Report to Users on Performance issues relating to OxCORT during Michaelmas Term 2008

Background

This Report presents a summary of the main issues experienced following the implementation of OxCORT version 3 phase 2 in Week 6 of Michaelmas term 2008, along with an overview of the remedial actions taken by BSP and other University colleagues to correct the issues and to ensure that they do not recur in Hilary term 2009. It covers a review of system performance and availability, the difficulties experienced in diagnosing and addressing system performance issues and functional issues, and an implementation overview.

OxCORT was developed from a system originally developed by Cambridge University named CamCORS – Cambridge Colleges Online Reporting of Supervision). The customisation of CamCORS to meet the requirements of Oxford was undertaken by OUCS and the original CamCORS developer at Cambridge during the academic year 2006-07. OxCORT was first used in the live environment at Oxford in Michaelmas Term 2007.

During 2007-08, the OxCORT Management Committee commissioned BSP to take over the further development of OxCORT from OUCS. A programme of development work was undertaken by BSP during 2007-08 and Michaelmas term 2008, leading to the implementation of OxCORT ‘version 3’ (version 1 being the original CamCORS system, and version 2 being the system after the programme of enhancements undertaken by OUCS during 2006-07). OxCORT version 3 was deployed in three stages:

1. In Trinity Term 2008: Revision Classes

2. At the start of Michaelmas Term 2008: new and enhanced features to support Colleges' start of year / term procedures (version 3 phase 1)

3. In Week 6 of Michaelmas Term 2008: new and enhanced features to support the calculation and reporting of the teaching undertaken by Tutors, the creation of associated payments due to Tutors, and various reports (version 3 phase 2).
1. SYSTEM PERFORMANCE AND AVAILABILITY

Issue: OxCORT experienced several unplanned outages and severely impaired performances following the implementation of Version 3 Phase 2.

Causes

A. The size of the code installed on the OxCORT application server had doubled for V3, whereas the server hardware resources had not been increased at all. The existing server hardware resources could not cope with the increased load arising from the increase in the size of the code base

B. Extensive changes were made to the way in which OxCORT handles the access security rules associated with the many fields in the Report Viewing and Editing screen, in order to make the rules easier to amend or extend in the future. The new method of handling access security requires the rules to be periodically ‘refreshed’ from a new table in the database. Due to the complexity of the access rules, the process of refreshing them from the database further added to the load on the limited server hardware resource

C. Many of the key screens in OxCORT, including Review Viewing and Editing, and Report Search and Selection, depend on a key database view named v-report. This view is very large and intricate, and the enhancements to OxCORT functionality in V3 further added to the size and complexity of this view. During periods of heavy usage, the frequency with which OxCORT needs to refer to this view, coupled with its increased size and complexity, contributed to already overstretched server resources

D. The hardware resources and configuration of the OxCORT database were found to be less than optimal for the size of the database and the number of users attempting to connect to it.

Corrective Action Taken

A. The OxCORT application server has been upgraded and now provides twice the processing power, and four times the amount of memory, as it provided prior to the implementation of V3

B. The application server now automatically re-boots at 4 a.m. each day. As well as providing other benefits, this process refreshes the security access rules. Refreshing the security access rules at a time of day when usage is lightest ensures that resource availability during office hours is maximized.

C. A number of performance improvement measures have been implemented on v-report to enable it to operate more efficiently

D. The amount of physical memory on the OxCORT database server has been doubled, and several key management parameters (System Global Area configuration, and the number of database connections) were re-configured to improve the speed and reliability with which users could connect to the database.

Expectations for Hilary Term 2009: the performance improvement measures outlined above should prevent a reoccurrence of the serious issues encountered in Michaelmas Term 2008. Stress testing and load testing will be undertaken during Hilary Term 2009 prior to the peak usage period of Weeks 7 and 8 in order to ensure that the corrective actions taken have fully addressed all performance issues.
2. DIFFICULTIES IN DIAGNOSING AND ADDRESSING SYSTEM PERFORMANCE ISSUES

**Issue:** BSP Developers and Database Administrators could not gain full access to the OxCORT servers in order to carry out a thorough investigation and diagnosis of the performance and availability issues.

**Causes:** the OxCORT application and database servers (the key technologies being Java/Apache Tomcat and Oracle) are hosted and managed by NSMS. The greater part of the University's experience with these technologies rests with the Development and Database Administration (DBA) Teams within BSP, but because of necessary security measures implemented on the OxCORT servers to prevent unauthorized access, the BSP teams had only limited access to them. This separation of physical hosting and availability issues resulted in difficulties in diagnosing the root causes of the problems.

**Corrective Action Taken:** it has now been agreed that during the Easter vacation 2009 the OxCORT servers will be relocated and hosted within BSP’s infrastructure. In the meantime, a temporary arrangement has been put in place which provides BSP with an improved degree of access to the OxCORT servers which does not compromise external security.

**Expectations for Hilary Term 2009:** BSP Developers and Database Administrators will have improved access, enabling diagnostic work, when required, to be carried out promptly and comprehensively

3. FUNCTIONAL ISSUES

**Issues:**

1. Payment slips did not print correctly in colleges using Internet Explorer Browser Version 7. (Note: this affected five colleges)
2. Payment slips were not produced where Tutors had selected *Pay my College/stint* and had selected more than one value for *My College is* in their reports
3. Payment amounts calculated by OxCORT in respect of Group Sizes greater than 15 were incorrect

**Causes:**

1. Certain routines which handle, display, and print data were changed between Versions 6 and 7 of Microsoft Internet Explorer. This issue was not detected during testing of the new V3 functionality because the standard BSP desktop PC configuration uses Microsoft Internet Explorer 6, and so Internet Explorer 7 was not available for testing purposes
2. The need to accommodate multiple values for *Pay my College/stint* was not fully anticipated during the solution design
3. The routine which calculates payments to the Tutors in respect of teaching where the Group size is greater than 15 was incorrectly specified.
Corrective action taken:

1. A fix for the Internet Explorer 7 issue was developed and implemented in December. As an interim measure, colleges which did not have access to an alternative browser were invited to e-mail the OSS Support Centre with details of their requirements. OSS Support then produced and printed the payment slips and e-mail PDF copies back. In addition, Microsoft Internet Explorer 7 has now been made available to a limited number of colleagues within BSP for testing purposes.

2. A fix to enable payment slips to be produced where Tutors’ reports for the period contained more than one value for My College/stint was developed and tested, and implemented on 19 December 2008. This affected seven colleges.

3. The incorrect calculation routine for large group sizes was re-designed on 19 December 2008. Note that investigations have revealed that this error affected only 0.27% of all OxCORT reports created in Michaelmas Term 2008 (approximately eighty reports out of more than thirty thousand created). Payments for relevant reports that had been completed prior 19 December were recalculated in January 2009.

Expectations for Hilary Term 2009:

The fixes described above have corrected the payment slip and printing issues for those colleges affected, and also the calculation of payment in relation to group sizes greater than fifteen. Neither of these problems will recur in Hilary Term. The availability of Microsoft Internet Explorer 7 within BSP will enable any similar issues to be detected during the testing of future developments, and thus reduce the possibility of browser-related issues recurring in the Live system.

4. IMPLEMENTATION OVERVIEW:

The Live deployment of OxCORT Version 3 took place on 19 November 2008, in accordance with agreed project timescales

In excess of 30,000 Tutorial Reports relating to Michaelmas Term 2008 were successfully created by over 2,000 Tutors.

The Performance issues have been thoroughly investigated and steps taken not only to avoid their recurrence but also to allow BSP better diagnostic access in the future.

Version 3 comprises significant extensions and enhancements to six key areas of the system, and eleven entirely new features and functions (see appendix). Of these, significant issues were reported on only two (production of payment slips for colleges using Microsoft Internet Explorer 7, and calculation of payment in relation to Group Sizes greater than fifteen, as described above). Aside from the problems relating to performance and availability, which gave rise to very understandable and regrettable dissatisfaction in 7th and 8th week, feedback from the OxCORT user community during User Acceptance Testing, and training and implementation, has been consistently positive.

A list of the new features enhancements introduced by Version 3 is appended:
<table>
<thead>
<tr>
<th>Phase</th>
<th>Development</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/a</td>
<td>Revision Classes</td>
<td>Facility enabling Tutors to bulk create reports for a large group of students for revision teaching, when a detailed assessment of each student's progress is not required</td>
</tr>
<tr>
<td>1</td>
<td>Register of Payments</td>
<td>New function enabling the Senior Tutors’ Register of Payments data to be entered and maintained</td>
</tr>
<tr>
<td>1</td>
<td>College Teaching Hours Weighting</td>
<td>New function enabling each College to enter and maintain their own weighting factors with regard to Tutors' teaching hours</td>
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<tr>
<td>1</td>
<td>College bank details</td>
<td>New function enabling each College to enter and maintain their own Bank details</td>
</tr>
<tr>
<td>1</td>
<td>Enhancements to Tutor Data</td>
<td>Enhancements to existing ‘Change Payment Details’ screen to enable Tutors to enter their Gender (required for Inland Revenue purposes) and Subject (required for Colleges’ internal reporting purposes), and to enable Tutors to record multiple College appointments</td>
</tr>
<tr>
<td>1</td>
<td>Tutor Stint Data Entry</td>
<td>New function enabling Colleges to enter and maintain Tutors’ stint data</td>
</tr>
<tr>
<td>1</td>
<td>Authorise Teaching Type</td>
<td>New function enabling OMC to authorise Departments to receive payment via new Payment Method ‘Pay my Department’</td>
</tr>
<tr>
<td>1</td>
<td>Departmental Bank Details</td>
<td>New function to enable Departments to enter payment details which relate to payments due to the Department under the new Payment Method ‘Pay my Department’</td>
</tr>
<tr>
<td>1</td>
<td>Report Viewing and Editing</td>
<td>Complete rebuild (with enhancements) of Report View and Edit screen to include new fields and improve future maintainability</td>
</tr>
<tr>
<td>2</td>
<td>Validate Teaching Data</td>
<td>New function enabling College Offices to check and validate the data entered by Tutors on Tutorial Reports before calculating payments and teaching hours</td>
</tr>
<tr>
<td>2</td>
<td>Calculate Payments and Teaching Hours</td>
<td>New function enabling: (a) payment to Tutors to be calculated using the Register of Payments; (b) non-standard payments to be entered by Tutorial Offices, where required; (c) Tutors’ total teaching hours to be calculated using the relevant College’s teaching hours weighting data where required</td>
</tr>
<tr>
<td>2</td>
<td>Tutor Payment Data Export</td>
<td>Enhancement to existing export file to include payment data, and to enable electronic data transfer from OxCORT to Colleges’ payroll systems</td>
</tr>
<tr>
<td>2</td>
<td>Inter-College Payment Data Export</td>
<td>Enhancement of existing inter-College export file to include payment data</td>
</tr>
<tr>
<td>2</td>
<td>Departmental Payment Data Export</td>
<td>New function enabling Course Directors to extract a listing of the payments which are due to their Department in respect of Reports where ‘Pay my Department’ has been selected</td>
</tr>
<tr>
<td>2</td>
<td>Export Report Data</td>
<td>Enhancement to existing function enabling College Offices to export full or selected Report data for monitoring and analysis purposes</td>
</tr>
<tr>
<td>2</td>
<td>Payment Report and Payment Slips</td>
<td>New function enabling College offices to produce a summary listing of payments due in respect of Tutorial teaching and accompanying payment slips</td>
</tr>
<tr>
<td>2</td>
<td>Summary and Individual Stint Reports</td>
<td>New function enabling College offices to monitor the number of contact &amp; weighted hours’ teaching that Tutors have undertaken within the selected period, compared to their stint requirement</td>
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</tbody>
</table>