

Development of a Multimedia Package on Operation and Maintenance of Air Brake System for Indian Railways - A Case Study

G.T.Lalla and Chanchal Mehra

ABSTRACT

Now a days many industries and bigger organisation (Indian Railways, Bharat Heavy Electricals Ltd.) are facing difficulties in implementing the new technology because of non-availability of fully trained staff. Also for the employed technical and other staff lot of resistance management has to face to get them trained for adoption of new technology. There are also very less organisations who can design effective training programmes and at the same time develop course material specially multimedia packages and computer base training (CBT) which can satisfy the need of different target groups of industries. Indian Railways was also facing similar situation while implementing the Air Brake System technology in Indian Railways. TTTI Bhopal took that challenge and designed, developed and trained Indian Railways trainer for implementation of the package on different target group. The present paper offers a case study on the same.

Key words: Multimedia Learning Package (MMLP), Competency, Package Components, Computer Based Training (CBT), Cluster of skills, Air Brake System, Target group, Centre for Advance Maintenance Technology (CAMTech), Research Designs and Sandards Organisation (RDSO).

1. INTRODUCTION

The Indian Railways is having the biggest network of passenger trains and goods-train in India. Daily millions people travel from one place to another place using this facility. Train facility is available from Far East to western coasts and from northern cities to southern part of India. Earlier these trains were operating on vacuum brake system, which was not an efficient and effective technical system. The equipment failure rates were fairly high and their impact on safe and punctual running of trains was quite adverse. Moreover appropriately trained manpower can lead to more productive operation and maintenance of assets and better identification and rectification of faults.

Indian railways took a decision to change the vacuum brake system to Air Brake System a much efficient and effective system. Thousands of personnel working on the vacuum brake system were to be trained to effectively implement Air Brake System, which is a new technology. The maintenance and operating personnel of Indian Railways are mainly responsible to implement this. They however come from various backgrounds and their educational experience is not uniform too. Also large number of staff is illiterate and their training requires demonstration along with inputs including illustrations, pictures, films, models, and practice. Thus there was a need of structured interactive training packages, which help, to upgrade the skills of the personnel and consequently improves the quality of maintenance and operation.

In view of above, the Centre for Advance Maintenance Technology (CAMTech) at Gwalior M.P. (India) decided to develop a multimedia training

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package on Operation and Maintenance of Air Brake System through a well established and experience training organisation.

The training package was to be developed for different grades of workers and officers ranging from operator in workshop, guard, driver to engineer looking after over all technology of the system.

In 1999 TTTI Bhopal undertook the task of development of multimedia package on Operation and Maintenance of Air Brake.

System. After having lot of discussion between the experts of TTTI Bhopal, officials of CAMTech Gwalior and RDSO Lucknow and looking to the need of target group and content following components of the package were decided to be developed.

- Curriculum Document – to meet the need of various groups of learners.
- Trainers Manual – to be used by trainers at different training centres.
- Trainees Manual and Workbook – to be used by learners/ trainees at various levels.
- A set of colour transparencies to be used by trainer during his sessions
- A set of colour slides – to be used by trainers during his sessions
- A set of five (5) video programmes – fulfilling the requirement of practical aspects
- Multimedia (Computer Based Training Programme) – fulfilling the requirement of self-learning having facility of interaction.

The package was in the print and in non-print form and was taking care of each and every aspect of text, demonstration, practical skills evaluation of trainees etc. This is useful for trainees as well as for trainers.

Looking to the need of target group working at different parts of India it was decided that all the components of package would be developed into three languages (Hindi, English and Tamil). Having considered the total target group it was also

decided that package will have the competency-based approach, which should bring significant change in individual learner.

Competency is an integration of clusters of skills to be developed by learners, background knowledge and positive attitude.

It was also decided that after development of the package few training programmes on different target groups will be conducted by TTTI demonstrating how the multimedia package is implemented and trainees are evaluated for acquired competencies.

2. PACKAGE COMPONENTS

2.1. Curriculum document

Following 8 competencies were considered in curriculum for different target group

Competency Code	Competency description
M1	Perform routine checks of air brake system for round trip.
M2	Undertake primary maintenance of air brake system according to primary schedule.
M3	Test air brake system of coach/rake after primary maintenance as per prescribed schedule.
M4	Carry out periodic overhauling as per prescribed schedule.
M5	Test subassemblies of air brake system after overhauling in accordance with prescribed schedule.
M6	Troubleshoot subassemblies /Components of air brake system and undertake remedial actions.
M7	Communicate effectively for upkeep of airbrake system ensuring safety and quality of service.

M8 Ensure air brake maintenance with focus on good teamwork and inventory control.

Above 8 competencies were validated by the expert group formed by CAMTech Gwalior, RDSO Lucknow and TTTI Bhopal. after extensive discussion. As the curriculum was for multiple target groups the sample path consisting of acquiring minimum competencies for each category of target group has therefore been suggested. It could be modified as per the need of individual. Competency being integration of cluster of skill, background knowledge and positive attitude each competency was further divided into number of skills and each skill was further divided into number of enabling objectives. Accordingly session plans were developed for theory, practice of skills and project session. Further details of components of curriculum document are not being discussed here.

Brief description of other components of package is as under.

2.2. Trainers manual

The trainers manual which was considered as mother book was designed in such a way so that every aspect of cognitive domain in competency is covered there by meeting requirement of trainers for theory part, practical part and project part. There were about 80 handouts. For each competency, related handouts were identified. Handouts were designed for each session. All the handouts were properly developed keeping in mind the basic requirements of Education Technology such as structuring of text, illustration, gaining attention of learner, point to remember, self assessed questions etc.

2.3. Trainees manual and work book

The book was designed covering the exercises related to all eight competencies suggested in curriculum on which total text (content) was developed in trainers manual. Some of the relevant

portion was also provided in trainees manual along with the list of standard tools, fixtures and equipment. The procedure of trouble shooting for important equipment describing probable faults, causes, and remedy were also provided which becomes the important component of a manual when specially a package is designed on operation and maintenance.

2.4. Colour transparencies

- Total 31 transparencies having proper code no. as well as reference to session number and handout number for easy utilization during session were designed and developed.

2.5. Colour slides

- Total 23 colour slides having session no., title for reference with trainers manual were designed and developed.

2.6. Video programmes

Video series on

- C₃W distributor valve
 - Part I - Dismantling (30' 40'')
 - Part II - Cleaning and (26', 18'')
assembly
 - Part III - Testing (15')
- Keep the wheel rolling (17' 5'')
- Single Car test (25' 28'')
and Rake test

All video programmes were developed in Hindi, English and Tamil language.

2.7. COMPUTER BASED TRAINING (CBT)

All the components of package except curriculum document were simultaneously designed and developed. Most of the content meeting the requirement of objectives of the package were covered in trainers manual. Transparencies and slides were showing the details of circuits and diagrams

and video programmes were showing the details of internal components and other details which were in motion and movement. Finally all these details of package in the integrated form were covered in CBT in which facility of interaction to user was provided. So it could be used as self learning material. All the elements of multimedia such as text, audio, animation (2D & 3D) graphics were incorporated as per the need of content.

The technical details of package (CBT) are as under

- (1) Total size of CBT 318 MB
 - 1a - files for animation 36.1 MB for 55 nos.
 - 1b - BMP files for graphics 79.0 MB for 477 nos.
 - 1c - Wave files for audio 158.0 MB for 88 nos.
- Total -- 273.1 MB

The difference (318-273.1) was used for text coding part, programming part and system files (Tool book-4, system files for runtime support on windows platform).

- (2) All the animations were developed using animator pro and 3D studio
- (3) Audio processing and recording and editing were done using wave for windows and creating wave.
- (4) Graphics (BMPs) were developed on Adobe Photoshop and paint shop pro. For scanning HP Scan jet default software was used.
- (5) Text - M.S.Word (English) for Hindi language, Hindi Special Hindi fonts D.V.Surekh, true type fonts were used.

3. HOW TO USE CBT?

The CBT package on Air Brake System was a menu driven package provided into two languages English and Hindi. The graphic user interface for CBT in matrix form is shown below in which learner can select the section of his choice and proceed for further interaction and details. On

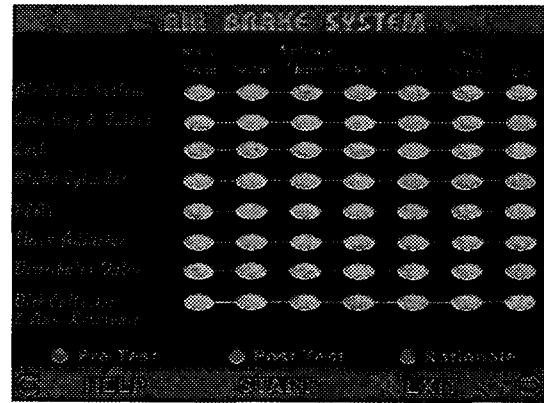


Fig. 1

clicking to a particular ellipse one will get the subchapters of related chapter for particular treatment.

In the GUI buttons for pre test and post test are provided at the bottom. Attempting pre test learner will know what he already knows about the package. Post-test reveal to what extent you could acquire new knowledge/ skills with the help of CBT. Learner will get score at the end of pretest and post test.

At the end of each chapter, quiz (topic tests) is provided for identifying learners weaknesses during learning through topics.

All chapters with their treatments are arranged sequentially one after other. As the one treatment of a sub chapter is finished, next treatment of same subchapter will appear in sequence.

Clarity has been provided to brake the sequence and one can choose any treatment of any subchapter at any time by clicking on content button provided at the bottom of each screen. On each screen, facility to change the language is provided, one can switch between English to Hindi or Vice versa from any screen by clicking on to respective bottom.

4. CONCLUSION

The design and development of such a multi-

Operation and Maintenance of Air Brake System Developmental Process

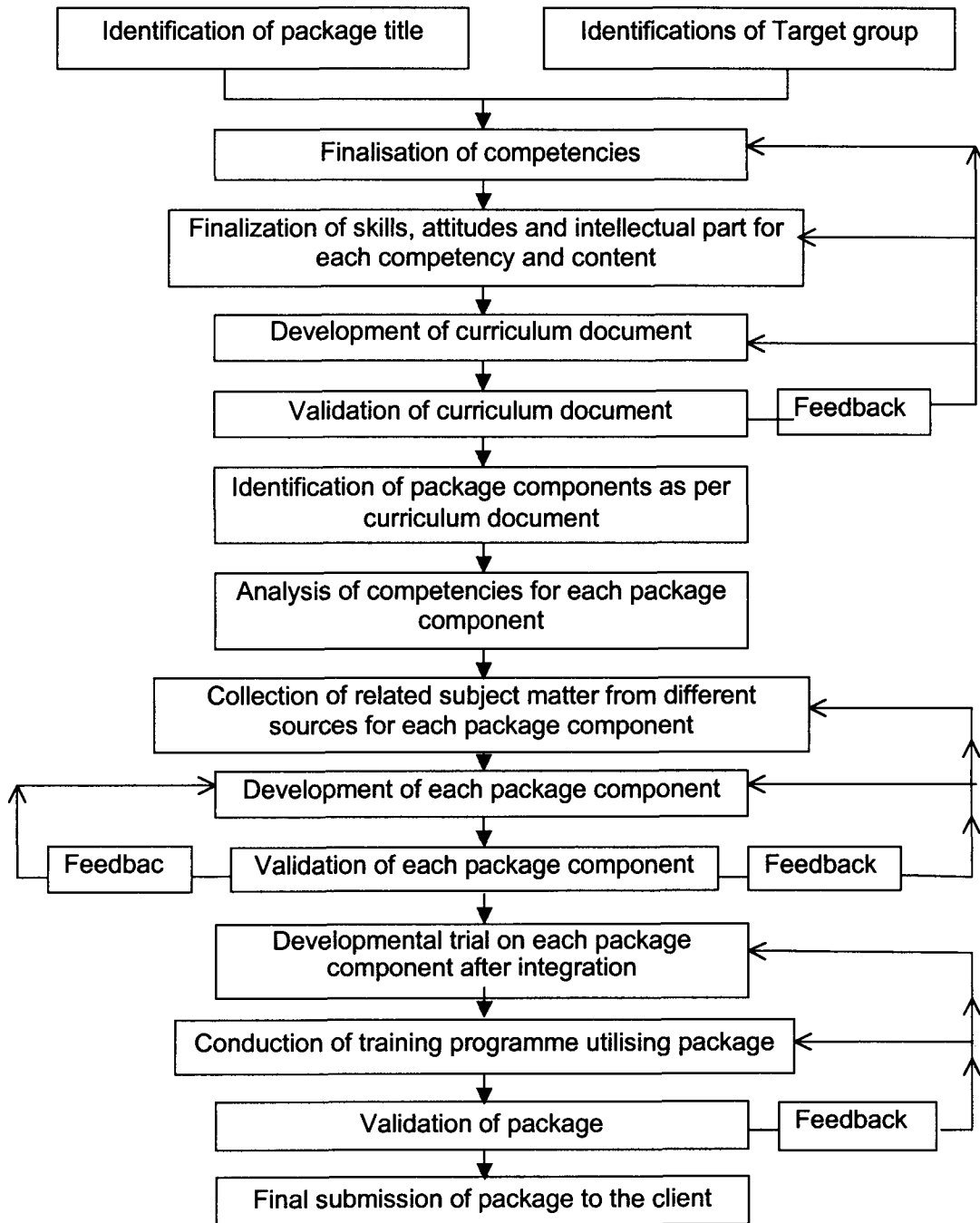


Fig. 2

DEVELOPMENT OF COMPUTER BASED TRAINING (Package Component)

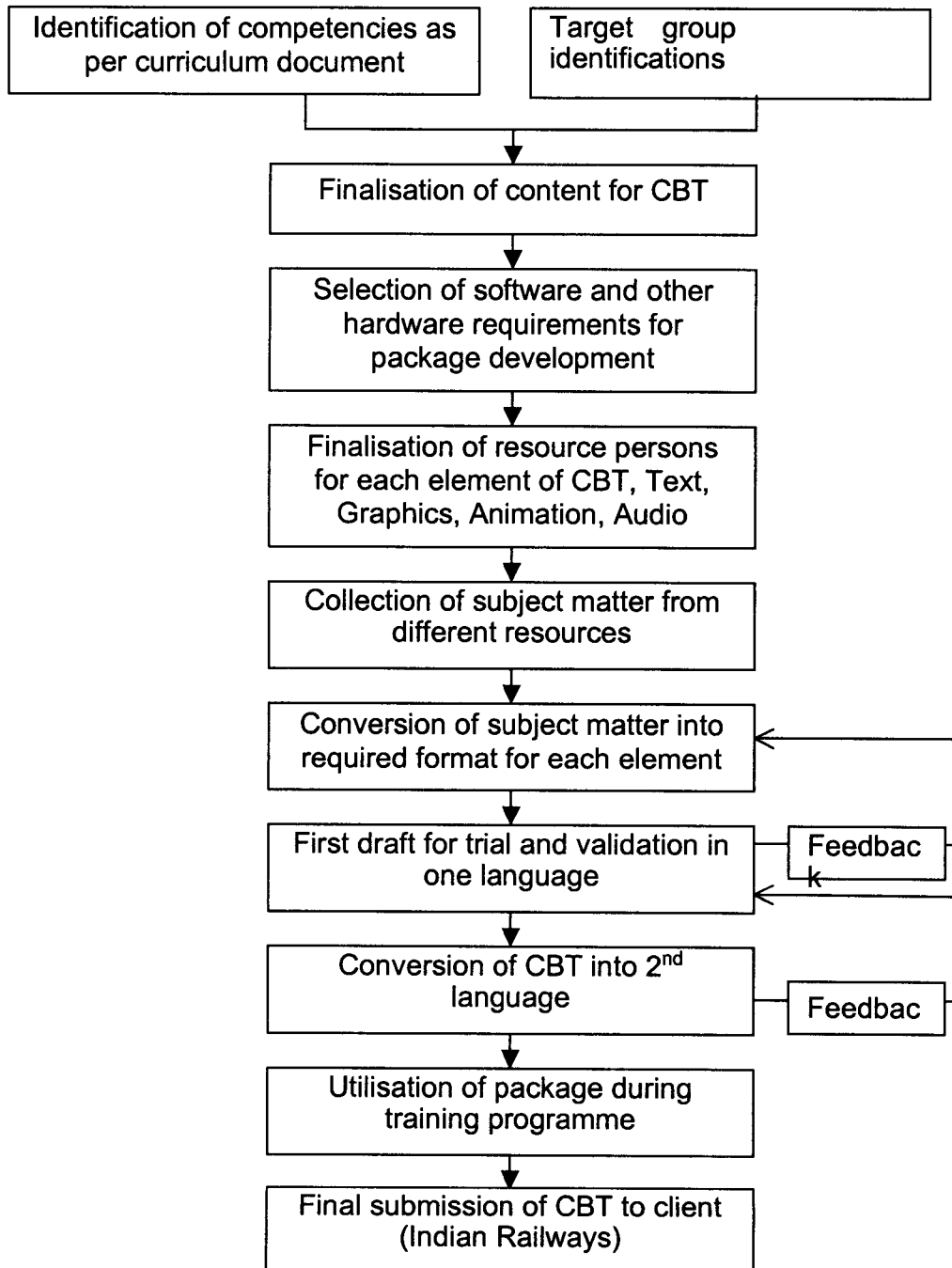


Fig. 3

dimensional package was a challenge to our institute(TTTI, Bhopal). The challenge was in the form of following.

- Compilation of correct and required content.
- Selection of format and specification, hardware, software for different components and elements of package to develop within the budget.
- To complete the package in all respect and deliver in stipulated time.

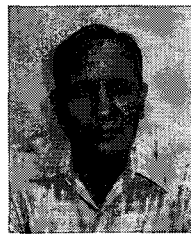
The strategy of starting some of the components of package simultaneously was the biggest dimension of success, getting package validated at required stages was also an important component for getting it completed in time. Finally the total strategy adopted to develop the package was fully successful and the process, which was adopted, has also enriched our institute in procuring variety of useful hardware and software. The package, complete in all respect, print and non-print form in required three languages (English, Hindi and Tamil) was submitted to Indian Railways, which was appreciated at every level of authority by client. Further the Centre of Advance Maintenance Technology, Gwalior, made multiple copies of all the components of package and distributed to different training centres situated at various parts of India. This was the multimedia package, which was meeting requirements of Indian Railways and their training centres.

5. REFERENCES

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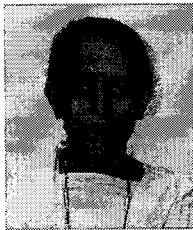
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