1. PROJECT TITLE

Reusable e-learning development for developing the next-generation websites in Cambridge: improving quality of education, research, administration and security.

2. REQUIRED INFORMATION

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- Project location: Cambridge, United Kingdom.
- Project Start date: September 2002 to July 2004

3. DESCRIPTION

- Conceptual framework of objectives:

  To implement the next-generation websites and web-based applications for the "Cavendish Laboratory", which stands for the Department of Physics, University of Cambridge.

- Project partners and stakeholders:

  Higher Education Funding Council for England (HEFCE) and the Cavendish Laboratory.

- Project methodology and grass roots activities carried out:

  Action research, web / software development.

- Tools leveraged (details are described in the body of this paper.):

  Web development tools: Dreamweaver, CSE Validator, Flash, SSH Secure Shell and servers (IIS, Linux, Apache, SQL and MySQL).

  Computer languages: ASP / ASP.NET, PHP, JSP, Java and DHTML (with Javascript).

4. PROJECT EVALUATION AND APPLICABILITY OF BENEFITS

- Principle project results:

  Completed stage one and stage two (final stage) re-development of the Cavendish website. Cavendish Laboratory has become one of the first Cambridge departments implementing online database systems.

- Evaluation of project and realized contributions:

Stage one and stage two of web development were completed before the deadline for each stage. Departmental website has fully integrated with research, teaching, administration, conferences / seminars and social events. The next-generation websites has received more than 90% positive feedback from the departmental staff and students.

• Assessment of how the project benefits can be extended to a larger area or community, or can be applied within a different socio-cultural context:

Departmental website provides quick, efficient and interactive services for a total number of 800 academics, students, staff and visitors. Based on the feedback, the quality for teaching, administration, research, departmental events and security have been improved by 150%. Special web-based resources including Flash simulations have been regularly utilised for training workshops, conferences and exhibitions, thus providing greater benefits for wider communities such as high-school teachers, students and researchers.

Body of my paper

Introduction

Reusable e-learning development (RED) is defined as the cloning, modification and customisation of existing files or source codes for developing another website or another web-based application. Reusable e-learning development provides a practical technique for time-saving, improving efficiency and maximising utility of existing resources for creating another website or another web-based application. RED is particularly useful for large-scale web development in utilising and managing an extremely high degree of overlapping of information, resources and web designs. Therefore, RED has been widely adopted by growing number of knowledge-based organisations (KBO), including Information Technology and Higher Education. One example is the University of Cambridge, where numerous departments, including the Cavendish Laboratory, the home of the Department of Physics, have adopted RED as the web development strategy in the re-development of Cavendish website.

The redevelopment process includes Stage One and Stage Two. The objective for Stage One is to convert each existing webpage into the standard webpage (HTML 4.0 and above with the University's style sheet) with the deadline by July 2003. Procedures for this stage are described in the Figure 1 below. However, Stage Two of web development has a different objective, which is to convert the standard webpage completed in Stage One into PHP pages, which will be further implemented into an online database system that improves the quality of education, research, administration and security. This is the web policy for the University of Cambridge within the next five years.

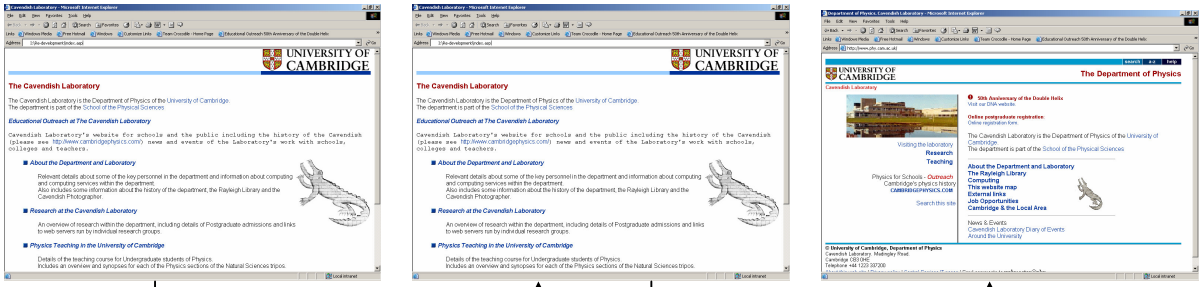
Stage One web re-developments:

(a) converting each existing ASP file into a standard HTML file, which follows HTML 4.0 with CSE HTML Validator as the web standard;

(b) transferring all the information on each existing ASP file to the standard HTML file;

(c) adding an university style sheet to each standard HTML file;

(d) retaining the same database structure between two different websites which include one containing approximately 600 ASP files and another one containing approximately 600 standard HTML files.



Original ASP files (600 pages)

HTML templates (Can use this template for other modifications: 600 pages)

Final standard HTML file (600 pages)

Figure 1: Stage One Re-development of Cavendish website

The estimated time for the re-development was 5 to 6 months due to the large number of webpages and modifications involved. However, the introduction of RED in 2003 has lead to an improved efficiency by minimising the completion time to 2 months in total. There is no secret for this, but the key factor is to design a working HTML template. Once this template is completed, it is saved as a different file, then transfer the information on the ASP file into this HTML template, and save this new HTML file as the same name as the ASP file. Then continue modification and debugging, until the ASP file is fully converted into a HTML file. In order to complete the whole process of re-development, it is essential to repeat this process 600 times and keep the modified files in another separate directory until the successful completion of web re-development. This technique also includes adding an university style sheet on each page and following the University's policy in web designs and methods of navigation.

Stage Two web-development: Cavendish Forum

This is another technical example that adopts RED, which deploys PHP and MySQL. PHP has become increasingly popular and widely adopted by a growing number of organisations due to its open-source characteristics and strong performance in the integration with databases. MySQL costs much less but performs nearly well compared with Oracle and that is why the combination of PHP-MySQL technology is chosen for the future generation of Cavendish website, particularly the Cavendish Forum. Between December 2002 and December 2003 the Department of Physics began development of an online Cavendish Forum based on PHP-MySQL technology. For the Cavendish Forum development of the open source codes for PHP have been reused for modifications, customisations and testing until the successful implementation. The completion time for this RED was 1 year less than the estimated time of similar web development that would not have used any source codes.

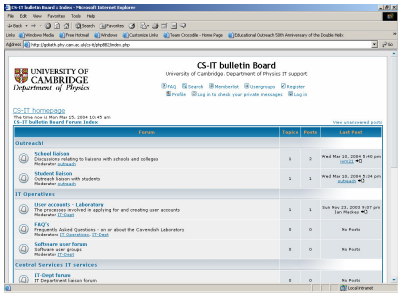


Figure 2: Cavendish Forum, another good example of showing the effectiveness of reusable e-learning development.

Stage Two web-development: Teaching pages

Teaching pages provide the main content for the Cavendish website because course curriculum, learning resources and educational agendas are included on the website. 200 web pages have been successfully converted into PHP pages, which are fully integrating with the online database system. Based on the feedback, academics and research students are highly welcoming the online database system because documents, papers and learning resources can be stored electronically in safer environments and also presented in an organised and efficient manner. Technically this provides a better efficiency due to fast connection and robust IT infrastructure for the departments. PHP-MySQL technology also ensures higher levels of security than our previous IT version because firstly, it is possible to identify the IP addresses of the online visitors and can also trace the activities going on for the departmental website. Secondly, online database system can also provide a saver environment for those making online transactions and information exchanges between different departments in Cambridge, particularly for confidential information exchanges that can be stored in the secure server. Figure 3 below demonstrates the Stage Two re-development.

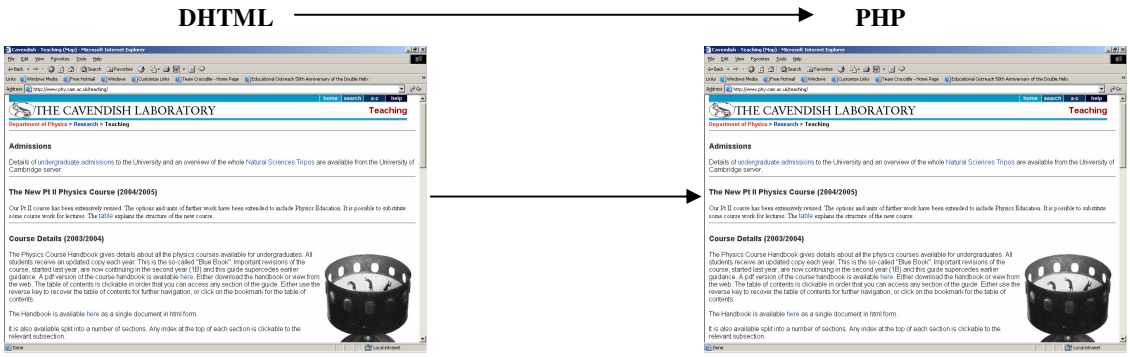


Figure 3: Teaching pages: The main contents for the Cavendish website including curriculum and learning resources and have been recently successfully converted into PHP pages, which further integrate with the departmental online database system.

1.2.3 Impacts on the web development and strategy of the Department of Physics when adopting RED

Between September 1999 and September 2002, the majority of working time devoted to web development was spent researching different methods for creating an interactive web-based environment for the Department, including the Cavendish Diary, the Cavendish Forum and the re-development of the Cavendish website. There were issues about different ways of web development and it was difficult to reach a common agenda. However, the introduction and adoption of RED in October 2002 was a turning point: It had resulted in the successful implementation of the Cavendish Diary, Stage One re-development of the Cavendish website, Stage Two re-development of the Cavendish website and the Cavendish Forum in only 22 months. This illustrates the effectiveness of RED in the improvement in work efficiency by decreasing the quality project completion time: Before the introduction of RED 36 months of research did not yield any major developments; following the introduction of RED it took 22 months to successfully implement 4 web-based projects. Cavendish Laboratory has also become the first few Cambridge departments that has fully integrate the departmental pages with our online database system, thus providing a safer online learning environment and a more sophisticated way for presenting the departmental strategy in education, research, administration and security. Our case study has successfully promoted coexistence and security in the Information Society.

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