SOFTWARE DESIGN AND DEVELOPMENT

Lotus Notes Domino™ is an industrial strength GroupWare product with sophisticated security, multimedia document, file and data handling, full text search and indexing and database replication features. It is client server based, web enabled, and has a fourth generation language development environment, which also supports among other things a scripting language. For these trials the database was developed mainly using the fourth generation features of the product, such as forms, views, action buttons, and navigators. The main database was stored at AUT on our Lotus Notes server, and students accessed the system via the web using standard web browsers.

The application designed to support these trials has evolved from an initial concept, with a number of structured generic elements (project, document, section, discussion thread, response etc.), but considerable freedom for user definition of elements. In the first trial the genericity proved a barrier to use. It inhibited communication between groups, navigation of the database and effective learning of how to use the system. In the second trial a much more tailored development approach was taken. While less generic, this approach gave more contextual clues, which eased use of the database, and reduced rates of error. For instance, instead of a field for project name allowing open ended entry, and project/group names such as "club kafka", which meant nothing to the remaining members of the group, the new design enforced entry of group name via a drop down list box. Group naming standards were thus able to be enforced (e.g.. group001NZ001, group001SE001), rather than simply recommended via a standard which was not read or not adhered to, causing confusion all round. In this way the design of the application brought structure to the process. The original application had three main areas,

1) a discussion area, within which documents and sections or structured discussion threads could be accessed;
2) a reference area for attached files and
3) a reference area for websites of interest

These areas were augmented by an online evaluation form enabling students to anonymously enter their reviews of the trial, and a secure set of views by which the researchers could access the on line evaluations.
In the second trial:

1) the discussion area was tidied up to some extent by enforcing naming standards, improving navigation and reducing the depth of hierarchies in the application.
2) Functionality was added to enable individual scoring, individual ranking and group ranking activity to be performed, and the results of this viewed by participants as they evolved.
3) Provision was made for weekly progress reporting via an online logbook, and views were designed for participants to indicate the reported progress of individuals and groups.
4) Again anonymous online evaluation forms were designed and a secure set of views to provided to assist in their analysis.

A number of limitations with the functionality of the application remain to be addressed, and usability remains an issue. Feedback from students requires further analysis to assist in this, but a means of linking the system more readily to the students' standard email mailbox could be useful, (perhaps via Notes agent functionality, which can for instance automatically send mail to specified recipients or groups).

EVALUATION

An EAST evaluation framework considers results in terms of the output variable *decision outcomes* (as identified in figure 1 above) under the four criteria of *efficiency, quality, consensus, and commitment.* For these trials the deliverables from the exercise are equivalent to the *decision outcomes*. Gaps in data collection inhibit a full evaluation, since the model in figure 1 had not been developed at the time of the first trial, but it does provide a base against which the outcomes can be reviewed.

1) *efficiency of decision outcomes - trial 1*
   at overall group level - 7 of the 8 groups produced at least one design proposal from their contributing subgroups.
   No group completed their joint feasibility studies.
   At subgroup level - of 20 Uppsala subgroups, 10 completed a design proposal, 1 of these being for the wrong overall group, 10 failed to complete a proposal, but 2 of these may have done so by email without the final results being forwarded to the authors
   efficiency of decision outcomes - trial 2
   at overall group level - 6 of the 9 groups (by self-report of the AUT student groups in class) produced a group ranking of the proposals. From the database itself it appeared that there was considerable confusion between subgroup and group levels. Database entries correlated with the self-report data in 2 cases as "confirmed" rankings, in 2 cases as a "draft" entry only, and in 1 case as an "uncategorised" entry. In 2 other cases later entries by subgroups countered the self-report data, and in 2 cases earlier entries by subgroups counteracted the self report data.

2) *quality of decision outcomes - trial 1*
   the quality of design proposals submitted in the trial were generally high, and offered interesting and innovative concepts for software games. Subjectively most would be ranked as good to excellent, with the