FUJ00079782

Document Title: CSR+ Development Audit

Document Type: Audit Report

Abstract: This Report is the output from an audit of the CSR+ development activities and presents a snapshot view during September 1999. It details the results of the investigation and provides an opinion as to the state of process compliance and capability.

Status: Issue

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FUJ00079782

0 Document control

0.1 Document history

Version	Date	Reason
0.1	20/10/99	Initial Draft
1.0	28/10/99	Following feedback and some additional work (see para 0.4)

0.2 Approval authorities

Name	Position	Signature	Date
Martyn Bennett	Director Quality & Risk		

0.3 Associated documents

	Reference	Vers	Date	Title	Source
[1]	IA/REP/002	1.0	04/12/97	MSQA Audit Report #1 – Design	
[2]	IA/REP/003	1.0	03/03/98	MSQA Audit Report #2 – Development	
[3]	IA/REP/005	0.2	17/04/98	MSQA Audit Report #3 – TI	
[4]	IA/REP/006	0.2	18/05/98	MSQA Audit Report #4 – T&I	
[5]	IA/REP/004	1.0	18/06/98	Release 2 Process Improvement Programme	
[6]	IA/REP/008	0.3	29/09/98	Report on EPOSS PinICL Task Force	
[7]	IA/REP/009	0.1	21/09/99	Report on EPOSS Solutions	
[8]	TD/STD/001	3.0	29/04/99	Host Application Database Design & Interface Standards (HADDIS)	
[9]	IA/REP/017	0.1	20/10/99	Data WareHouse MSQA	

FUJ00079782

0.4 Changes Made (v0.1 – v1.0)

The summarised improvements at 3.1.1 have been qualified.

Additional statistical information has been presented at 4.2.1.

Rewording in 5.4 – Risk Management.

Revised recommendation in 5.5 – Planning Process.

Additional paragraph and recommendation at 5.6.5

New 5.7 - CSR+ Documentation.

New 5.8 - CSR Documentation.

Addition to 5.9 re Quality Planning and SMP production.

FUJ00079782

0.5 Table of content

1Introduction 6
2Scope & Conduct 6
2.1Audit Scope 6
2.2Audit Conduct 6
2.3Acknowledgement 7
2.4Report Main Body Structure 7
2.5Next Steps 7
3Management Summary 8
3.1Overall Assessment 8
3.2Retrospective Work 9
3.3Inconsistent Work Practices and Documentation 9
3.4Evidence 10
3.5Release Management 10
3.6Review of NR2 MSQA 10
4Detailed Findings - Development Unit Teams 12
4.1POCL Products 12
4.1.1Automated Payments Service 12
4.1.2Logistics Feeder System 14
4.1.3Agents 16
4.2POCL Infrastructure 17
4.2.1Electronic Point of Sale Service 17
4.2.2Reference Data Management Centre/RDDS 19
4.2.3Transaction Processing Service 20
4.3Generic Products 21
4.3.1Roll-Out Database 21
4.3.2Operational Change Management System 22
4.3.3Data Warehouse 22
4.4Systems Infrastructure 23
4.5Security 24
5Detailed Findings – Other Areas 26

FUJ00079782

5.1Functional Requirements Capture 26
5.2Non Functional Requirements Capture 26
5.3Security Management Requirements 27
5.4Risk Management 28
5.5Planning Process 29
5.6Process & Standards 30
5.7CSR+ Documentation 31
5.8CSR Documentation 32
5.9Quality Improvement Initiatives 33
5.10ISO9001 Registration 35
5.11Release Management 36
5.12Intranet Development 37
6Review of NR2 MSQA Recommendations 38
6.1Introduction 38
6.2Audit of Design 38
6.2.1Summary of Findings 38
6.2.2Pathway Response 38
6.2.3Current View 38
6.3Audit of Development 39
6.3.1Summary of Findings 39
6.3.2Pathway Response 39
6.3.3Current View 39
6.4Audit of Technical Integration 39
6.4.1Summary of Findings 39
6.4.2Pathway Response 39
6.4.3Current View 40
6.5Audit of Test & Integration 40
6.5.1Summary of Findings 40
6.5.2Pathway Response 40
6.6Conclusion 40
7Annex A – Terms of Reference 41

FUJ00079782

1 Introduction

The audit forms part of the 1999 programme of planned Internal Audits into aspects of ICL Pathway's organisation and activities. It presents an update to the findings of the NR2 Mid Stage Quality Audits undertaken between December 1997 and May 1998.

Originally planned as four separate audits to take place during Q1 & Q2 of 1999, the CSR+ MSQAs were amalgamated and delayed to Q3 to accommodate the re-organisation of the Development Directorate that took place during May.

The main aim of the audit was to provide assurance to Pathway Management about the status of the CSR+ design, development and testing activities, principally within the Development Directorate. Principally a review of process and compliance it also considered management processes, including communication, organisation and resource planning and includes a review of the status and deployment of the corrective actions that emerged from the previous NR2 (CSR) Mid Stage Quality Audit.

As the audit progressed it became clear that some avenues of enquiry led beyond the Development Directorate and some findings and recommendations reflect this scope extension.

2 Scope & Conduct

2.1 Audit Scope

The scope of the audit was defined in Terms of Reference that were distributed to interested parties on 8th September 1999. These are attached at Annex A to the report.

2.2 Audit Conduct

The audit was conducted on various dates between 8th September and 7th October 1999 by Jan Holmes and Ian Honnor from Quality & Risk.

The May re-organisation introduced the concept of parallel Delivery Units within Development, each containing teams addressing specific product design, development and system testing. Delivery Unit Managers were interviewed to gain an understanding of their organisation, scope of work and methods employed. These were followed by interviews at Team Leader level in both development and system test areas. B&TC Team Leaders were also interviewed resulting in some 35 interviews taking place over a four week period. The larger

FUJ00079782

than anticipated number of interviews has had two detrimental affects on the audit timetable :

a. The production of the draft report was delayed by two weeks.

b. Some areas have not been completely addressed at the time of final report publication.

In particular the report does not cover the OSD Dublin audit nor does it cover the System Testing groups. Supplementary reports will be produced.

2.3 Acknowledgement

There never is a good time to conduct a wide ranging audit such as this and Acceptance pressures during September exacerbated an already tight Development schedule. Both Ian and I enjoyed total support and co-operation during the audit and for that we wish to record our appreciation.

2.4 Report Main Body Structure

The remainder of this report is structured as follows :

Section 3 provides a management summary that draws together the main findings of the audit. While it can be read in isolation it can only provide an overview and does not necessarily reflect the totality of recommendations made.

Section 4 is a detailed analysis of the Delivery Units, down to product team level, and identifies what was found during the audit. It, and the associated Working Papers – not presented in the report – provide the evidence for the recommendations made.

Section 5 presents findings and recommendations in areas not directly related to any specific Delivery Unit team.

2.5 Next Steps

During w/c 8th November I shall be putting together the Corrective Action Plan (CAP) and discussing with the relevant Directors and Managers the actions to be put in place to address the recommendations. Note that at this stage recommendations can be challenged and those challenges will be reflected in the CAP.

Once completed the CAP will be presented to the Pathway Audit Committee (PAC) [*] for ratification. (The concept of the PAC is being piloted on this audit and, if successful, will become the model for future post audit activity).

Progress of the CAP will be monitored during the coming weeks and months and reported to the PAC at regular intervals.

FUJ00079782

[*] Pathway Audit Committee : Managing Director, Deputy Managing Director, Director Quality & Risk.

FUJ00079782

3 Management Summary

3.1 Overall Assessment

3.1.1 In talking to members of the Management Team prior to commencing the field work it was clear that they wanted assurances that things had improved since NR2, that the CSR+ Release was being developed in a more controlled manner, and that they could expect a more stable, resilient product as a result. It is therefore pleasing to report that, notwithstanding the detailed observations and recommendations made in this report, there is an overall improvement in the application of process, review and standards to the CSR+ products. These can be summarised as follows :

- Appropriate documentation has, to a great extent, been developed at the right time in the lifecycle.
- Informal reviews of content have been conducted, at best by email comment cycle.
- Informal code reviews have been conducted between Developers and Team Leaders.
- Unit and link testing has been conducted, although this ranges from informal to rigorous.
- The most significant change has been in the attitude of the Team Leaders interviewed where all expressed a personal interest and desire to improve things and 'do it right'. This is a marked change to NR2 where Team Leaders were under too much pressure to even think about doing it right, just delivering.

3.1.2 However, the following balancing factors have to be applied :

- The documentation produced, particularly at the lower level of detail (LLDs, Test Scripts), are not consistently developed against the Online Standard templates.
- Email comment cycles alone are not suitable vehicles for document reviews. They are usually limited to reviews of content, not the application of design principles or a rigorous end-to-end review of the design against requirements. Moreover, participation by selected reviewers is not mandatory. Some Team Leaders asserted that theses had been carried out but there was no evidence to support these claims.
- There are no underpinning standards for C or VB code, the primary languages used. Many Team Leaders imposed standards based on their own examples of best practice and applied these when conducting reviews. The remains, however, no universal standard in use across the programme

FUJ00079782

although work is currently underway to address this shortfall. With the exceptions of RODB and Security there is no evidence of these reviews taking pace.

- The unit and link testing approach was variable. Some teams had conducted full regression testing while another had tested only the CSR+ changes – although plans were in place to develop regression scripts and subsequently exercise them. Others had undertaken very informal testing without the benefit of scripting.

Details can be found in the main body of the report.

3.2 Retrospective Work

3.2.1 A number of the Development Teams have identified incomplete elements of documentation, especially Low Level Designs and Unit and Link Test documents. Some had already identified work to remedy these shortcomings and were prepared (and preparing) to develop missing documentation from earlier baselines to improve the situation for future Releases.

This retrospective work should be supported by the organisation and should be taken into account in any resource planning that may be underway. However, it must be planned and I recommend that Delivery Unit Managers are tasked with developing 'Get Well Plans' for their retrospective units to deal with the missing or incomplete deliverables.

3.3 Inconsistent Work Practices and Documentation

3.3.1 Scrutiny of the detailed report shows that there are differences in the way that development teams operate and inconsistency in the work products that they produce. There is still a general lack of awareness of the Online Standards and the depth and richness of guidance that is available there. Work carried out by the CSE during June and July identified the degree of use (and non-use) by development teams, although the justification for not using them has not been explored to any extent.

3.3.2 The consolidated audit report from the NR2 MSQAs [5] identified concerns around awareness and deployment of the Online Standards but omitted to make any concrete recommendations as to how to improve either. The audit has identified a considerable change in attitude within the delivery units although there remains the challenge of delivery schedules to be met and a general lack of awareness of the Online Standards.

FUJ00079782

The current work to convert the existing helpfile OLS to a full intranet provides an ideal opportunity to re-launch them and I recommend that an awareness programme is launched to overcome the apparent lack of knowledge of the coverage and content of the OLS. This must be backed up with effective management checks ensuring that the key controls are exercised.

3.4 Evidence

3.4.1 One of the key areas considered during the audit was the existence of evidence to support the development lifecycle. Evidence of work done is a vital component of ISO registration which can be crudely broken down into 'Say what you're going to do; do it, now prove it'. This is obviously a gross over simplification but evidence lies at the core of the registration process. Verbal assurances that such a review has taken place, or that this testing happened, however honest and truthful represent anecdotal evidence at best and this would not be acceptable to an ISO Assessor.

There was an abundance of verbal assurances that lifecycle reviews had taken place but very little hard evidence, in the form of walkthrough notes, document comment sheets, review meeting minutes, etc existed. Having moved from the NR2 position where even anecdotal evidence was hard to find Pathway must now formalise the documenting and retention of review outcomes. Not only does this provide evidence of review but can also be used to measure the effectiveness of the review process itself, an important element of continuous process improvement.

3.5 Release Management

3.5.1 Although covered in the detailed report this is discussed here since it is the core process that drives the Pathway business outside Operations and the immediate Roll Out activities. Following the 18th August ratification of the process the failure to appoint a Project Manager to implement and deploy it across the programme has meant that at least 2 months of potential benefit to CSR+ has been lost.

The appointment of a Project Manager to implement and deploy the Release Management process should be made at the earliest opportunity.

FUJ00079782

3.6 Review of NR2 MSQA

3.6.1 The results of the NR2 MSQAs are presented at Section 6. Although considerable effort and expense had been put into certain of the recommendations, eg the OPENframework Initiative, it has been difficult to establish if any benefit accrued from that work. The work currently underway to produce a comprehensive Non Functional Requirements Catalogue suggests that the changes to the OLS documentation templates made following this initiative did not bring about the required outcome.

3.6.2 Many of the minor issues around documentation naming and numbering conventions remain although some of the 'bigger issues', eg improving the test environments available to unit and link testing have been achieved. As identified in the Overall Assessment there have been considerable improvements in the production of low level documentation and unit and link testing, both areas previously identified as major weaknesses.

FUJ00079782

4 Detailed Findings - Development Unit Teams

This section of the report presents the detailed findings of the audit based on interviews with Development Unit Team Leaders and scrutiny of available documentation. It is organised by Development Unit teams and allows management to consider the variances in approach where these occur.

Release 17 of the Pathway Online Standards were used as a basis for the compliance element of the audit.

There are a number of recommendations that emerge that apply, in whole or in part, to all Delivery Units.

4.1 POCL Products

4.1.1 Automated Payments Service

Commentary - APS Counter

The Counter element of APS has been completely re-written for CSR+. The decision was taken before the re-organisation and was justified following an in-depth review of the code when it was considered to be un-maintainable and incapable of being enhanced to accommodate the new Smartcard functionality. The approach taken was to reverse engineer a suite of Low Level Design documents from the existing code, validate against the High Level Design and re-code.

Documentation has been developed at all levels, compliant with existing Pathway standards, and there is evidence of reviews having taken place through the retention of earlier versions.

Commentary – APS Host

There is no evidence of reviews having taken place on Design documentation but the Team Leader has asserted that a specific activity to review and apply the QA Checklist criteria will be conducted during the system test support period. It was not possible to trace any direct relationship between the unit test scripts and modules and the Team Leader was only able to provide a broad estimate (between 200 & 400) of scripts executed.

FUJ00079782

Control Feature	APS Host	APS Counter
Stage Management Plan	No	No
Product Breakdown Structure	No, but ~95% of deliverables believed to be on Plan	No, but HLD and 12 supporting LLDs on Plan
High Level Design	Yes (2). OLS Compliant.	Yes (1). OLS Compliant.
Low Level Design(s)	Yes (~60). Not OLS Compliant.	Yes (12). OLS Compliant.
Interface Specification	Yes (14). OLS Compliant..	No OLS Compliance n/a.
Specification Reviews	Informal desktop review with APS Host Designer and relevant Developer. No evidence of reviews.	Documents sent to Delivery Manager. Evidence of review through retention of earlier versions of document.
QA Checklists (Specifications)	QA Checklist identifies documents only but no quality criteria as required by form. Review dates between 09/98 and 08/99.	No.
Code & Code Reviews	~114 mixed modules Established own coding standards. Informal desktop reviews only and no evidence available,	Used coding standards based on previous VME work. Informal desktop reviews prior to testing. No evidence available.
QA Checklists (Code)	No	No
Test Documentation	No Unit or Link Test Strategy. Unit test scripts exists but difficult to ascertain numbers since no naming conventions used, shared scripts between modules. Estimated at between 200 and 400 separate scripts. No Test Report	Test Strategy generated. Informal unit testing prior to code being transferred into Link. Link test scripts generated and test environments complete with Smartcard peripherals. Results recorded in daybooks. Bugs maintained in discrete bug database which also identified CSR to CSR+ fixes. No Test Report.
QA Checklist (Test Documentation)	No	No

FUJ00079782

4.1.2 Logistics Feeder System

LFS is a new product for CSR+ and was developed following the production of a Business Requirements Document, originally signed in May 1998 but not finally agreed until August 1999 following further negotiations.

Commentary – LFS Counter

Although code has been delivered the delivery and updating of supporting documentation, and the associated reviews, were severely affected when the LFS (Counter) team was reduced from 5 to 2 as a result of effort being re-directed to EPOSS Acceptance and PinICL clearance, and staff resignation.

The Team Leader estimated that there was something in the region of 2 months work to produce the work products currently missing.

A major concern in this area is the absence of formal unit and link test scripts, again attributable to staff shortage.

Commentary – LFS Host

Other than evidence of reviews and instances of non compliance with documentation standards, the level of management control in this area was considered to be good.

FUJ00079782

Control Feature	LFS Host	LFS Counter
Stage Management Plan	No	No
Product Breakdown Structure	No.	No.
High Level Design	Yes (1). OLS Compliant.	Yes (Common HLD with Host). OLS Compliant.
Low Level Design(s)	Yes (47). OLS Compliant.	Yes (1). Note that this single LLD contains details for all LFS modules. OLS Compliant.
Interface Specification	No. Interface details are incorporated into HLD.	No
Specification Reviews	Informal desktop review with relevant Developer. No evidence of reviews.	Informal desktop review with relevant Developer. However, could not be sustained following team size reduction. No evidence of reviews.
QA Checklists (Specifications)	QA Checklist identifies HLD only but no quality criteria as required by form. Review date 04/99.	QA Checklist identifies HLD only but no quality criteria as required by form. Review date TBA.
Code & Code Reviews	59 application and 7 common modules. Established own coding standards by example. Informal desktop reviews only and no evidence available,	~7 Established own coding standards by example. Informal desktop review with relevant Developer. However, could not be sustained following team size reduction. Spreadsheet of results maintained when reviews were taking place.
QA Checklists (Code)	No	No
Test Documentation	Single document covering Unit & Link testing strategy and plans. Not OLS Compliant. 59 (1 per module) Unit test scripts exist. No Test Report.	No Unit or Link Test Strategy. No Unit Test Scripts other than a number of more complex cases that exist in Team Leader's daybook. No Test Report.
QA Checklist (Test Documentation)	No	No

FUJ00079782

FUJ00079782

4.1.3 Agents

Commentary

Time constraints precluded a detailed review of Agent development at BRA01 and any observations are based solely on the evidence of information passed to the Programme Office when requesting QA Checklists.

Control Feature	Agents
Stage Management Plan	Yes but not Release specific.
Product Breakdown Structure	Document register maintained.
High Level Design	Yes (7). Not OLS Compliant. A&TC Standard used.
Other Specification	Yes (13) Not OLS Compliant. A&TC Standard used.
Specification Reviews	Informal email comment cycles. No evidence of reviews.
QA Checklists (Specifications)	No.
Code & Code Reviews	154 modules. 'Complicated' code subject to desk check. No evidence of reviews.
QA Checklists (Code)	No.
Test Documentation	No Unit or Link Test Strategy. Informal Unit testing only. Formal deliveries subject to automated scripts to carry out regression test. Results retained for these tests. No Test Report.
QA Checklist (Test Documentation)	No

FUJ00079782

4.2 POCL Infrastructure

4.2.1 Electronic Point of Sale Service

Commentary

From the CSR+ perspective the development of the EPOSS product has been successful with software drops being made according to planned schedules and confidence in the team that future drops will also be achieved on time.

Unfortunately EPOSS continues to be resource hungry in dealing with live problems associated with CSR and in ensuring that these fixes are brought forward and incorporated into the CSR+ product.

The EPOSS Task Force Report [6] raised the question of the maintainability and resilience of the EPOSS code following the 6 week PinICL blitz where some 550 PinICLs were processed. Since then a further ~996 PinICLs have been raised – using the 'Product = EPOSS and Target Release = IR-CSR or PDR-CSR' search criteria - and these can only have had a detrimental effect on the quality of the code. In particular the maintainability, resilience and potential for change aspects must be subject to doubt. The report also identified many instances of poor programming technique and application of coding standards and while CSR+ changes have been reviewed by the Team Leader no attempts have been made to address the significant body of code not affected. There is also anecdotal evidence that EPOSS components used by other applications are fragile and cause problems for the calling application, Print Server was mentioned by both LFS and APS Counter teams.

To further support the recommendation statistics on EPOSS & Desktop PinICLs raised sine 1stOctober 1998 were obtained. The selection criteria used were :

Release = NR2 or CSR; From 1/10/98 to 28/10/99; Product Group = EPOSS & DeskTop; Product = EPOSS

Month	EPOSS & DT	EPOSS
October 98	133	99
November 98	88	79
December 98	90	50
January 99	75	57
February 99	147	68
March 99	113	47
April 99	139	55
May 99	266	44
June 99	292	73
July 99	307	56

FUJ00079782

August 99	260	50
September 99	269	52
October 99	439	84

The figures indicate that the problems facing EPOSS during the Task Force period have not diminished. Of greater concern are the non-EPOSS PinICLs within the group suggesting that there are still serious quality problems in this vital, customer facing element of the system.

The EPOSS Solutions Report [7] made specific recommendations to consider the re-design and re-write of EPOSS, in part or in whole, to address the then known shortcomings. In light of the continued evidence of poor product quality these recommendations should be re-considered.

Control Feature	EPOSS
Stage Management Plan	No
Product Breakdown Structure	No
High Level Design	Yes (5) but content limited to a related Change Proposal. OLS Compliant.
Low Level Design	Yes (3) but content limited to the component affected by the Change Proposals. Not OLS Compliant.
Interface Specification	No
Specification Reviews	Informal with EPOSS Developer. Has involved EPOSS TDA. No evidence of reviews.
QA Checklists (Specifications)	Yes.
Code & Code Reviews	Informal with developer. No evidence of reviews.
QA Checklists (Code)	Yes.
Test Documentation	No Unit or Link Test Strategy. LLD contains section on unit testing required. No Test Report.
QA Checklist (Test Documentation)	Yes.

FUJ00079782

4.2.2 Reference Data Management Centre/RDDS

Commentary

In common with some other areas the Team Leader has a planned action to review both CSR+ and CSR documentation during October and November.

A particular concern in this area is the complete absence of any formal unit and/or link testing strategies, plans or scripts. Given reference data's central role in the successful operation of the system this, of all areas, should be subject to rigorous and formal testing.

Effort should be expended, as soon as practicable, into developing a full suite of unit and/or link test scripts, and a formal test strategy for future releases of RDMC/RDDS should be established.

Control Feature	RDMC/RDDS
Stage Management Plan	No
Product Breakdown Structure	No, but list of deliverable documents provided.
High Level Design	Yes (2). OLS Compliant.
Low Level Design	Yes (39). OLS Compliant.
Other Specification	Yes (8) OLS Compliant.
Specification Reviews	Informal email comment cycles. No evidence of reviews.
QA Checklists (Specifications)	Yes.
Code & Code Reviews	~437 modules. Desktop reviews carried out on basis of complexity. ~50% code reviewed. No evidence of reviews.
QA Checklists (Code)	Yes.
Test Documentation	No Unit or Link Test Strategy. Informal Unit testing only. No Test Report.
QA Checklist (Test Documentation)	Yes.

FUJ00079782

4.2.3 Transaction Processing Service

Commentary

Generally, this area was felt to be well controlled. The scope of unit testing was limited to the CSR+ changes, due mainly to the absence of any CSR test documentation and the Team Leader has accepted an activity to develop a full suite of unit test scripts to enable full regression testing and improve testing for future releases. The absence of test documentation is common to other areas and this retrospective work is being commended to others in a similar position.

Control Feature	TPS
Stage Management Plan	No
Product Breakdown Structure	No.
High Level Design	Yes (1). OLS Compliant.
Low Level Design	Yes (30). Likely to increase by 3 following CP2186. Not OLS Compliant.
Specification Reviews	Informal email comment cycles. No evidence of reviews.
QA Checklists (Specifications)	No.
Code & Code Reviews	No evidence of reviews.
QA Checklists (Code)	No
Test Documentation	Unit & Link Test Strategy incorporated into System Test Strategy. Unit testing only against CSR+ changes and results captured through updating the scripts. No Test Report.
QA Checklist (Test Documentation)	No

FUJ00079782

4.3 Generic Products

4.3.1 Roll-Out Database

Commentary

Although this project has had more than its fair share of change and uncertainty regarding requirements and how it is to be implemented it was found to be well controlled from a process perspective. In common with other areas there was little evidence of design specification reviews although the presence of the Review and Approve checklists, introduced by the Project Manager, was welcome.

Control Feature	RODB
Stage Management Plan	Yes. Produced January 1999.
Product Breakdown Structure	No.
High Level Design	Yes (1). OLS Compliant.
Low Level Design	Yes (1). OLS Compliant.
Other Specification	Yes (1) OLS Compliant.
Specification Reviews	Informal email comment cycles. No evidence of reviews.
QA Checklists (Specifications)	No.
Code & Code Reviews	~36 modules. Review & Approve checklist introduced as evidence of code reviews having been carried out.
QA Checklists (Code)	No.
Test Documentation	No Unit or Link Test Strategy. Unit testing has taken place although documents offered as scripts were more akin to Test Reports showing actual results as well as expected.
QA Checklist (Test Documentation)	No.

FUJ00079782

4.3.2 Operational Change Management System

This system was just entering the development phase and the Team Leader was putting together the activity schedule to present to the Programme Office. Specification documentation exists, High Level Design, Low Level Design and Interface Specification which the Team Leader understands to have been reviewed by the TDA prior to handover. She anticipates having to update the LLDs in order to introduce the level of detail necessary for coding to commence. She confirmed that quality reviews were included on the activity plan but was not aware of the Programme Office QA Checklists.

4.3.3 Data Warehouse

The OSD Dublin development team were visited as part of the audit. A separate report will be issued under reference IA/REP/017.

FUJ00079782

4.4 Systems Infrastructure

This Unit is providing a wide range of products and services for CSR+ and, as its name suggests, this is mainly in the field of infrastructure software including operating systems (NT, Dynix), messaging software (Riposte) and scheduling (Maestro). It is also delivering three products that are key to the operation of Horizon, namely Audit, AutoConfig and FTMS.

Control Feature	Audit	AutoConfig	FTMS
Stage Management Plan	No.	No.	No.
Product Breakdown Structure	No.	Yes. Informal list maintained by Team Leader.	Yes.
High Level Design	Yes (1) OLS Compliant.	Yes (5) OLS Compliant.	Yes (1) OLS Compliant.
Low Level Design	Yes (1) being developed in parallel to code production.	Yes (8) OLS Compliant.	Yes (1) OLS Compliant.
Other Specification	No	Yes (1) OLS Compliant.	Yes (1) OLS Compliant.
Specification Reviews	Email comment cycle for HLD.	Email comment cycle. No evidence available.	Email comment cycle. Evidence available.
QA Checklists (Specifications)	No.	No.	No.
Code & Code Reviews	No.	No.	Planned to be done against FTMS Code Review Checklist.
QA Checklists (Code)	No.	No.	No.
Test Documentation	Yes. Will be produced in parallel to testing cycle.	Test Specification containing Scripts available. A Link test Report has been produced and was seen.	Unit Test Plan and Scripts on documentation list.
QA Checklist (Test Documentation)	No.	No.	No.

FUJ00079782

4.5 Security

Commentary

There are three security products being developed for CSR+, the Key Management System (KMS), Virtual Private Networks (VPN) and Secure Build. Both KMS and VPN are new for CSR+.

The products were originally being developed by A&TC under a development contract with ICL Pathway and a Pathway Project Manager, and commenced as a PRINCE based project producing a Project Initiation Document that identified the organisational, resource and procedural controls that would be applied to the development. It also identified the documentation structure that would be delivered and the quality control activities that would be present in the lifecycle.

Following the re-organisation the project came completely within the control of Pathway and a revised Roles and Responsibilities document produced to reflect the changes. The Unit enjoys the services of a dedicated Project Control Officer, with the full agreement of the Programme Office and this has resulted in a Plan that is, in the opinion of the Project manager, more detailed and flexible than that enjoyed by his peers.

The pervasive nature of this development demands the highest level of management control and the evidence presented during the audit, albeit not exhaustively tested, suggests that this control is present and being exercised.

FUJ00079782

Control Feature	Security
Stage Management Plan	Yes. A Project Initiation Document was been produced.
Product Breakdown Structure	No, but all documentation deliverables are on Plan.
High Level Design	Yes (2). OLS Compliant – subject to changes agreed with TDA.
Low Level Design	Yes (17 KMS) (7 VPN) (? SB). OLS Compliant – subject to changes agreed with TDA.
Other Specification	Yes. OLS Compliant.
Specification Reviews	Informal email comment cycles followed by formal design walkthroughs using results of email comment cycle. Comment Sheets and Walkthrough Comments retained and seen.
QA Checklists (Specifications)	No.
Code & Code Reviews	58 KMS. 5 VPN Code reviews carried out and statistical analysis of results (16 module so far) maintained. Evidence shows some 22% logic errors, 25% standards non-compliance and 7& design errors. Considered by the Project Manager to be high value activity.
QA Checklists (Code)	No.
Test Documentation	Test Strategy produced. OLS Complaint. Testing guidelines established that defined the method for Unit and Link Testing. Test Specification produced and reviewed internally. Full regression carried out when all problems solved. Unit Test Reports produced (46 KMS) (3 VPN). Link Test conducted over two phases. Ph1 to ensure that components held together, Ph2 to run full E2E, ~290 scripts. Internal bug database maintained for all unit and link test errors foun and used to monitor error resolution prior to system test.
QA Checklist (Test Documentation)	No.

FUJ00079782

5 Detailed Findings – Other Areas

5.1 Functional Requirements Capture

5.1.1 A considerable amount of effort was expended into ensuring that where feasible, CSR+ requirements were captured, understood, documented and approved prior to the commencement of work. Requirements workshops were held during 1998 for a number of discrete areas and Requirement catalogues produced. In POCL Infrastructure an extra Requirements Summary was developed to accommodate the central role of Reference Data and its relationship with EPOSS, the objective being to eliminate any overlap of the separate areas and ensure that there were no gaps between them. These were presented to the Management Team and ratified for inclusion into the Release Content Definition.

5.1.2 A Release Content Definition has been compiled although its status as the definitive description has not yet been assured through approval by POCL. If the CSR example is anything to go by it is highly unlikely that any formal approval will be obtained prior to the Release being implemented.

5.1.3 Unfortunately, any stability in the requirements baseline is fast being eroded by the continual stream of CPs being received for CSR+ and those for CSR which will have to be carried forward. Between June 4th and October 15th 126 CPs were processed by Change Management for CSR and 88 for CSR+. This problem was further exacerbated during Acceptance when concessions were given during the negotiations I understand that further concessions have been offered during the recent CSR+ re-planning exercise. The current re-plan takes into account all known concessions (in the form of CRs raised by POCL and CPs raised by Pathway) and an aggressive delivery date has been arrived at.

5.1.4 The proposed Release Management process (see para 5.11) identifies the concept of a fixed size requirements 'bucket' once a delivery and resource schedule has been established. Changes to the 'bucket' has to be time and resource neutral insofar that requirements added must be balanced by others being sacrificed. However, the principle cannot be implemented until such time as the process is deployed across the programme.

In order to protect the revised delivery date it is imperative that no further changes are accepted to the CSR+ requirements baseline and I recommend that the principles enshrined in the Release Management process be applied to the current CSR+ requirements baseline.

FUJ00079782

5.2 Non Functional Requirements Capture

5.2.1 A Non Functional Requirements Catalogue had been developed by B&TC during 1999. This was based on an earlier 1996 NFR document, itself derived from the Business Portfolio and other documents that related to the original contract. Its delivery to the TDA identified that a revised NFR catalogue, that reflected the revised contract, needed to be developed. An action has now been accepted to produce a revised NFR Catalogue based on the revised contract and work is currently underway within the TDA to deliver this document.

5.2.2 At the same time, B&TC already have a number of test scripts for NFRs, some based on the Technical Test Register, an inheritance from NR2 Technical Testing, and some carried forward directly from NR2 testing activity. The extent to which these scripts relate to or map onto the requirements currently being collated within the TDA is not clear.

5.2.3 Following the Programme Plan revision, there will be a 25% increased in the user population at the point of CSR+ Release Approval as follows:

- Plan V8.0 : RAB Approval 26/05/00 : Outlets live ~8,500
- Plan V9.0 : RAB Approval 25/08/00 : Outlets live ~10,680

By December 2000, when PONU's busy season starts, some 15,000 outlets are forecast to be live and a high level of assurance that the NFRs, in particular those that relate to systems performance and capacity, is essential.

The design and development work for CSR+ is largely complete. B&TC's proposed testing of NFRs is currently based on old, potentially superseded requirements although the delivery a revised NFR Catalogue is imminent. It is imperative that the existing scripts are validated against the NFRs in the new Catalogue at the earliest opportunity.

There is am implied risk that the NFR Catalogue may highlight deficiencies in the CSR+ products delivered that will require re-work.

5.3 Security Management Requirements

5.3.1 The Requirements authority for KMS is QRM, who also are one of the prime users.

It was noted that :

- There is an informal agreement between QRM and Secure Development for a User Acceptance Test to be conducted by QRM during February 2000. There is no evidence that this agreement is supported by a committed, resourced plan in QRM.

FUJ00079782

- The size of the KMS user role within QRM is not yet determined - though the additional head count requirement is small (possibly one person full time).
- There is uncertainty whether the current contracts with OSD include the operational services expected to be provided by them in operating the KMS.

The agreements and commitments to conduct the KMS User Acceptance Tests should be formalised and reflected in the Security Manager's workplan for 2000.

5.3.2 At NR2 there was a jointly agreed approach to penetration testing which was frustrated by a lack of hardware resource. There remains an expectation on both sides of the Agreement that Penetration Testing will be performed for CSR+ in or about the 1st Quarter of 2000 although there is no committed ownership and plan that supports this activity.

Assuming that the requirement for penetration testing remains the approach agreed for NR2 should be reviewed for continued suitability. Ownership of the activity should be assigned and the necessary resources committed and reflected in the Programme Plan.

5.4 Risk Management

5.4.1 A new Risk Management process is currently being developed using the Predict! tool at its core. To this end Delivery Managers had been asked to develop Risk Registers appropriate to their areas and make this information available to the Pathway Risk Manager. The formats of the various Registers are not consistent although this should not present a problem given that all information will be input to the tool and will emerge in a standard format for future use. The Risk Manager has also developed a manual register format, consistent with the Predict! format for those areas that would not benefit from using the tool directly.

It was noted that difficulties are being experienced in the integration of the Predict! Tool with the AMS planning tool. While maintaining full integration as the ultimate goal the Risk Manager should not delay in introducing the revised RM process across the programme.

5.4.2 It was noted that at least one other Risk Register was in common use across the Programme. This is maintained by the Director, Quality and Risk Management and is used by him to monitor 'high level risks' with members of the Management Team and senior managers. Once the Predict! Risk Management

FUJ00079782

tool has been implemented there is no benefit to maintaining a separate and parallel register. Duplication of effort to review and maintain separate registers, and inconsistent analysis and measurement methods compromises the integrity of the Predict! based process and the benefits that should accrue from a single programme wide approach to risk management.

FUJ00079782

It is anticipated that the Predict! register will form the sole repository and source of risk information, providing a common and consistent view of risk, and the use of all other registers, lists and matrices should cease once this has been fully implemented.

5.4.3 Scrutiny of the available risk registers shows that Migration and related issues figure highly in Delivery Unit Manager's minds. The proposed Release Management process assigns specific responsibilities to the B&TC Release Manager in the area of migration and early visibility and deployment of that process may address some of the concerns expressed by the DMs.

Para 5.11 addresses the lack of management action in appointing a Project Manager to implement and deploy the proposed Release Management process.

5.4.4 As an entirely independent initiative the Programme Office have generated their own risk register that plays into the Quality Improvement Plans (identified in para 5.9) and the underlying requirements of ISO9001 (see para 5.10). It is interesting to note that without exception the risks identified on the PO risk register have their basis in development lifecycle and project management activities, whereas the risks on the Delivery Units are almost without exception business and time based.

The risks identified on the PO risk register apply in whole or in part to all Delivery Units. In order to ensure that Delivery Managers and Team Leaders address the detail of these risks they should be incorporated into each DU's risk register and the risks managed alongside those already identified.

5.5 Planning Process

5.5.1 During the audit a number of observations were raised, particularly at Team Leader level, about the current planning process and the provision of 'actuals' via the TARs. Their concerns were in the following areas :

- The plans that they were originally presented with by the Programme Office bore little comparison to their individual work plans which they originally submitted.
- Because the plans were baselined they were unable to change the plan details other than adding new activities via the TAR.

FUJ00079782

- As time went by the plans moved further away from what was actually happening on the shop floor and as a result became less useful to the Team Leaders in their day to day management of activities. Some have reverted to maintaining their own individual work schedules to cater for this deficiency.
- Poor return rate of updated plans in exchange for completed TARs.
- There is a view that the plans as they stand are being maintained for management reporting purposes and not to help Team Leaders in their daily duties.

From the audit perspective the main concern in the unnecessary duplication of effort in maintaining multiple and informal plans and schedules. There is also a question over the basis of review between Delivery Manager and Team Leader, especially when this review informs management on progress through weekly reports.

5.5.2 I understand that there is a review already underway into the planning process and I do not propose to pursue this further in this audit. [Note : It was pointed out during the draft report that this review would not address the issues identified above – the recommendation has been changed as a result].

For the Planning Process to be accepted and used positively by the Team Leaders it is imperative that it meets their needs as well as management's. I recommend that a full review is carried out of the Planning Process that confirms or refutes the concerns raised by the Team Leaders and establishes a process that is acceptable to, and used by, all interested parties.

5.6 Process & Standards

5.6.1 Following the reorganisation of Development the responsibility for the maintenance and development of the Pathway Online Standards passed to the Chief Software Engineer (CSE). The approach taken was to consider process development from the tactical – what can we do for CSR+ - and the strategic – what must Pathway do to conform with the overall ICL requirements – perspectives. Tactically, the decision was to transfer the ascertain the degree of compliance in the Delivery Units, transfer the OLS from the existing helpfile technology to an intranet and then re-launch them during CSR+ timescales. Unfortunately the task was more complex than originally thought, progress has not been as rapid as anticipated, and the intranet site is unlikely to be rolled out before the end of the month.

5.6.2 The CSE is part of the Technical Design Authority (TDA) and in a scoping document declared that non Development Directorate areas of responsibility and activity were explicitly outside. However, the scope of the original OLS extended beyond Development and included programme wide processes, eg

FUJ00079782

Document Management and Change Management. Not to include these areas at this stage would, in my opinion, be retrograde and leave a potential hole in the Pathway wide deployment of processes. Other areas of Pathway are developing and implementing their processes in an entirely discrete manner and this could result in problems, especially at the interfaces between departments, and could ultimately mitigate against Pathway's ability to obtain certification to ISO9001.

5.6.3 In Section 5.10 there is a recommendation that a Project Manager is appointed to manage the ISO Certification exercise.

To have any chance of success I believe that a similar singular resource should be appointed to take overall responsibility for the co-ordination of process development and deployment across the whole of Pathway and that this resource and the ISO Project Manager should be organisationally co-located.

5.6.4 In Section 4.2 the audit described how the APS Counter application had been re-coded to deal with serious weaknesses in code quality identified by the incoming development team. Under normal circumstances this would be a sensible and practical response to an untenable situation. Unfortunately the absence of effective development standards in Counter development, coupled with the absence of appropriate technical review, has resulted in an implementation that does not function or operate as effectively as it should. This is resulting in rework.

The Host Application Database Design and Interface Standards were developed to provide definitive technical standards for host development teams. Arguably out of date since it deals specifically with Oracle development, there are no known equivalents for Counter or Agent Development. I recommend that the HADDIS is updated to reflect the current host development environments and the equivalents for Counter and Agent development be produced.

5.6.4 It was also noted that there was no established coding standard for C or Visual Basic, the principal programming languages used. A number of Team Leaders had established de facto standards within their teams and had, to some extent, shared this around with other teams.

However, to improve coding quality and ensure a consistent basis for code review coding standards for C and VB must be developed and deployed via the Intranet OLS. These standards should then be used.

FUJ00079782

5.7 CSR+ Documentation

The NR2 Design MSQA identified a number of problems with documentation numbers, baselines and identification although at that time it was almost impossible to quantify the scale. The Programme Office generates and distributes a weekly Documentation Status Report to senior management in the Development Directorate. The report indicates the current status of CSR (NR2) and CSR+ documents, whether they are registered and present in PVCS and whether they are approved or not.

Scrutiny of the latest issue of the Report shows that the number of documents expected to be generated for CSR+ by Pathway is ~346. That there are only 107 registered in PVCS and 46 approved suggests that significant effort has to be expended to register, develop, review and approve the expected suite. However, the total number of documents expected may be overstated since the CSR+ worksets include products that are not being delivered by CSR+, for example, worksets exist for Common Charging System (CCS) and Fraud Risk Management Service (FRMS). Equally there is the possibility that the content of worksets may have changed since first agreed earlier this year.

The Programme Office has instigated a review of CSR+ worksets that has already resulted in the removal of some 440 documents.

Release 17 of the OLS introduced a revised documentation lifecycle including the concept of worksets and defined the responsibilities of workset owners in the continuing review of workset content.

In order to present a more accurate reflection of CSR+ documentation status, thus improving the reporting to and monitoring of this by management, two review cycles should be undertaken/completed :

a. The Programme Office should complete their review the totality of the PVCS documentation worksets for CSR+.

b. Workset owners should review their worksets and confirm the current content or provide details of changes to the Programme Office.

5.8 CSR Documentation

5.8.1 The position at CSR+ is of nothing compared to that of CSR. Scrutiny of the Documentation Activity Report for 22nd October 1999 indicates that there are 1,643 documents identified in documentation worksets as being potentially deliverable for CSR. Of these, 1,027 are to be generated by Pathway and 616 by 3rd parties (NB. there may be some movement between these number but not a

FUJ00079782

lot). There are only 190 documents actually registered in PVCS yet there are 323 currently approved.

FUJ00079782

The size of this task is significant and should be included within the proposed 'Get Well Plans' identified in 3.2. In order to size the job the Programme Office should undertake a review of the worksets to ensure that they are all required and workset owners should review their content to confirm their accuracy, as required in Documentation Management, OLS Release 17.

5.9 Quality Improvement Initiatives

5.9.1 A number of strategic appointments were made during 1999. One of these was an external consultant into the Programme Office as a Quality Assurance Manager. His role was to ensure that the quality and review processes embedded in the existing delivery lifecycle processes were in use and effective and to achieve a PinICL reduction for CSR+. He was also asked to review the existing processes and to present Team his findings and recommendations for the future to the recently formed Development L1 Management Team.

5.9.2 He also developed two Quality Improvement Plans; one short term that addressed CSR+ and one long term that looked to Release 3 and beyond. Both of these were presented to the Development Director in early August 1999 seeking approval to proceed. To date no formal approval has been given and consequently the initiative has stalled with many of the benefits of the QIP being lost or compromised as a result.

5.9.3 The audit identified a number of elements of the CSR+ QIP that are being progressed but these are as a result of individual Team Leader actions, outside a managed programme of activities linked to the QIP, and not what was originally envisaged by the QAM when putting the QIPs together. There is little or no evidence to suggest that any of the long term improvements are being actioned.

The Quality Assurance Manager should be given the authority to proceed with the role that he was recruited to undertake. This will require the acceptance of, and agreement to, the Quality Improvement Plans by the Development Director and formal approval by him to proceed.

5.9.4 Following on from the production of the Quality Improvement Plans the QAM was asked to prepare a separate report on the current status of the project management and development lifecycle process within Development against the requirements of ISO9000-3, the TickIT interpretation of ISO9001. A comprehensive report was produced and delivered to the Development Director in August 1999. To date there has been no action to address the weaknesses identified and this work has stalled. The report has not been widely

circulated and at the time of the audit the Pathway Quality Manager has not received a copy to assist him in his job of steering Pathway towards Certification.

This report provides a valuable insight into the state of Developments processes and the weaknesses that exist. It should be given a wider circulation, especially to the Pathway Quality Manager, and any corrective work identified should be authorised.

5.9.5 During July a series of Quality Review Checklists were developed and distributed to the Delivery Unit Managers. The objective of the exercise was for Team Leaders to complete the Checklists for documents and code already reviewed up to that time, and to continue to use the Checklists for other reviews from that point forward. The information was to be used to 'understand the extent and nature of reviews conducted thus far on CSR+ and hence identify areas of risk.' [John Hemington memorandum 29/07/99].

5.9.6 It was accepted that the Checklists would only act as information gathering vehicles since any benefit from carrying out design reviews is only achieved if the review is conducted before coding starts.

5.9.7 The response has, to date, been poor and the analysis prepared by the Quality Assurance Manager confirms the detailed findings presented earlier in this report. As at 20th August the figures were :

Delivery Unit	Design	Code	UTest	LTest	Comments
POCL Products	12	0	0	0	All documents email review with review criteria unknown.
POCL Infrastructure	7	1	2	2	Checklists used to review overall product status (EPOSS & RDMC) and not possible to identify specific deliverables.
Systems Infrastructure	0	0	0	0	
Security	N/a	N/a	N/a	N/a	
Internal Infrastructure	0	0	0	0	
Data Warehouse	3	0	0	0	Interface specification. Review criteria has been identified.

5.9.8 During the audit the Development Director reminded the Delivery Unit Managers of the requirement to complete these Checklists as they help to establish a current position from which corrective work can be instigated. The Resolution Plan for Acceptance Incident 298 establishes a series of corrective

FUJ00079782

actions to be put into place during CSR+ including the use of Checklists, particularly for code. This is a commitment made to the customer and subject to review by them to confirm that they have been applied.

Many of the Delivery Unit teams are planning retrospective review sessions for their documents. This should be extended across all Units and the use of the Checklists mandated during those reviews.

5.9.9 Formal quality planning for CSR+ was found to be virtually non-existent other than review activities being included on the Plans delivered by the Programme Office. The production of a Quality Plan, or at least a document that contains the generally accepted elements of a Quality Plan, is a vital early step in project planning and management. The Stage Management Plan defined in the OLS provides much of the required detail and during early 1999 this was enhanced by the QAM with the ultimate aim of having each Delivery Manager complete one for their stream. The revised SMP was to be piloted within POCL Infrastructure and although a draft plan was prepared it was not completed and the concept was not rolled out to the other streams.

It is questionable whether there is any benefit in producing Quality Plans at this stage of CSR+ development. However, the value of the document in bringing together details of the resources, organisation, processes, reviews, risks, assumptions and other contributory factors must be realised in future Release and its production by Delivery Managers made mandatory.

5.10 ISO9001 Registration

5.10.1 Under the revised contractual agreements Pathway are obliged to have obtained registration to ISO9001 for the full scope of business 12 months after Acceptance, i.e. by 24th September 2000. The scope of business is deemed to include :

- Software design, development and delivery services.
- Programme control and assurance services.
- Implementation services delivered through national Roll Out.
- Operations and operational support services.
- Customer services.
- Business development services including customer requirements.
- Organisational support including HR, IT infrastructure, etc.

FUJ00079782

Currently the responsibility for managing the attainment of registered firm status rests with the Pathway Quality Manager, part of the Quality and Risk Management Directorate.

5.10.2 The Quality Manager is currently looking after a number of other initiatives and cannot give the time to this contractually binding work.

Having personally steered three separate companies through the rigours of ISO 9000 registration, including one to ISO9001/TickIT, I believe that the breadth of scope of the proposed certification, and the time remaining in which to achieve it, demands that a full time Project Manager is assigned to the task. Either the Quality Manager should be able to transfer any non-essential initiatives or a resource should be assigned to him specifically to manage the registration commitment.

Notwithstanding the appointment of dedicated resource to drive this project, and to assist when one is appointed, an activity should take place to produce an inventory of all processes, developed or under development, and their deployment status within Pathway. This activity should build on the work undertaken for Development and the inventory mapped onto the requirements of ISO9001 to identify shortcomings.

5.11 Release Management

5.11.1 At the request of the Managing Director a considerable amount of work was carried out during July and August to define and document a Pathway programme-wide Release Management process. This was in response to concerns that the re-organisation of Development had removed the 'Release Manager' role and as a result there was lack of clarity as to how a Release was to be populated, co-ordinated and made visible to the programme. In particular the MD did not know who he should approach to obtain an overall picture of progress.

5.11.2 On Thursday 18th August a presentation was made to members of the Management Team where the proposed process was ratified and an action placed on those attending to appoint a Project Manager to implement and deploy the process across the programme. Speed was of the essence so that CSR+ could take advantage of any controls and improvements that the revised process might provide.

5.11.3 The audit found evidence where those elements of the process that would benefit CSR+ directly have not been applied and as a result problems have arisen :

- The introduction of the B&TC Acceptance Checklist by B&TC was achieved without consulting the Delivery Unit Managers. This is a B&TC document

FUJ00079782

that provides a formal checkpoint from Development to B&TC and agreement to its content and use is a pre-requisite to its acceptance by Development.

- A key principle within Release Management is that the delivery of a Release involves more than just Development and the delivery of software products. Other parts of Pathway have to deliver their specific elements, including the ability to support the Release in the field. This is particularly true where a new product is being introduced and Customer Services may have to design and develop a new support strategy. LFS is such a new product and the auditor was unable to satisfy himself that appropriate actions were being taken by CS in this area.

5.11.4 It is ten weeks since the August presentation and a Project Manager has not been appointed. As a result there has not been any deployment action and any benefit that might accrue to CSR+ is diminishing rapidly.

A Project Manager should be appointed without delay and he/she must concentrate their initial efforts into identifying those areas that will benefit CSR+ and implementing them.

5.12 Intranet Development

5.12.1 There are at least five different Intranet developments currently underway in Pathway. The ones that the auditors became aware of were :

- Architecture, including the online TED.
- Online Standards replacement site.
- Key Management development site.
- SSC tool support site.
- B&TC general information site

Each of these sites is being developed independently and each presents in an entirely unique way.

5.12.2 Pathway Infrastructure have confirmed that there are no development standards for Pathway intranet sites and that there is no formal strategy for their use or deployment within the organisation. There can be no doubting the value of using intranet technology to make information widely available to others but the approach to development currently underway displayed lacks co-ordination and is unlikely to obtain the best possible return for the effort expended. There is the risk of duplication as evidenced by a section within the B&TC site, not yet populated, that will provide details of processes that should be published via the revised Online Standards. Support for these sites can also

FUJ00079782

become an issue if their exploitation rests entirely with an individual operating independently rather than within a general development framework for this type of output.

Pathway IT Infrastructure should established a policy and strategy for the development and deployment of intranet sites within Pathway. It should also conduct a review of existing activity, identify standards for their content and presentation values, and ensure that future intranets developed for use within Pathway conform to the strategy.

FUJ00079782

6 Review of NR2 MSQA Recommendations

6.1 Introduction

The (N)R2 Mid Stage Quality Audits (MSQA) were introduced at the request of the Programme Director (MJBC) in October 1997. Their objectives were :

- To demonstrate to ICL Pathway's Management Team that compliance with standards and procedures had improved since Release 1.
- To demonstrate that the corrective actions put in place by ICL Pathway, in response to the PA Consulting Programme Review Report, were being carried out.
- To provide an assurance to the PDA that ICL Pathway was complying with its own standards and procedures.

Four audits were planned, Design, Development, Technical Integration and Test & Integration, and the audit programme concluded in June 1998 when a 'Report of Reports' was produced and the main points presented to the Management Team.

6.2 Audit of Design

6.2.1 Summary of Findings

- Inconsistent application of document structures and contents.
- Inconsistent application of document titling and reference numbers.
- Difficulty in linking formal plans to documents or CPs.
- No document baselines or recognised groupings (sets).

Many of the audit findings were originally raised as early as February 1997.

6.2.2 Pathway Response

Two separate initiatives were put in place to address these problems. One, which looked at document baselines, involved external consultancy from HPS and contributed in the development of the Document and Change Management processes and the PVCS CM tool to its current state. The other, involved external consultancy from Openframework Consultancy, looked at how some of the underlying principles of Openframework could be incorporated into the emerging Pathway standards. Changes to the Pathway OLS were made to bring some of the recommendations to bear.

FUJ00079782

6.2.3 Current View

The CSR+ audit has identified that issues of inconsistent documentation form and content remains, particularly at Low Level Design. It would also be extremely difficult to guarantee being able to identify what a particular document was addressing simply by looking at its reference number.

6.3 Audit of Development

6.3.1 Summary of Findings

- Effectiveness of unit and link testing.
- Protection of IPR contained in documentation and source code.
- No causal analysis of PinICLs.
- Sub-contractor control.

6.3.2 Pathway Response

Essentially there were two responses. The effectiveness of the unit and link test procedures on Pathway Online Standards were reviewed and standards for documentation introduced. In addition, procedures to manage 3rd party development were defined and introduced. Causal analysis for PinICLs was introduced and is now available. A Metrics study was sponsored by the Programme Office and a report produced and distributed during November 1998. Key recommendations have been extracted and either have been or are currently being implemented.

6.3.3 Current View

Based on the evidence offered during this audit there has been a considerable improvement in unit and link testing for CSR+. However, this must be balanced against the lack of evidence offered to support the assertions, and the differences between the product teams.

6.4 Audit of Technical Integration

6.4.1 Summary of Findings

- No PIT handover Checklist.
- Improved PCMS status reporting and checking.
- Little or no analysis of failed (software) drops.
- Plans not linked (Development, TI and T&I), particularly Test Rig Plan.

FUJ00079782

6.4.2 Pathway Response

Checklist eventually introduced and in use. The analysis of drops was incorporated into the Metrics study identified above. Plans were linked although the test rig plan was considered too volatile so not included. PCMS status check rejected in favour of per reviews.

6.4.3 Current View

As identified in the Section 2 : Scope & Conduct, TI was not included in the audit.

6.5 Audit of Test & Integration

6.5.1 Summary of Findings

- Relationship and linkage between T & I and Design.
- Coverage of TSC work and the (then) new ICL trading rules.
- Rework at system & integration test that should have been uncovered at unit or link test.
- Improvements required in testing environments available to unit and link testing if testing effectiveness is to be improved.
- One dimensional measures where only progress was measured to the exclusion of others, eg. quality or resource utilisation.

6.5.2 Pathway Response

It was agreed that design reviews and reviews of test documentation would be entered onto the NR2+ plan. The problems with the TSC were to do with agreed scope and coverage or work that were addressed through a Gap Analysis Matrix. Arguably the recent re-organisation of Development has contributed to improvement in testing effectiveness by making improved test rig facilities available to the earlier testing stages than previously was the case.

6.6 Conclusion

The NR2 MSQA's were introduced to address specific concerns raised by PDA and PA. Almost all of the recommendations were accepted and in many cases corrective actions put in place to address the shortcoming identified.

Where I believe Pathway has been less than successful is in addressing the fundamental problems identified during the Design MSQA, that of baseline management and gaining control over the masses of documentation being developed in an uncontrolled manner. There is a continuing problem of

FUJ00079782

involvement and notification of documentation between Development and B&TC and I was notified of one area where a dedicated individual spent between 3 and 4 weeks collating and obtaining the relevant documentation to allow test scripts to be updated/created.

FUJ00079782

7 Annex A – Terms of Reference

ICL PATHWAY

INTERNAL AUDIT : Terms of Reference

AUDIT TITLE : ICL Pathway Development Directorate
Mid Stage Quality Audit : CSR+

File Reference : AUD/3/4/9

Date : 8th September 1999

Aim

The main aim of the audit is to provide assurance to Pathway Management about the status of the CSR+ design, development and testing activities within the Development Directorate. Principally a review of process and compliance it will also consider management processes, including communication, organisation and resource planning and will include a review of the status and deployment of the corrective actions that emerged from the previous NR2 (CSR) Mid Stage Quality Audit.

Objectives

1. To review the scoping of CSR+, in particular the identification of business and technical requirements.
2. To review the controls being exercised within the Development Directorate leading to the delivery of a high quality software product for CSR+. This will include a review of the risks associated with CSR+ and their current status and management.
3. To demonstrate to ICL Pathway's Management Team that compliance with standards and procedures has improved since NR2.
4. To demonstrate that the corrective actions put in place by ICL Pathway, following the Design MSQA in 1998, are being carried out.
5. To assess the implementation and deployment of the recent departmental re-organisation. This will include a review of the interfaces between Development and other related parts of Pathway, eg. QRM.

Dates

The audit will commence during September with completion and draft report production targeted for week ending 8th October. A final report will be issued by Friday 15th October.

Audit Resources

The audit will be conducted by Jan Holmes, Pathway Audit Manager. Other members of QRM may be co-opted where necessary.

FUJ00079782

Reporting

At the conclusion of the audit a draft report will be produced and discussed with the auditees. A final report will be produced and distributed to the Director and Senior Managers of the Development Directorate, as well as the Managing, Deputy Managing and QRM Directors.

Further distribution will be at the discretion of the Development Director.

Based on the report content a series of Corrective Actions will be agreed and documented in a Corrective Action Plan. This will be subsequently issued and the agreed actions monitored on a regular basis.

TOR Distribution

Terry Austin	:	Development Director
Mike Coombs	:	Deputy Managing Director
Martyn Bennett	:	Director of Quality and Risk Management
Peter Jeram	:	Projects Manager
Graham Chatten	:	Programme Office Manager
Stephen Doyle	:	Delivery Manager : POCL Products
Chris Humphries	:	Delivery Manager : DW & Internal Infrastructure
Chris Wannell	:	Delivery Manager : Systems Infrastructure
Alan D'Alvarez	:	Delivery Manager : Security
Lorraine Holt :	Delivery Manager : POCL Infrastructure	
Alan Ward	:	Chief System Architect
John Hunt	:	Chief Software Engineer
Gill Jackson	:	Business & Technical Conformance
David Groom	:	Quality Manager
Graham King	:	Risk Manager