator requires to perform his job at workplace. At the same time due to poor vocabulary and language proficiency topics were not understandable to trainee. The result is despite of having a very good and costly training system in place it was not yielding the expected results. Therefore a good multimedia training program can be effective if it is customized to the specific industry need.

An effort has been made through this work to produce, an in-house multi-media based training module for United-Ethylene Glycol-2 Plant, to propel the training & development process.

2. Development and execution of Multimedia Training Module:
Various perspectives on the operation’s training in terms of the training and skills relevant to job are carefully examined and included in this module. Plant operation’s training aspects, such as process knowledge, E- Training manual, operational skill development, animated incident case studies, knowledge capturing through interview, personal information database of trainees showing the united job qualification program (JQP) progression are well integrated to make it a multimedia training module for United
EG2 plant. Figure 1 shows components and their weight-age in this training module. Each of these components is discussed subsequently in this paper.

This training program provides the pragmatic level of knowledge defined within Bloom’s taxonomy of educational objectives (Bloom, 1956) (5) and the performance and action defined by Schulman (Schulman, 2002) (6). Module design is based on the objective that training should enable trainee to apply the concepts learned at their workplace. The theories for cognitive processes involved in learning and the actions taken to promote and improve training is foundation of module design.

Fig. 1: Multimedia Training components

**Theories for learning and training:** The theories for cognitive processes involved in learning and training taken to promote and improve it are as follows & shown in table 1:

a. **Perception:** If a visual structure (format, fonts, colors, etc) is provided and maintained throughout the module, trainees will be able to differentiate and identify the content type and the perception processes will be automated.

b. **Attention:** Sensory memory and working memory stimulation has been paid attention. The use of movie clippings, highlighting and pointers, such as headings and boxed texts, facilitates the more unconscious task of the sensory memory. Using simple grammar and vocabulary (active voice, short sentences, etc.), clearly establishing learning objectives, and addressing trainees personally and informally improve their conscious attention and, consequently, the effectiveness of the working memory.

c. **Cognitive load:** A thoughtful evaluation of each topic and content reduce the foreign cognitive load not related to the content type. Distribution of the information across auditory and visual media reduces the effort of each processing channel. Redundant presentation is avoided, and care taken to assure that the information is coherent and to remove anything that is irrelevant and ornamental.

d. **Coding:** Information presented as text and illustrations like reference reading material for each topic can be recalled better than information that is presented as text only. Conceptual maps and process diagrams organize the information and improve the construction of mental models.

e. **Retrieval/transfer:** To improve learning, contexts with which students are familiar are provided. The examples used are as close as possible to the context to which the learning is to be transferred.
f. **Meta-cognition:** Meta-cognition refers to the knowledge that students have of their own thought processes. It is important to extend this knowledge by means of strategies of reflection. Stimulating checklists after each of the section asks the questions, such as: What is the objective? Do I know anything about the subject?

| Perception       | • Application of visual structure  
|                  | • Maintain format, fonts, colors, etc |
| Attention        | • Make use of sensory and working memory.  
|                  | • Use of movie clippings, highlighting etc, |
| Cognitive load   | • Reduce unproductive load of foreign material.  
|                  | • Remove anything that is irrelevant |
| Coding           | • Make the reference material available easily.  
|                  | • Use of IT application to provide easy access. |
| Retrieval/transfer | • The examples used are close to the context  
|                  | • Improve the learning, contexts |
| Meta-cognition   | • Knowledge gained from thought processes.  
|                  | • Use of stimulating checklists after each section |

| Table 1: Cognitive processes theories for Training and learning |

### 2.1. Process knowledge:

The objective of this section is to provide the basic process knowledge to trainee operator in game environment. It can often be quite motivating if done well. Duncan (1981) (7) refers to this as the 'educational' approach. Earlier methods use only a part of human senses; it depends solely on reading, which is not effective. To make operators self-motivated and study efficiently entire plant operation presented through movies with animation and narration in this section. The strength of this section lies on the fact that it addresses the basic knowledge and skills required for each area of EG plant and customized to cater. This section consists of process description with process flow diagram, description of equipment and their role in the process, protections like safety devices and interlocks provided to safeguard these equipments and process, key performance parameters and its importance, process hazards and OSHA material safety datasheet of chemicals used in area. All above topics are presented in movie form and concludes with a short test to judge the understanding of trainee about the subject. Fig 2 contains movie clips of this section to give a glimpse of work done.

| Fig. 2: Process Knowledge Movie clips |
2.2, **E-Manual:**
The objective of E-Manual is to provide complete reference solutions for EG plant job qualification training program. With a catchy front end this manual is intended to provide all the training reference material required for United EG2 plant Job qualification program (JQP) within a click away on desk top, so as trainee can access it with ease and no energy go waste in collecting the reading material thus satisfy the trainee’s need.

Aligned precisely with the JQP of EG2 plant it is divided in to seven areas. Every area is divided in eight sections. Each section contains carefully identified and listed topics which are required to be understood by trainees to get qualified in that area. These topics are hyperlinked and made accessible to trainees through E-Manual. Since the reading material for each topic is scattered in different manuals and are not organized it was demotivating and inconvenient for trainees to locate these topics and refer them. In lieu of this fact the E-Manual gained significant importance.

Figure 3 shows the navigation tour of E – Manual. Upon opening the E-Manual front end will open where all seven qualification areas will be displayed shown in step 1. Click the
area to be accessed, clicking will take trainee to front page of selected area as step 2 in figure. At the end of this section different section of that area are listed in blue boxes as shows in step 3. Required section will open upon clicking the blue box. It will open the JQP section required as indicated in step 4. Topics are listed and reference material is linked to it. Click the required topic as step 4; trainee will get the linked reference material as shown in step 5.

2.3. **Movies based Standard Operating Procedure:**
The objective of this section is to create safe, accurate, procedures at the worksite, replace the traditional procedure writing and present an opportunity to trainees to learn the skills in visual environment. This section presents the unique way of training the operator and procedure development process at worksite. Movies are made to show operator performing the specific task step by step. A movie library has been created covering many frequently performed tasks in Ethylene Glycol plant like process stream sample collection and equipment change over etc. This section enables to capture expert’s knowledge quickly; digitally recorded each task “step by step” bring the learning at its easiest form. Access to tailored task library and search index make training of new employees more efficiently.

Movies based Standard Operating Procedure:
The biggest issues with traditional procedure writing methods are employees are taken off the worksite and given the task of writing procedures, which is time consuming and costly. Best-practice is required to be practically demonstrated on the worksite and presenting such task through movie is one of the very down to earth approaches of effective procuring of any task. Also, consultants, regardless of their expertise, often do not have experience at specific worksite, do not know the specific equipment and hazards, and therefore tend to either be inaccurate or miss the specificity required to ensure complete safety and compliance. The true experts are qualified operators working on site. They are using the equipment and performing the tasks day in and day out. It is their knowledge that is most valuable and they should be the creators and owners of manual.

2.4. **Video interview Library:**
Objective of this section is to capture the experience and knowledge of senior staff and experts’ in glycol field through recorded interviews on various subjects related to process and made them accessible to trainees through interview library. Ethylene glycol process is a proven and matured process; many years down the line in existence it produced many experts in the field. We are lucky to have highly experienced professionals working in organization. What happens when they resigns, retired or transferred? Their knowledge and experience goes with them. This intellectual loss necessitates the need to capture and transfer knowledge that lies only within the minds of senior and experienced staff and goes out with them. Whether they are operators or a specialist in critical roles when they quit or reach retirement age and leave company it makes an impact to business. Licensors their representatives, vendors’ visits the plant the knowledge floats around during discussion, only people who are involved with them get the critical information and knowledge which does not percolate down and in fact it vaporize with time. If it is preserve through an interview and made accessible it can serve to be a great knowledge bank. A retrievable interview library transforms “knower knowledge and information”
into explicit shareable reference and training materials. The strategy is to ensure that knowledge remain within the walls of the organization and shall not be lost with person. It also helps to shorten the time required to build up skilled staff.

2.5. **Animated case studies:**
Industries always work to negate incidents and accidents. But if happened are the great source of learning. That’s why organizations buy and holds costly incident reporting and investigation software. Industries spend huge amount of money to run the incident investigation process. The whole objective of investigating process is to pin point the root cause of incident and how it can be prevented to recur in future. The real success of investigation process lies on how correctly and precisely the findings and recommendations are percolated till operators of the plant. It does not yield the purpose of investigations unless is understood by operators working at the grass root. In advent of modern technological advancement animation proves as an effective tool to simulate and present such incidents due to its features and capability. Having imagination any situation can be animated in computer by using animation technique and the whole investigation can be presented in form of animated movies. Animating the investigated scenario and show it happening as animation movie is the ultimate way of explaining and communicating the root cause of any incidents. A library is still under construction to portray the incidents happened in EG plant, however it is presently ornamented with the best of the animated industrial accident investigations around the world. Figure 4 is a movie clip to showcase the concept.

![Fig.4 Animated case study clip](image)

2.6. **Training progress status data bank:**
The objective of this section is to enable employees’ to take ownership of their own learning and help minimize trainer’s tasks. Trainees can access to their training plan and manage Learner calendar schedules for occupational development where as training coordinator can access the training progression status and personal information about the trainee instantaneously. Supervisors and trainers can monitor competency and compliance quickly and can be notified when an employee is not competent so as corrective action can be initiated. This section consists of training and compliance strategies and gives an application where one can track, manage and report on employee learning and ensure employees are competent, compliant and in line with job qualification program. Figure 5 shows template displaying the training information.
3. Evaluation of module Effectiveness:

This training module is focused to cater the need of trainee operators working in EG2 plant so they are the real evaluator of the effectiveness of this module. A survey has been conducted among the EG2 plant operators to evaluate the effectiveness and usefulness of this module. The results indicate the wide acceptability and success of concept among the operators. More than 98% operators were found with opinion that this module is effective and addressing their training requirement and can propel their training progress.

4. Benefit and Conclusion:

Development of new training methodology:
Multimedia technique is developed in this study for training in EG2 plant. The application of this technique can be considered as a major breakthrough in training and development due to its impact on shop-floor personnel and phenomenal success in United EG2 plant.

Potential for wide applicability:
SABIC is biggest glycol manufacturers in world. Sharq, Yansab, Yanpet, Saudi Kayan, and United are using the same glycol manufacturing process technology therefore this training module can be readily extended to all above affiliates for glycol plant operation training.

The core business of SABIC is manufacturing of petrochemicals. Many process plants are in operation in different SABIC affiliates this concept can be extended training in all the other process plants.

Utilization of IT network:
United is having strong and robust Information Technology network in place and a multimedia training system such as the one outlined can be readily implemented, maintained and modified at significantly reduced level of complexity and cost to other plants.

Customization and Cost benefits:
Developed in house this module is capable of addressing the needs of trainees effectively it yields the great advantage of cost savings.
4. **References:**


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5. **Authors biography:**

**Sunil Kumar Sawke** holds a degree in Chemical Engineer from National Institute of Technology Raipur. He works with SABIC; he has more than 20 years of experience in field of Process Engineering, Plant Operations, Training & Development and Commissioning of petrochemical plants. He has papers related to developments of soft sensors, process simulation and new training strategies as well as leading numerous successful implementations in this area.