SEARCH, SHARE, ACCESS AND IMPROVE ONLINE DATABASE SYSTEMS LEARNING RESOURCES

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RESOURCE: http://www.solent.ac.uk/t302/resource

ABSTRACT

We describe in this paper a prototype application, RESOURCE, that has enabled learners and tutors to access online database systems learning resources in an efficient manner.

The problem of delivering up-to-date database systems resources to large numbers of distance and on-campus learners and their tutors is outlined, and requirements for a flexible database-driven solution derived.

The solution put forward combines qualities of the library model in respect of searchable, shared, peer-reviewed resources with qualities of the prevailing model of provision by tutors of more specific teaching resources.

The underpinning database solution contains title, author, location and other data about the resource, and how these resources are deployed to a topic or learning outcome. Interfaces have been, and can be, easily developed to meet varied search and access requirements. In particular, proven library and other search interface implementations are being re-used where possible.

Initial feedback is encouraging, and extending its use to the database systems teaching community is suggested.

Keywords

learning, teaching, resources, database, share

1. INTRODUCTION

Books, journals, videos and other learning resources of a more general nature can fairly easily be searched for, and accessed, from both physical and virtual libraries, databases and other sources. This model of resource provision is characterised by a high level of general, shared, peer-reviewed, Institutionally acquired resources, but a low level of delivery of more specific, tailored teaching resources (such as a presentation or tutorial activity) to learners.

On the other hand, the prevailing model of provision of mainly classroom-based teaching resources reflects a high level of tutor ownership, but a low level of sharing and peer-review. Delivery to large numbers of learners and teams of tutors is often inefficient, particularly in respect of up-to-date versions of resources whether online or paper-based.

There are an increasing number of online sources that enable more specific resources to be shared. These include the Internet Guide to Engineering, Maths and Computing (EEVL) [1], the Exchange for Learning Programme (X4L) [2] and, indeed, the Databases Curriculum Area of the Centre for Computing and Information Sciences (CCIS) [3]. However, the authors' have not identified a database-driven resource that combines qualities of the two models outlined above, and optimises benefit to the database systems teaching community.

This paper describes a solution to this problem, named RESOURCE, that has been used in production throughout the current academic year 2002/2003.

The problem context, requirements and solution described below draws from, and extends, a more generalised framework approach described in [4].

2. THE PROBLEM IN CONTEXT

This problem has emerged in recent years as a consequence of a full and part-time team of tutors grappling with the delivery of resources for database systems modules across all levels of a Computing programme of courses involving hundreds of learners of varied learning needs.

We did initially get schemes of work and an adequate number of learning resources online during the 1999-2000 academic year, although significant inefficiency of access and delivery remained. Two specific requirements arose prior to the start of the current academic year that triggered a search for a new approach.

Tutors to be able to insert, update and delete their own resources from the catalog, and to maintain topics and their resource deployments.

4. THE SOLUTION

Figure 1 shows the application architecture. This comprises the resources, the resource catalogue and the main interfaces. The design and implementation of the database and interface elements are described in more detail in sections 5 and 6.

It should be emphasised that the solution discussed in this paper reflects a realistic, incremental and cost-effective approach that takes into account the limited time, skills and other resources available to the authors' in their essentially user/developer roles.

Candidate software implementation tools and technologies are briefly mentioned where appropriate.

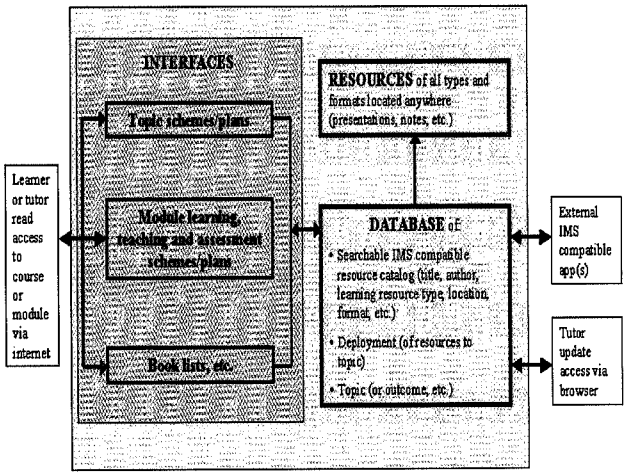

Figure 1 – Application Architecture

5. THE DATABASE

The database design to support the requirements, and implementation options, are discussed in this section.

5.1 Design

The design, shown in Figure 2, is straightforward and requires minimal explanation to this audience. Additional entities of resource type and format, and physical design details, are not shown for the sake of brevity.

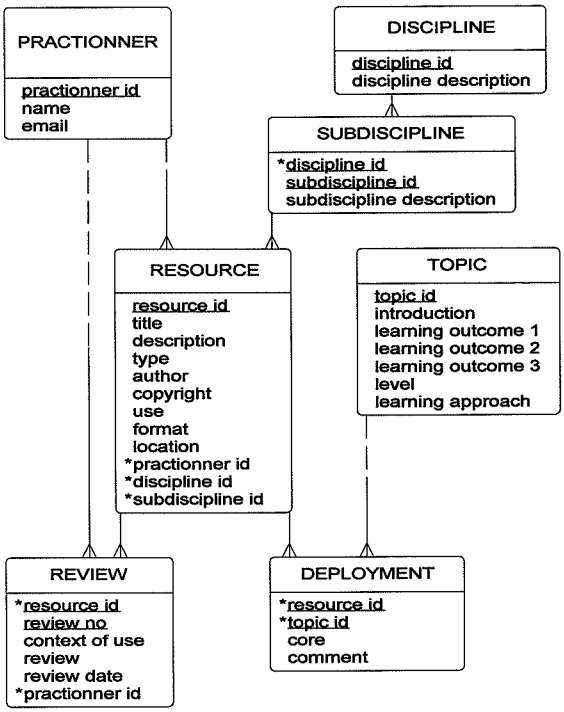

Figure 2 – Database Design

5.2 Implementation

Initially, for early prototyping convenience, the database was implemented using Microsoft Access. As the number of tutors requiring update access increased, the need for a database server became imperative.

The Oracle database was the preferred option, as we have used Oracle for over 15 years as our primary teaching vehicle and also for the Institution's administrative solutions. We have a site-wide license covering this type of application, and so this represented a cost-effective solution.

An alternative which would also meet the requirement would be to use an open source database server such as mySQL which has a version that is free under license.

Choice of database server should not be a major issue, particularly when taking into account open database connectivity and available migration tools.

6. INTERFACES

The required interfaces providing access fall broadly into four types:

- Focussed information relating to module schemes of work and topics (R3, R4);
- Generic information relating to particular resource types such as book lists (R5);

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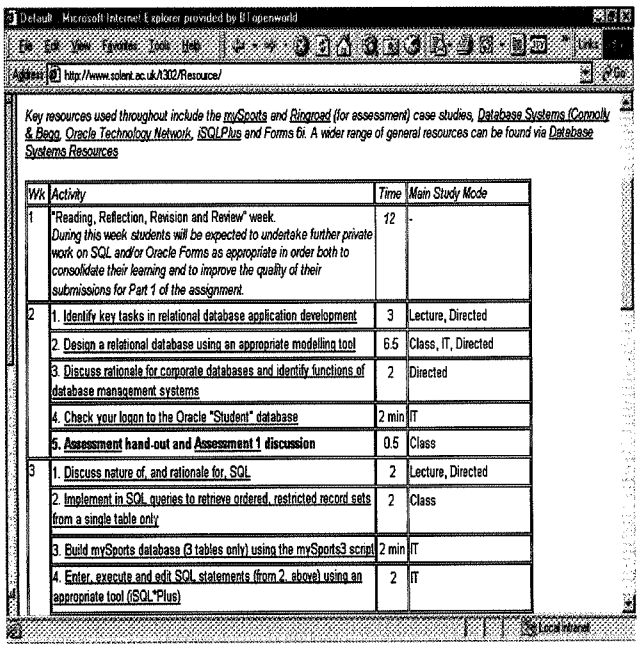
- Search forms based on resource/topic meta data attributes (eg author) and resource content (R8);
- Forms for update of resources, topics and deployments (R9).

These interfaces have (and are) being developed using a combination of convenient and cost-effective approaches. The main features, illustrated with examples, are described in sections 6.1-6.3 below. The update forms are currently prototypes, and are not included at this stage.

6.1 Focussed Information

The teaching schemes of work, as illustrated in Figure 3, can easily be constructed using any suitable web design tool. Microsoft FrontPage was used in this instance, although Macromedia Dreamweaver was also available on a site wide license.



Key resources used throughout include the mySports and Ringroad (for assessment) case studies, Database Systems (Connolly & Begg, Oracle Technology Network, iSQLPlus and Forms 6i. A wider range of general resources can be found via Database Systems Resources

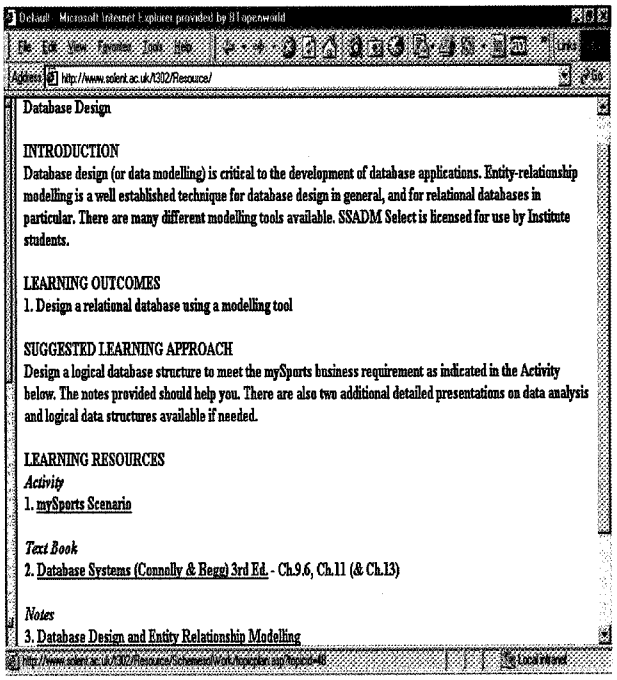
Wk	Activity	Time	Main Study Mode
1	"Reading, Reflection, Revision and Review" week. *During this week students will be expected to undertake further private work on SQL and/or Oracle Forms as appropriate in order both to consolidate their learning and to improve the quality of their submissions for Part 1 of the assignment.*	12	-
2	1. Identify key tasks in relational database application development	3	Lecture, Directed
	2. Design a relational database using an appropriate modelling tool	6.5	Class, IT, Directed
	3. Discuss rationale for corporate databases and identify functions of database management systems	2	Directed
	4. Check your logon to the Oracle "Student" database	2 min	IT
	5. Assessment hand-out and Assessment 1 discussion	0.5	Class
3	1. Discuss nature of, and rationale for, SQL	2	Lecture, Directed
	2. Implement in SQL queries to retrieve ordered, restricted record sets from a single table only	2	Class
	3. Build mySports database (3 tables only) using the mySports3 script	2 min	IT
	4. Enter, execute and edit SQL statements (from 2. above) using an appropriate tool (iSQL*Plus)	2	IT

Figure 3 – Scheme of Work

Each activity link on the scheme of work leads to a plan for that particular topic or learning outcome. For example, the database design activity (the activity 2 link in week 2) leads to the plan shown in Figure 4. This plan shows the topic introduction, learning outcomes and the list of resources (as links) deployed for this topic.

These plans can be generated using any convenient and established server-side processing approach such as Active Server Pages (ASP) or Java Server Pages (JSP), and using readily available scripting languages such as Visual Basic or JScript.

Essentially, these server side scripts dynamically generate and return pages containing information about the topic and deployed resources drawn from the database.



Database Design

INTRODUCTION

Database design (or data modelling) is critical to the development of database applications. Entity-relationship modelling is a well established technique for database design in general, and for relational databases in particular. There are many different modelling tools available. SSADM Select is licensed for use by Institute students.

LEARNING OUTCOMES

1. Design a relational database using a modelling tool

SUGGESTED LEARNING APPROACH

Design a logical database structure to meet the mySports business requirement as indicated in the Activity below. The notes provided should help you. There are also two additional detailed presentations on data analysis and logical data structures available if needed.

LEARNING RESOURCES

Activity

1. mySports Scenario

Text Book

2. Database Systems (Connolly & Begg) 3rd Ed. - Ch.9.6, Ch.11 (& Ch.13)

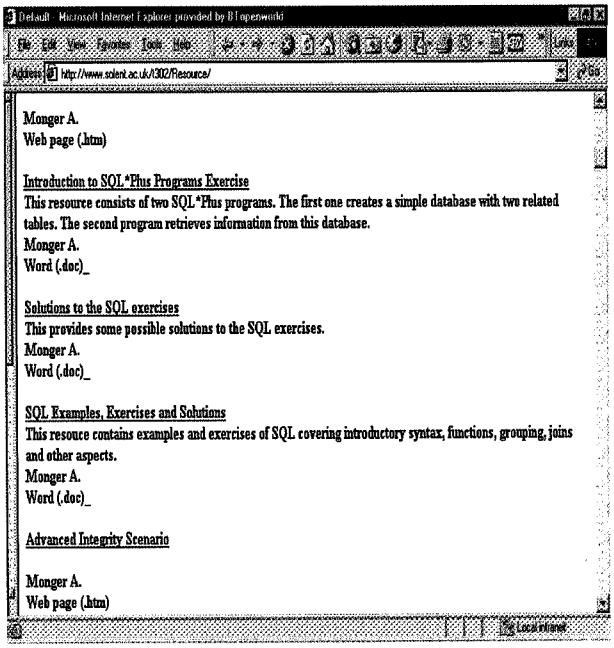
Notes

3. Database Design and Entity Relationship Modelling

Figure 4 – Topic Plan

6.2 Resource Lists

These can be implemented in a scripting manner similar to that described in 6.1 above. Figure 5 shows part of a list of all the SQL resources.



Monger A.
Web page (.htm)

Introduction to SQL*Plus Programs Exercise
This resource consists of two SQL*Plus programs. The first one creates a simple database with two related tables. The second program retrieves information from this database.
Monger A.
Word (.doc)_

Solutions to the SQL exercises
This provides some possible solutions to the SQL exercises.
Monger A.
Word (.doc)_

SQL Examples, Exercises and Solutions
This resource contains examples and exercises of SQL covering introductory syntax, functions, grouping, joins and other aspects.
Monger A.
Word (.doc)_

Advanced Integrity Scenario

Monger A.
Web page (.htm)

Figure 5 – SQL Resource List

6.3 Search Forms

The site is indexed by the well known Google search engine, and will enable resources that are stored on the site to be searched by content. This takes advantage of functionality such as usage metrics available free to academic institutions.

Other search forms, using proven re-usable library and other search interfaces implementations where possible, are under development.

7. Evaluation and Further Work

We have undertaken an initial evaluation based upon high-level criteria of functionality, reliability, performance, cost, usability and enhancement of quality of resources and learning.

At present, there are over 100 resources, 30 topics and 300 deployments – significant in the context of the delivery, but not large in database terms. Questionnaire and focus group feedback from the database systems tutors and students has been encouraging.

The main issue which was raised by the students was not the usability of the application itself, but rather the volume and prioritisation of the resources delivered. In particular, we went perhaps somewhat over the top with the deployment of resources for the final year Advanced and Distributed Databases module delivered in the first half of the year. This led, for some students, to an overwhelming list of resources based on a somewhat coarse grained division of five main topics.

This will be remedied for next year (including a subdivision into core and additional resources), and was avoided in time for the delivery of the level 2 Application Development and Databases.

The following further work is prioritised:

P1. Research into issues such as sharebility, copyright etc that may inhibit further adoption of the resource;

P2. Research into the notion that increased shareability might lead to increased peer-review, and hence to higher quality of resources and learning;

P3. Improve the application using a more flexible XML approach as used by Fitzpatrick [6];

P4. Ensure compliance with the World Wide Web Consortium's (W3C) Web Access Initiative (WAI);

P5. Explore the possibility of collaboratively developing this resource within the HE database systems community.

In respect of P5, and to demonstrate the application in the context of this conference, permission was sought from the LTSN-CCIS, and the authors, to include metadata in the RESOURCE catalog.

At least as an interim measure, we would be pleased to host the RESOURCE application on our (Institute) server, and populate with database systems resources until scale and other factors suggest a more structured and sustainable longer term approach.

8. Summary and Conclusion

Essentially, the RESOURCE application is now directly benefiting learners and tutors in the Computing group through increased efficiency, shareability, peer review and access to database systems resources.

Students are impressed with the focus and range of resources available online. They also commented favourably on the frequent real-time improvement of quality of the resources. A correction of an error pointed out to us by the students in a teaching session would be propagated universally online moments later! Significant enhancement in quality of the resources is expected in the future. The benefit to referral students, and those looking ahead, is about to be realised this summer.

Tutors were impressed at being able to access all the lecture and tutorial teaching materials provided by the module leader. The capability to publish online a scheme of work and comprehensive learning resources for a new module in just 30 minutes has also attracted interest!

The database application itself is not complex (a suitable case study for teaching at level 1 perhaps?) and is cost-effective in respect of development.

The authors will be pleased to promote its use to the database systems academic community.

9. References

[1] Internet Guide to Engineering, Maths and Computing (EEVL) http://www.eevl.ac.uk

[2] Exchange for Learning Programme (X4L) http://www.jisc.ac.uk/pub02/c02_02.html

[3] Learning, and Teaching and Support Network, Centre for Computing and Information Sciences, Databases Curriculum Area http://www.ics.ltsn.ac.uk/resources/databases/index.html

[4] Monger A, Flackett J, A Framework for the Delivery and Sharing of Online Learning Resources, British Computer Society INSPIRE conference http://www.solent.ac.uk/t302/resource

[5] IMS Global Learning Consortium http://www.imsglobal.org

[6] Fitzpatrick C, An XML Approach to Creating Web-based Learning Environments http://www.ics.ltsn.ac.uk