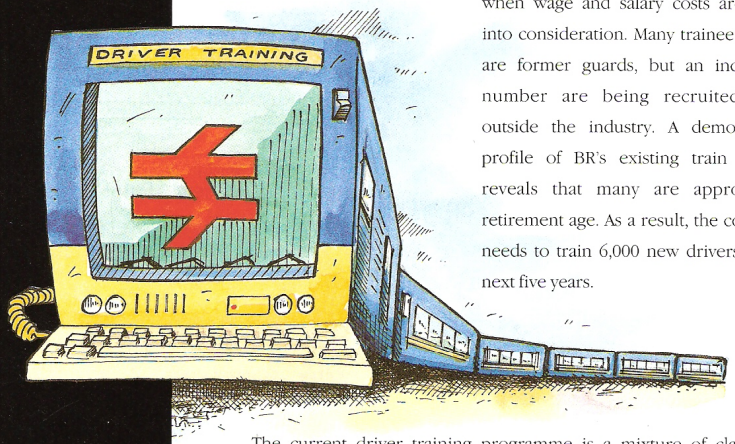
LEARNING TECHNOLOGIES

Using Technology to Improve Quality

LEARNING TECHNOLOGIES CASE STUDY

BRITISH RAIL: ON THE RIGHT TRACK WITH TRAINING TECHNOLOGY

Around 600 locomotive drivers are trained by British Rail in a year. The training programme costs around £13 Million, or approximately £20,000 per person, when wage and salary costs are taken into consideration. Many trainee drivers are former guards, but an increasing number are being recruited from outside the industry. A demographic profile of BR's existing train drivers reveals that many are approaching retirement age. As a result, the company needs to train 6,000 new drivers in the next five years.



The current driver training programme is a mixture of classroom training (with some computer based training) and practical experience. BR is keen to improve the quality of training by using a part-task simulator which will give trainees some experience in operating a train before going 'live on the track.'

Project Background

Around five years ago, an interactive video tape system was developed for British Rail Western Region. The system was (and still is) used for driver route learning, and consisted of a personal computer connected to a video tape machine. Hodos, a London-based multimedia company, was asked whether it would be possible to produce a low cost simulator, based on similar technology, for basic driver training.

In May 1989, Hodos proposed a driver simulator project to the Employment Department for funding, supported by British Rail. By this time, Hodos had decided that a technology developed by Intel and known as Digital Video Interactive (DVI), offered a more cost-effective and flexible solution to building a simulator than a video tape-based system.

EMPLOYMENT DEPARTMENT GROUP

For further information contact:
Employment Department
Learning Technologies
Room E502
Moorfoot
Sheffield S1 4PQ
Tel: (0742) 594680

PP80/10141/692/351

The project was approved and contracts were signed in November 1989. Both the Employment Department and British Rail committed resources to the project. BR has also provided additional resources like access to training personnel, general advice and the use of track facilities.

There were three major components to the project aims:

1. A training needs analysis to see how the simulator could be used in driver training.
2. A feasibility study to determine whether DVI technology was suitable for the prototype simulator.
3. The development of a prototype simulator which would be tested and evaluated by BR.

The Training Needs Analysis

The driver training programme is intensive and consists of three phases or schedules:

Schedule One is a seven-week programme which includes a four-week induction course on conditions of service, first aid, safety and other related matters.

Schedule Two lasts twenty-one weeks, during which the trainee rides up front on a service train and gains first-hand experience of driving a locomotive.

Schedule Three is twenty-one weeks of classroom training and practical experience.

It was felt that the simulator would be particularly useful in Schedules Two and Three of the training programme.

The analysis showed that a simulator could enhance the training programme in a variety of ways:

1. It would provide an opportunity for new applicants to understand the problems of driving a train.
2. It would provide a safe learning environment.
3. It would make the classroom experience more relevant to the practical experience of driving a train.
4. Trainees would gain an insight into the general orientation of cab and controls before their first practical experience.
5. The simulator would help develop hand, eye and hearing co-ordination.
6. It would allow candidates to make mistakes which would be dangerous and/or expensive in a real life situation.
7. It would allow trainees to practise and learn safety procedures.
8. It would allow trainees to practise and learn signalling and automatic warning system procedures.
9. It would help trainees develop good driving techniques, particularly in the area of energy conservation, (for example , using gradients to save fuel).
10. The simulator could be used for quality control. Unsuitable candidates could be identified more quickly and easily.
11. On occasions, the simulator could be used by the trainee alone, allowing the instructor to supervise other candidates.

The Feasibility Study

DVI technology makes it possible for personal computers to display digital sound, video, text,

graphics and animation. The various media can be stored on a hard disc or a special type of compact disc which is linked to the computer. One of the advantages of DVI is that it makes it relatively easy to display variable speed video. This is useful for scenes where the train is accelerating or braking. Although the simulator design would push DVI technology to the limits, it was seen to offer the best solution to the project's needs.

The results of the training needs analysis and feasibility study prompted Hodos to develop a prototype simulator, and work began in June 1990.

The Simulator Design

The original simulator design was for a desk top system comprising of a small computer monitor and controls. However, this has been superceded by a full size, free standing control desk mock-up made from metal and fibre glass. The mock-up has been made to BR specifications and includes real train controls. The simulator uses a 37-inch monitor screen for display purposes, although other display systems (such as a video projection screen) could be used as an alternative.

A second, smaller screen is used for the instructor's console. The instructor can select various parameters for the simulation, such as the section of track, signal setting, number of carriages and so on. These parameters can also be changed during the simulation. The instructor's monitor also shows how the driver is performing and displays details of the control settings, speed limits, signalling, gradient and so on.

The simulation is realistic and in addition to video pictures, there is a sound loop which continuously replays background noise. The noise changes whenever the train speed is altered. There are also single sound samples which are activated when the train goes under a bridge or over points. Other sounds are produced when the Automatic Warning System is in operation.

During the simulation, data is recorded on a computer disc. At the end of the simulation exercise, the trainee and instructor can sit down together, run through the data and analyse the performance.

The Prototype's Evaluation

During the period 1990/91, the simulator was evaluated by a number of BR's training instructors and the response has been very positive. One instructor admitted: 'I expected not to like it [the simulator], but was very impressed by what I saw'. Another trainer thought that the simulator was 'brilliant'. Geoffrey Huller, BR's Training Technology Manager said: 'Driver training has been in the dark ages for years and far too classroom-orientated. This simulator helps move training from the classroom to the working environment'.

On the strength of the instructors' response, BR has ordered five simulators for field trials in regional training centres at Glasgow, Newcastle, Leeds, Plymouth and a fifth location, which is currently being finalised. The simulators were due to be dispatched in late 1991, but problems in the production of the control parts by an outside manufacturer have delayed their

deployment. BR hopes to have the simulators in place by Spring 1992.

Further Uses of DVI Simulator Technology

The DVI simulator could also be used in other aspects of BR operations. For example:

- For selection procedures, such as psychometric testing of reaction times, co-ordination and so on.
- For route learning. At present, this involves the driver travelling as a train passenger and noting down the various route characteristics, such as signals, gradients and junctions. This can be a time consuming business, especially on long routes like London to Edinburgh. A DVI route learning simulator would enable the driver to learn his route at the workplace, saving time and money.
- The simulator could also be used for conversion training, whereby experienced drivers learn how to operate new types of trains.
- The simulator could be used for recruitment purposes, by motivating people to apply for training.
- The simulator could be used by other BR sections, such as engineering maintenance staff, many of whom learn how to drive track-laying equipment.

The DVI technology could also be applied in other areas, for example:

- By London Underground for tube drivers.
- For learning how to drive other machines, such as tanks and cranes.
- For surrogate journeys of dangerous or inaccessible environments like the inside of a nuclear reactor.
- For three dimensional modelling or virtual reality techniques.
- Hodos is already engaged on another Employment Department project which uses DVI technology to help health workers treat femoral fractures in the elderly.

DVI-based simulators are proving to be versatile, effective and very cost competitive. The train simulator is relatively cheap at under £50,000, compared to approximately £1 million for some existing simulators.

Conclusion

It is very easy to dismiss new learning technology as 'a solution looking for a problem', but this project clearly shows that the right approach can bring benefits to a company. British Rail's strategy has been to identify a training need, consider a possible technological solution and then evaluate it before making a full scale commitment. On the evidence so far, the DVI simulator has the potential to greatly enhance BR's training programme.