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CASE NUMBER: HQ16X01238, HQ17X02637 & HQ17X04248 IN

THE HIGH COURT OF JUSTICE QUEEN'S BENCH DIVISION

BETWEEN:

ALAN BATES & OTHERS

CLAIMANT

AND

POST OFFICE LIMITED

DEFENDANT

EXPERT REPORT OF JASON COYNE

16 OCTOBER 2018

OCCUPATION:	PARTNER
SPECIALIST FIELD :	IT SYSTEMS
ASSISTED BY:	SIOBHAN FORSTER
	CHRISTOPHER RASKE
	JAMIE SMITH
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ON THE INSTRUCTIONS OF:	FREETHS LLP
ON BEHALF OF:	ALAN BATES & OTHERS

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List of Acronyms and Abbreviations

AP	Automated Payments
APADC	A scripting mechanism that allows POL to define what additional data is captured during a transaction
APOP	Automated Payments Out Pay
APS	Automated Payments System
ATM	Automated Teller Machine
BAL	Branch Access Layer
BAU	Business as Usual
BIF	Business Impact Forum
BIM	Business Incident Management
BRDB	Branch Database
CAPO	Card Account Post Office
CCD	Contact Controlled Document
CCTV	Closed-circuit Television
CNT	Counter
CP	Change Proposal
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CS	[POA's] Customer Services organisation
CSR+	Core System Release Plus
CTS	Client Transaction Summary
CWU	Communication Workers Union

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DBTN	Disputed Banking Transaction Notice
DCS	Debit Card System
DRS	Data Reconciliation Service
DWH	Data Warehouse
EBBT	Enquiry Based Banking Transaction
EBT	Electronic Banking Transactions
EFTPOS	Electronic Funds Transfer Point of Sale
EMV	Europay MasterCard Visa standard for financial smart cards
EPOSS	Electronic Point of Sale System
EPS	Electronic Point of Sale Service
ETU	Electronic Top Up
FSC	Financial Services Centre
FTMS	File Transfer Management System
GPOC	Generic Particulars of Claim
HNG-X	Horizon Online
HRSAP	The SAP System used by Royal Mail Group's Human Resources to pay Subpostmasters
HSD	Horizon Service Desk
HSH	Horizon System Helpdesk
IBM	International Business Machines Corporation is an American multinational technology company
ICL	International Computers Limited
IT	Information Technology
JSN	Journal Sequence Number
KEL	Known Error Log

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LFS	Logistics Feeder Service
MDM	Master Data Manager
MI	Major Incident
MSC	Managed Service Change
MSU	Management Support Unit
MTBF	Mean Time Before Failures
NAO	National Audit Office
NBE	Network Banking Engine
NBSC	Network Banking Support Centre
NBX	Replacement architecture of network after removal of NBE
NS&I	National Savings and Investments
NWB	Network Banking
OBCS	Order Book Control Service
OCP	Operational Change Proposal
OCR	Operational Change Request
OSD	ICL Pathways Operation Services Division
OTI	Open Tele service Interface
OTT	Operation Test Team
OWA	Operational Working Agreement
P&BA	Product and Branch Accounting
PIN	Personal Identification Number
PM	Post Master
PO	Post Office

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POA	Post Office Account
POCA	Post Office Card Account
POCL	Post Office Counters Ltd
PODG	Post Office Data Gateway. A generic reference-data driven system that is used to deliver file-based information between two end points (internal or external).
POL	Post Office Limited
POLFS	Post Office Ltd-Financial System
POLMIS	Management Information Service for Post Office Limited
POLSAP	Post Office Ltd-Financial System
PONB	Post Office's Network Banking Unit
PTF	PEAK Targeting Forum
RDDS	Reference Data Distribution System
RDMC	Post Office's Reference Data Management Centre
RDS	Reference Data System
SAP-IS	SAP Industry Solution
SAPADS	Post Office Ltd' s Advanced Distribution System (based on the SAP package) that interfaces to LFS
SCP	Supplier Change Proposal
SLA	Service Level Agreement
SLT	Service Level Target
SMC	System Management Centre. Second line support
SPM	Subpostmaster

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SQL	Structured Query Language
SSC	System Support Centre. Third Line Support
SSH	Secure Shell
TA	Transaction Acknowledgement
TDES	Triple - Digital Encryption Standard
TEM	Tivoli Enterprise Manager
TES	Transaction Enquiry Service
TIP	Transaction Information Processing. This is the remote end-point of the FTMS service that delivers reconciliations reports to Post Office Limited / Transaction Information Processing System
TIPAIS	Transaction Processing Interface Specification
TPS	Transaction Processing Service/System
XML	eXtensible Markup Language.

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1. Introduction

1.1 I have been instructed to prepare this report by Freeths LLP

1.2 My instructions are to produce a report that focuses on the agreed list of issues as set out in the Schedule to the Court order dated 23 March 2018.

1.3 This report is based as far as reasonably possible on the Model Form of Expert Report as developed by the Academy of Experts.

1.4 The report seeks to address the issues that concern the Horizon system (as defined here) and which (a) arise on the parties' generic statements of case, (b) can be resolved by IT expert evidence, and (c) require limited, if any, evidence of fact.[1]

1.5 Definition:

"the Horizon System" is considered for the purposes of this list of issues to mean "the Horizon computer system hardware and software, communications equipment in branch and central data centres where records of transactions made in branch were processed, as defined in GPOC at §16 and as admitted by Post Office in its Defence at §37."

1.6 This report provides a review of the Horizon system and its composition from 1999 to present day.

Business Scope

1.7 The business scope of Horizon is recorded as:[2]

a. Point of Sale Application

b. Transaction Recording (and Auditing of transactions)

c. Posting Summary Transactions to POLSAP (Post Office Ltd.'s back end accounting system)

[1] In accordance with the orders given by the Court at the CMC on 22 February 2018
[2] Witness Statement of Gareth Jenkins.pdf (Para 2.2), 5 October 2012 [C-0003632] [b544230cf07249c189cf664fcba6d899]

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d. Posting Detailed transactions to Credence (Post Office Ltd.'s back end Management Information system)

e. Posting Remuneration Data to HRSAP (Royal Mail Group's back end

Payroll system)

f. Delivering Client Data to Post Office Ltd.'s Clients (i.e. 3rd parties that Post Office Ltd acts as an agent for)

1.8 Since branch accounts could be affected by data delivered to/from Post Office back end systems and third-party clients, it is necessary to consider all of these aspects in order to appropriately opine on issues which are specific to branch accounts.

1.9 Within this report, the different issues have been grouped together in order to address similar thematic issues within a single section. I understand that Dr Worden will adopt a similar approach although he may select a different method of grouping. The groups I have adopted are:

a. Section 5 - 'Horizon Bugs/Errors/Defects and Controls' (Issues 1, 3, 4 and 6);

b. Section 6 - 'Reconciliation and Transaction Corrections' (Issues 5 and 15);

c. Section 7 - 'Horizon Reporting - Facilities for Subpostmasters' (Issues 2 and 14);

d. Section 8 - 'Horizon Shortfalls - Data and Reporting for Subpostmasters and Post Office' (Issues 8 and 9); and

e. Section 9 - 'Remote Access and Transaction Amendments' (Issues 7, 10, 11, 12 and 13).

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1.10 The issues in numerical order are listed below for ease of reference.

Agreed List of Issues

Issue 1

1.11 To what extent was it possible or likely for bugs, errors or defects of the nature alleged at §§23 and 24 of the GPOC and referred to in §§ 49 to 56 of the Generic Defence to have the potential to (a) cause apparent or alleged discrepancies or shortfalls relating to Subpostmasters' branch accounts or transactions, or (b) undermine the reliability of Horizon accurately to process and to record transactions as alleged at §24.1 GPOC?

Issue 2

1.12 Did the Horizon IT system itself alert Subpostmasters of such bugs, errors or defects as described in (1) above and if so how?

Issue 3

1.13 To what extent and in what respects is the Horizon System "robust" and extremely unlikely to be the cause of shortfalls in branches?

Issue 4

1.14 To what extent has there been potential for errors in data recorded within Horizon to arise in (a) data entry, (b) transfer or (c) processing of data in Horizon?

Issue 5

1.15 How, if at all, does the Horizon system itself compare transaction data recorded by Horizon against transaction data from sources outside of Horizon?

Issue 6

1.16 To what extent did measures and/or controls that existed in Horizon prevent, detect, identify, report or reduce to an extremely low level the risk of the following:

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a. data entry errors;

b. data packet or system level errors (including data processing, effecting, and recording the same);

c. a failure to detect, correct and remedy software coding errors or bugs;

d. errors in the transmission, replication and storage of transaction record data; and

e. the data stored in the central data centre not being an accurate record of transactions entered on branch terminals?

Issue 7

1.17 Were Post Office and/or Fujitsu able to access transaction data recorded by Horizon remotely (i.e. not from within a branch)?

Issue 8

1.18 What transaction data and reporting functions were available through Horizon to Post Office for identifying the occurrence of alleged shortfalls and the causes of alleged shortfalls in branches, including whether they were caused by bugs, errors and/or defects in the Horizon system?

Issue 9

1.19 At all material times, what transaction data and reporting functions (if any) were available through Horizon to Subpostmasters for:

a. identifying apparent or alleged discrepancies and shortfalls and/or the causes of the same; and

b. accessing and identifying transactions recorded on Horizon?

Issue 10

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1.20 Whether the Defendant and/or Fujitsu have had the ability/facility to: (i) insert, inject, edit or delete transaction data or data in branch accounts; (ii) implement fixes in Horizon that had the potential to affect transaction data or data in branch accounts; or (iii) rebuild branch transaction data:

a. at all;

b. without the knowledge of the Subpostmaster in question; and

c. without the consent of the Subpostmaster in question?

Issue 11

1.21 If they did, did the Horizon system have any permission controls upon the use of the above facility, and did the system maintain a log of such actions and such permission controls?

Issue 12

1.22 If the Defendant and/or Fujitsu did have such ability, how often was that used, if at all?

Issue 13

1.23 To what extent did use of any such facility have the potential to affect the reliability of Branches' accounting positions?

Issue 14

1.24 How (if at all) does the Horizon system and its functionality:

a. enable Subpostmasters to compare the stock and cash in a branch against the stock and cash indicated on Horizon?

b. enable or require Subpostmasters to decide how to deal with, dispute, accept or make good an alleged discrepancy by (i) providing his or her own personal funds or (ii) settling centrally?

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c. record and reflect the consequence of raising a dispute on an alleged discrepancy, on Horizon Branch account data and, in particular:

d. does raising a dispute with the Helpline cause a block to be placed on the value of an alleged shortfall; and

e. is that recorded on the Horizon system as a debt due to Post Office?

f. enable Subpostmasters to produce (i) Cash Account before 2005 and (ii) Branch Trading Statement after 2005?

g. enable or require Subpostmasters to continue to trade if they did not complete a Branch Trading Statement; and, if so, on what basis and with what consequences on the Horizon system?

Issue 15

1.25 How did Horizon process and/or record Transaction Corrections?

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Documents Reviewed

1.26 The document categories that were reviewed for the purposes of this report are as follows:

a. Dimensions Disclosure

b. Horizon Technical Disclosure

c. Additional Horizon Disclosure

d. Stage 01 Disclosure

e. Stage 02 Lead Claimant Disclosure

f. Stage 02 Generic Disclosure

g. Stage 03 Disclosure

h. PEAK Disclosure

i. KEL Disclosure

j. Second Sight Disclosure

k. Primary Claimant Disclosure

l. Horizon Disclosure

m. Horizon Witness Statement Disclosure

n. Coyne RFI Disclosure

1.27 Due to the volume of documents in the matter[3] it has not been possible to review each document individually at the time of writing. It should also be noted that PEAK disclosure was not provided until 27 September 2018 and therefore the opportunity for review has also been limited due to time constraints. Potentially relevant documents have therefore been initially identified using search terms and then reviewed.

[3] Approximately 396,000 parent documents.

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1.28 Of the 218,367 PEAKs disclosed by POL I have, in the interest of expediency, used intelligent search techniques to initially review those that might specifically relate to branch accounts. I have therefore reviewed 1,262 in the limited timeframe allowed since disclosure.

1.29 Of the 1,262 reviewed I have found evidence of errors with, but not limited to, financial impact, Reference Data errors and correction to branch accounts.

1.30 Summaries and key excerpts from a select number of PEAKs which could have a financial impact upon branches (that are also narrated within this report) are found at Appendix A.

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Author

1.31 My name is Jason Coyne and I am a Expert Report of Jason Coyne at IT Group UK Limited.

1.32 I have 30 years of experience in Information Technology. During this time I have designed, programmed and supported Electronic Point of Sale (EPoS) systems for use in payment handling, stock control, distribution in addition to full business accounting systems. I have also assisted public sector councils with revenue and benefits processing systems, investigated failures within stock market trading systems, European gambling and gaming networks and determined fraud in retail banking, point of sale, cash in transit and electronic funds transfer systems.

1.33 I have been instructed by UK and International firms of solicitors in connection with technology project fault analysis, software development and digital forensic investigations. I have been an expert witness in numerous criminal and civil cases over the past 19 years.

1.34 I am a member of the Academy of Experts, British Computer Society and of the Society for Computers and Law.

1.35 I have also participated in numerous mediations and have appeared before tribunals and in other forms of dispute resolution in London, Brussels and Johannesburg.

1.36 In December 2008 I obtained the Expert Witness Diploma from Cardiff University Law School.

Declaration of Independence

1.37 I have never previously been instructed to undertake work for either party. I therefore declare that I have no connection with the claimant or defendant involved in this case that might in any way affect my independence.

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2. Background

2.1 This dispute arises from the action pursued by the Claimants (Subpostmasters) against the Defendants, Post Office Limited (POL).

2.2 The Defendant (POL) currently operates a network of around 11,500 Post Office branches throughout the UK[4], within which, a high number of products and services are offered.

2.3 POL appoints a Subpostmaster (or manager equivalent) to run the branch. The vast majority of Claimants are or were Subpostmasters.

2.4 In a number of limited circumstances, it is understood that some branches have been run by a limited company through a Franchise Agreement, or by a Crown Office employee, through a contract of employment. For the purposes of this report, all categories will be referred to as Subpostmasters.

2.5 Horizon comprises an Electronic Funds Transfer Point of Sale (EFTPOS) retail and accounting system introduced by POL in Post Office branches in or around 1999.

2.6 Post Office contracted with ICL Pathway Ltd (latterly Fujitsu Services) and Horizon was initially piloted in 1996.

2.7 Horizon was updated frequently, at various periods with a major amendment in 2010 known as "Horizon Online", often referred to as "HNG-X".

2.8 After its introduction in 1999, many Subpostmasters reported difficulties with the operation of Horizon.

2.9 It is reported by POL that Horizon processes 47 million transactions per week.[5]

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[4] Historically, at the launch of Horizon this number may have been 19,000 branches.

[5] 2.2 12. Presentation_The Post Office, An Insight_.pdf, *The Post Office-An Insight, Angela Van Den Bogerd,* circa 2017, [POL-0021926] [05e2ac28f7b36b04dd83ab301edf9f91]

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2.10 In 2003, Fujitsu won the contract to manage the administration of the Horizon systems, initially until 2010 but this arrangement continues today.

2.11 In 2013 ATOS won the contract to manage the 'first line' Horizon support helpdesk including the management of Reference Data.

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3. Executive Summary

3.1 In respect of Issue 1, it is agreed in the experts Joint Statement dated 4 September 2018, that bugs/errors/defects that existed within Horizon have the potential to cause apparent or alleged discrepancies or shortfalls relating to Subpostmaters' branch accounts/transactions. It is also agreed that evidence exists which shows that bugs/error/defects have caused actual discrepancies or shortfalls relating to Subpostmasters' branch account/transactions.

3.2 Each discovered bug/error/defect could have remained unresolved in Horizon for varying periods of time. In my opinion there is the possibility of other bugs/errors/defects existing within Horizon which have yet to be discovered and resolved.

3.3 The sheer volume of Known Error Logs and reconciliation reports confirm the wide-ranging extent of the impact of such bugs/errors/defects. This evidence demonstrates that such bugs/errors/defects would undermine the reliability of the Horizon system to accurately process and record transactions.

3.4 In respect of Issue 2, as agreed in the experts Joint Statement, the extent to which any IT system can automatically alert its users to bugs within the system is necessarily limited. Whilst Horizon has some automated checks which would detect certain bugs there are types of bugs that would not be detected by such checks.

3.5 Horizon did contain alert messages that would notify a Subpostmaster to certain instances of some counter level errors, but the wider implications of the error would be unknown to the Subpostmaster.

3.6 However, there do not appear to be notifications issued either by Horizon or by Fujitsu or Post Office where known bugs and defects have been discovered. The exception may be in relation to the Suspense account issue where Post Office say that Subpostmasters were notified, although how they were notified has not been disclosed.

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3.7 With regards to Issue 3, whilst the present-day version of Horizon, supported by manual human support may now be considered as relatively robust in the spectrum of computer systems used in businesses today it has undergone major modifications in its history. It is likely that in 1999 when it was first commissioned, and in 2010 when it was significantly upgraded (to Horizon Online), it was less robust. Horizon comprises a hugely complex estate of hundreds of interfacing systems, each which exposes many potential points of error.

3.8 Post Office have stated that the Horizon system has changed 19,842[6] times since its inception. I have identified that Horizon's operation is highly dependent upon timed system processes with reliance on data messages being replicated until delivery which is often where faults occur.

3.9 Fundamental in determining the robustness of Horizon is gaining an understanding of the Post Office (and Fujitsu) manual business processes applied when determining and handling the effects of bugs/errors/defects. Therefore, when technical failures occur, understanding the correlating manual processes, inputs and respective fixes applied in each instance to remedy an imperfect system to a reasonable level of robustness is key.

3.10 Horizon's relative robustness does not mean that is thereby extremely unlikely to be the cause of shortfalls. As agreed in the Joint Statement between the experts, robustness does not mean perfection. We also agree that the level of robustness may have increased or decreased each time as the systems have changed. It is also known that bugs/errors/defects have caused actual discrepancies and shortfalls in branches.

3.11 Regarding Issue 4, it is agreed in the joint statement that the potential exists for such errors in the data recorded within Horizon. Bugs errors

[6] The number of "release notes" reported by Post Office in response to my RFI.

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and defects that were known to Post Office, as well as those that were not classified as "Known Issues" ultimately presented themselves as errors in data entry, data transference and data processing. Due to the nature of the complex and far reaching Horizon interfacing architecture and real time services, such errors were unavoidable.

3.12 With regards to Issue 5, reconciliation (the nature by which Post Office and Horizon compares transaction data recorded by Horizon against transaction data from sources outside of Horizon) is a large and complex facility. It involves many different streams of electronic processing from both Fujitsu data centre computing components, multiple "external clients", Post Office and Fujitsu business process departments and manual investigatory procedures (where corrective fixes are applied, if necessary). If the reconciliation process identified a difference between the sources being compared, then manual steps are taken to establish and correct the errors and potentially issue Transaction Corrections as a remedy.

3.13 The reconciliation process ultimately presents the possibility of further error within the Horizon system whereby an inappropriate method of fix was selected, and/or the corrective fixes may have been carried out erroneously.

3.14 Regarding Issue 6, it is agreed in the joint statement that, whilst Horizon contains measures and controls for detecting system integrity concerns, the automatic mechanisms have failed in the past.

3.15 There are a range of measures and controls existing in Horizon each designed to prevent, detect, identify, report and reduce the risk of several multifaceted errors. It is likely that during the life of Horizon system that these measures and controls improved. It is also reasonably likely that in the majority of cases the measures and controls were successful. However, there is also evidence to indicate that a cost/benefit analysis was applied to the fixing of

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bugs/errors/defects and that the possibility of error was not reduced as far as possible.

3.16 Regarding Issue 7, documentation illustrates that Fujitsu could remotely access transaction data recorded by Horizon. Several technical tools exist with the specific purpose of allowing Fujitsu to carry out modifications and corrective fixes to transaction data. In addition, a number of external audit reports commissioned by Post Office reported that such access could occur without adherence to the control mechanisms in place.

3.17 With respect to Issues 8 and 9, whilst there are reports available to the Subpostmaster for accessing and identifying branch transactions recorded within Horizon; these reports would not necessarily allow them to identify any discrepancies/or shortfalls that arose from errors occurring within the processing of data within the Horizon systems, or of a discrepancy reported by an external client. The experts agree that other causes of apparent or alleged discrepancies and shortfalls may be more difficult or impossible to identify from reports or transaction data available to Subpostmasters.

3.18 Many Known Error Logs (KELs) identify that not all errors were understood even by Fujitsu. In the circumstances, it is highly unlikely that a Subpostmaster could interpret or identify the causes of any bugs/errors or defects when Fujistsu themselves often did not understand the cause of such or their full effects.

3.19 Post Office have a significantly larger repository of information available to them than the Subpostmaster. Post Office could request further lower level detail of data from Fujitsu and would have visibility of reports beyond the counter level that were not available to the Subpostmaster.

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3.20 Further agreed in the Joint Statement, identification of errors would require cooperation of Post Office staff because of a Subpostmasters' limited knowledge of complex back-end systems.

3.21 In respect of Issue 10, documentation illustrates that a wide range of users at Fujitsu did and do have the ability and facilities to access and modify transaction data. Fujitsu staff were able to implement changes that had the potential to affect transaction data both without the knowledge or consent of the Subpostmaster and/or Post Office. In addition, a number of external audits commissioned by Post Office reported that the appropriate control mechanisms to prevent mistakes being made were not always followed.

3.22 As agreed in the experts Joint Statement, the very nature of applying fixes within any IT system, including those implemented by Fujitsu have the potential to affect transaction data or data in branch accounts.

3.23 Regarding Issue 11, business process rules and technical restrictions should apply in relation to accessing and modifying transaction data. It is reported that a documented audit log of each and every occasion of live data access exists, however, this has not been made available by Post Office.

3.24 Regarding how often transaction data was accessed (Issue 12), I have asked for this information by way of Request for Information, but at the date of submitting my report Post Office has refused, making reference to the relevancy of my request. Post Office states that there are more than 36,000 documents regarding how often the access was granted (outside of actions not needing express authorisation that could also be carried out to fix data), but these have not been made available for review.

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3.25 Regarding Issue 13, the implications of Fujitsu carrying out corrective fixes to data within the Horizon system is that it could have the potential to affect the reliability of Branches' accounting positions.

3.26 Issue 14 and how Subpostmasters fulfilled certain processes is detailed at section 7.

3.27 Issue 15 and how Horizon processes and records Transaction Corrections is set out in detail at Section 6.48 of this report. For a Transaction Correction to be processed, the financial value of the correction is manually assessed by Post Office staff, before submission to the Subpostmaster via Horizon.

3.28 Transaction Corrections can be issued to either rectify an error or discrepancy deemed as a fault by the Subpostmaster (or clerk), or when branch transaction data does not align with Post Office, or a Post Office external client which may not be an error on the Subpostmasters' part. It is also possible that Transaction Corrections were issued as a result of error in Horizon transaction data processing.

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4. History of Horizon

Known Chronology Milestones

4.1 This chronology is not exhaustive but rather selects a number of the milestone dates throughout the development of Horizon.

i. Pathway (later Fujitsu Services) awarded contract for Benefits Payment Card May 1996

ii. Horizon Pilot 1996

iii. Pathway cited "greater than expected complexity" and "…major implications for the degree of difficulty of the project"[7] which ultimately lead to failure of the project.

iv. Post Office Counters Ltd and Pathway sign agreement to utilise the project to automate Post Offices July 1999

v. Horizon rollout 1999 – 2002

vi. Core System Release - This included the introduction of Automated Payment Smart cards and APS/TPS reconciliation. August 2000

vii. Maintenance Release M1 - Prime purposes of the upgrade were the enhancement of the CSR+ Applications (APS, LFS, EPOSS, EPS, OBCS), enabling of the AP client variable day file transmission, enhancement to Reference Data products and minor changes to TIPAIS Pathway generated CPs to improve operability of the system February 2001

viii. S04 Release Additional functionality on the Horizon Pilot outlets to permit the printing of forms Approx. July 2001

ix. S06 Release Day D rectification measures - This included a new automatically generated broadcast message to detail when

[7] 1.2 2. Final Report – Cancellation of Benefits Payment Card.pdf, National Audit Office – The Cancellation of the Benefits Payment Card project, 18 August 2000, (Page 9), [C-0003630] [51956ab654c0a9250059c5848099a80f]

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counters at an outlet are offline. This was to be implemented in a staged manner and included a receipts and payments fix June 2001

x. S10 Release Data centre and counter upgrade introduced unattended reboot facility at the counter September 2001

xi. B11 Release the first network banking release, changed the version of Tivoli used by the whole estate Approx. December 2001

xii. S11 Release January 2002

xiii. B12 Release June 2002

xiv. S20 Release September 2002

xv. B13 Release Approx. September 2002

xvi. Network Banking 2003

xvii. S30 Mails Application /Escher Mails 3.3 package (1 Feb 2003)

xviii. BI3 S70 EMV Banking and Retail, TDES and NBE Accommodations 2003?

xix. S50 Release October 2003

xx. S60 Release Approx. February 2004

xxi. S52 Release March 2004

xxii. S70 Release October 2004

xxiii. S75 Release (containing changes to support the changeover to use of NBX banking agents (NBE replacement)? Approx. Oct 2004

xxiv. IMPACT Programme

xxv. POLFS (a SAP-IS Retail System) implemented 2004

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xxvi. S80 Release Jan 2004 - Aug 2005[8]

xxvii. BI3 S80 T&T Harvester Agent accommodations Approx. Nov 2004?

xxviii. POLSAP rationalisation (rationalisation of disparate systems SAPADS and POLFS) 2007-2009

xxix. S90 'Bureau Plastic' accommodations January 2006

xxx. S92 Release March 2006

xxxi. T10 Release August 2006

xxxii. T40 Release January 2007

xxxiii. Horizon Online Rollout 2010

xxxiv. First Line support provided by ATOS June 2014[9]

4.2 Whilst Horizon is maintained by Fujitsu (formerly ICL Pathways), the communications between terminals and Post Office was initially subcontracted to Escher[10].

4.3 Horizon, initially based upon Escher's Riposte messaging system (and later supported by the WebRiposte system to accommodate Network Banking changes and the Network Banking Engine supplied by IBM), was subsequently migrated to Horizon Online. Horizon is therefore ultimately a composition of many sub-contracted components.[11]

4.4 POL explain that there are 19,842 release notes (in relation to software changes), consistent with each of these notes being a change to the Horizon system.

[8] PMREP013_1.doc, *S80 Release Closure Report*, 07 February 2007 [POL-0089062] [9c9308a30adb884074f47fe11c7469d7]
[9] POL-17645-MGT012 Fujitsu – Horizon Service OWA v2 1 draft.doc, *Fujitsu – Horizon Service Operational Working Agreement,* 13 May 2014, [POL-0215476] [339d47429f9f8a83ff93e95e9d3eeb82]
[10] TDARC026v04.doc, *Horizon Network Banking Architecture,* 30 October 2000 [POL0032839][45d467837b7a6d8cec7c914093b39df5]
[11] ARCAPPARC0002_0.2.doc, *HNG-X Integration Architecture*, 08 November 2006 [POL-0087918] [daec0de8a5eee25b5c9d06730c338dd0]

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Horizon (pre-Horizon Online)

EFTPoS – Electronic Funds Transfer at Point of Sale.

4.5 Initial work was carried out in 1997 to specify a high-level design approach for the support of EFTPoS within the Horizon platform.[12] The purpose was to accommodate new functionality to allow debit and credit cards as an additional method of payment (MoP) for Post Office goods and services, directly within the Electronic Point of Sale System (EPOSS).

4.6 The requirement to introduce a Network Banking Service took priority over (and subsumed) this requirement.

4.7 Post Office Counters Ltd (POCL) objective became to add debit card payments as an additional method of payment to the Horizon Network whilst the Network Banking Service was being delivered (initially 2002[12])

The Introduction of the Network Banking Solution

4.8 After the failure to introduce the Payments Benefit Card in 1999,[13] POCL and Pathway signed an agreement to automate post offices, and Post Offices Network Banking Unit (PONB) introduced the requirement to fulfil banking transactions at Post Office counters so as to offer services for several different banking institutions.

4.9 In summer 2000, a 'proof of concept' was undertaken to investigate the integration of internet technologies with the current Horizon System to support the delivery of banking transactions[14] (and subsequently to replace the loss of the benefits card system). A primary facet of the Network Banking Solution was the delivery of the banking transactions

[12] NBSRS002_0.4.doc, *EFTPoS System Requirements Specification*, 12 October 2001 [POL-0062288] [2f9abb4aa7bfa0a263d0e3bd891015f0]
[13] 1.2 2. Final Report – Cancellation of Benefits Payment Card.pdf, National Audit Office – The Cancellation of the Benefits Payment Card project, 18 August 2000, [C-0003630] [51956ab654c0a9250059c5848099a80f]
[14] NetworkBanking_Report_FinalV_ReportV1.doc, *WebRiposte Framework - Final Report*, 22 January 2001 [POL-0058079] [e709a9e390fb3e7570a1b5c90c78f605]

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within the already established Escher WebRiposte environment. The full installation and integration of this was the task of ICL Pathway.

4.10 WebRiposte was a message passing technology from Escher Group which extended the functionality of the existing Riposte Message Server[14] (which was responsible for storing all the data in the Post Office branches and replicating it to the Data Centres[15]).

4.11 IBM were selected for the supply of the Network Banking Engine which was designed to handle the interface between the Horizon system and the agreed Financial Institutions, which Post Office referred to as 'External Clients'.

4.12 The introduction of network banking and EFTPoS developments brought with it a more complex enhanced architecture within which further systems to ensure transaction integrity and reconciliation could be imposed.

4.13 However, it should be considered that 'Horizon' originally stemmed from an inherited system and architecture with an initial, fundamentally different design requirement.

4.14 Early documentation identifies that around 1998 and during a period where Pathway Performance Technical Testing was to be conducted by A&TC (assessing the system from a technical angle of suitability), there were so many design changes that the totality of the testing had to be re-planned into four stages[16].

4.15 The aim of the testing and various other relied upon documents was for Pathway to produce a report to meet Horizon acceptance requirements.

4.16 The document further states (in relation to the testing conducted):

> *"It was not practical to build a performance test rig to replicate the entire system architecture. The tests were therefore carried out on sub-*

[15] Witness Statement of Gareth Jenkins.pdf, 5th October 2012 [C-0003632]
[16] SUTRP004_1.doc *Pathway NR2 Technical Testing Performance Tranche1 Closure Report*, 08 December 1998 [POL-0047506] [6bc1e58bdede0a88d15c008c9403940d]

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systems consisting of system components designed to represent the live system as resources permit. The system definition, however, has changed significantly over the test period and tests may not have run on the current hardware definition."

4.17 I have not identified nor reviewed a Horizon Acceptance Report. Nor have I seen the output of the early tests conducted in relation to the Horizon system. However, it is apparent that the initial system design and architecture was an evolved and evolving landscape.

Horizon Components

4.18 Horizon is a complex multifaceted system. Core components that facilitate its operation (an understanding of which are necessary for this report) are summarised below.

Reference Data

4.19 Reference Data (effectively data about products and operational elements) is a critical element of the Horizon system, which interfaces with a wide range of Horizon components. Without Reference Data, Horizon would not fully function, nor could Subpostmasters operate their branches. It informs the operation of the Point of Sale system at the counter amongst many other things. The management and operations with regard to Reference Data has been outsourced from within Post Office control to a sub-contractor (ATOS) since June 2014.

4.20 The integrity of Reference Data is critical for the correct operation of a variety of systems within the Horizon architecture. Post Office's Reference Data Management Centre (RDMC) supports the loading, storage and release of Reference Data within the Horizon system. The Reference Data Distribution Service (RDDS) distributes Reference Data to Post Office branches and other data centre systems. The POL Reference Data Team is a team dedicated to delivery of Reference Data and verification of operational business change through Reference Data. Horizon counter Reference Data was distributed by

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the Riposte messaging facility, although this was replaced by a different mechanism in Horizon Online.

4.21 Despite the criticality of the integrity of Reference Data, a document from July 2017 suggests that changes to Reference Data were not subject to any appropriate change control process. The document[17] reports; "… we have now aligned that all Reference Data changes go through the appropriate change process". This is consistent with the position that prior to July 2017 Reference Data could be changed without any formal consideration as to what the impact might be.

Transaction Data

4.22 According to Fujitsu, there are only four sources of transactions that make up transaction data[18]:

a. Those manually entered by a user in branch at the counter;

b. Transaction Corrections (TC) which are produced by Post Office to be accepted by a user in branch to correct discrepancies in the accounts;

c. Transaction Acknowledgements (TA) which are non-counter transactions and typically initiate from another piece of equipment (such as a lottery terminal). These transactions are typically relayed to Post Office/Fujitsu and need accepting into Horizon before forming part of the branch's transaction data;

d. Fujitsu inserted transactions. These are known as balancing transactions and are injected into branch accounts by Fujitsu in order to 'balance' a discrepancy. These do NOT require acceptance by the Subpostmaster as TC's and TA's do.

[17] Operations Board 21 July 2017.pdf, [POL-0221328] [9c45e0be3ff2b6773447cc6e41db5f46]
[18] Witness Statement of Torstein Godseth – 27.09.18.pdf

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The Horizon Counter (1996 - 2010)

4.23 The processing of the Horizon counter detailed below has been taken from the Witness Statement of Gareth Jenkins dated October 2012.[19]

4.24 Horizon was initially designed to store all data locally on the branch counter's hard disk (see Appendix B Figure 1).

4.25 Once the data has been successfully stored there it is then replicated (copied) to the hard disks of any other counters in the branch (or in the instance of a single counter branch stored to additional external storage on the counter). It is then passed on from the counter to the Horizon data centre where it is stored in the CS messagestore.

4.26 The replication process was designed so that if the data was not copied immediately (because of communications or hardware failure), then further attempts are made to replicate the data at regular intervals until it is finally copied successfully.

4.27 Once the data reaches the Horizon data centre a further copy is taken by the Audit Agent which writes it to an audit file where it is available for retrieval for up to seven years.

Transaction Auditability

4.28 Data in the audit trail was designed to be sealed with a secure checksum that is held separately to ensure that transaction data has not been tampered with or corrupted.

4.29 Horizon was designed so that every record written to the Transaction Log at the counter should have its own unique incrementing sequence number. Therefore, it should be possible to detect if any transaction records become anomalous (where they are actually captured by the Transaction Log in the first instance).

[19] Witness Statement of Gareth Jenkins.pdf, *Witness Statement of Gareth Jenkins,* 05 October 2012 [C0003632] [b544230cf07249c189cf664fcba6d899]

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4.30 Whilst a customer session was in progress, details of the transactions for that customer session were normally held in the computer's memory until the customer session (referred to as the 'stack') was settled. At that point all details of the transactions were written to the local hard disk and replicated. When a stack was secured it was written in such a way that either all the data is written to the local hard disk or none of it is written.

4.31 The data for the stack will have been successfully secured to the local hard disk before the screen updated indicating that a new customer session can be started.

4.32 Although an attempt will have been made to replicate the data to the messagestore, there is no guarantee at this point that such replication will have been successful. For example, if there is a network failure followed by a terminal failure there is a risk that transactions in the intervening period could be lost.

4.33 Any failures to write to the hard disk after appropriate retries would result in the counter 'failing' and needing to be restarted.

4.34 Whenever data is retrieved for audit enquiries several checks should be carried out, namely that:

a. The audit files have not been tampered with and their Journal Sequence Number (JSN) is incremental to the last one;

b. The individual transactions have their integrity checked to ensure that no corruption has occurred;

c. A check should be made that no records are missing. Each record generated by a counter has an incremental sequence number and a check is made that there are no gaps in the sequencing.

Migration towards Horizon Online (Horizon Online 2010 - Present)

4.35 A document dated 2005 authored by Fujitsu records the requirement for Fujitsu to provide a more competitive solution, since Fujitsu accounted

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for 65% of the IT spending for Post Office.[20] The document further notes:

> *"The original business case for HNG within Post Office was based on a balance of cost reductions and improved capabilities. The new business case is almost entirely based on cost reductions."*

4.36 Therefore, the major requirement for Horizon Online was to make secure minimum changes to the legacy host systems whilst still providing the end to end business needs.[21] Cost reductions in the Horizon Online solution were to derive from (1) reusing legacy counter hardware, (2) revised test and disaster resilience strategy, (3) application re-engineering, (4) revised development processes, and (5) utilising offshore programmers for software development.[20]

4.37 Horizon hardware was recycled for continued use in Horizon Online, there was an acknowledgement in a Board Report[22] regarding design considerations when implementing Horizon Online:

> *"While the architecture is generally designed for resilience, cost/risk trade-offs were agreed in the move from the original Horizon system to the new HNG-X one which mean that the service is not truly high availability".*

4.38 Since analysis of serviceability issues within Horizon identified that the two key areas of cost were (1) the stability and manageability of the Riposte application and (2) the effort in recovering data stored locally on counters, the Horizon Online objective was therefore to redevelop the business applications and enforce a centralised model for data storage.[20] The counter hardware would remain and locally store operational data (e.g., Reference Data) and business logic, but the

[20] RMARC002_0.1.doc, *Horizon Next Generation - Plan X (HNG-X)*, 21 September 2005 [POL-0084540] [754315a4037a6ea4c1ec7ee070b7d170]
[21] *Data Reconciliation Service High Level Design Delta for HNG-X*, 30 September 2009 - [POL-0032942] [972420ee28dfe6db41e6847ae3f4493e]
[22] BoardPDFpack.pdf, *Royal Mail Holdings plc Board*, September 2012, [POL-0171024] [7dad94569f245c16763d0255b114a139]

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transactional data would be stored in the data centre rather than on the branch counters.[20]

4.39 In order to further reduce the overall application development costs within Horizon Online, substantial re-use of data centre application components was proposed. The legacy host database applications (TPS, APS, LFS, DRS and TES) were to remain largely intact, and a web service interface was to replace Riposte messaging, and simplification of security mechanisms.[23]

4.40 The diagrams of data centre applications and Horizon / Horizon Online migration shown in Appendix B (Figure 2 & Figure 3) illustrate the changed components of Horizon to accommodate Horizon Online and legacy components remaining, and the changes at branch counter level.

The Branch Database

4.41 Horizon Online brought significant changes to the counter processing as described above.

4.42 For Horizon Online, all data is now stored in an online branch database known as the BRDB (therefore, no longer stored on the counter hard drive).

4.43 Transactions are carried out locally on the Horizon Online counters and a 'Basket' is built up during a customer session. Each transaction should result in a Basket entry consisting of one or more accounting lines.

4.44 At the end of a customer session when the Basket has been completed and all settlement items (or tender lines) have been processed and added into the Basket as further accounting lines (in double entry terms), such that the total value of the Basket is zero, the entire Basket is sent to the data centre as a BAL message where the Branch Access

Layer (BAL) processes the message and all the accounting lines are

[23] RMARC002_0.1.doc, *Horizon Next Generation - Plan X (HNG-X)*, 21 September 2005 [POL-0084540] [754315a4037a6ea4c1ec7ee070b7d170]

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recorded and committed to the BRDB.[24] Horizon Online message flows are depicted in in Appendix B (Figure 4).

4.45 The BRDB is the repository for all branch transactions and event data captured. It also provides the storage mechanism for other branch data such as Transaction Corrections.

4.46 Transactional data is written to the branch database (BRDB) via the Branch Communication Application on the Branch Application Servers. Logic in the branch communication application should then be able to discern between the different transaction types by passing over the data stream and inserting the data into the relevant BRDB tables. The largest single function performed by the branch communication application is the capture of transaction and settlement information resulting from completion of customer sessions and other activities within the branch estate. The data needs to therefore be scanned to determine its type before it is acted upon.[25]

4.47 The branch communication application will then be responsible for inserting transaction data directly into the 'Main Transaction Store' within the BRDB. The main transaction store then facilitates delivery of appropriate data to Post Office Account external interfaces via the legacy applications (See Reconciliation in Horizon Online Diagram Appendix B - Figure 6).

Report Data

4.48 The branch communication application is responsible for inserting a subset of transaction data directly into a Report Data Store (within the BRDB) that is designed specifically to facilitate counter/branch daily/weekly reporting.[25]

Aggregated Data

[24] Witness Statement of Gareth Jenkins.pdf, *Witness Statement of Gareth Jenkins,* 05 October 2012 [C0003632] [b544230cf07249c189cf664fcba6d899]
[25] RMARC002_0.1.doc, *Horizon Next Generation - Plan X (HNG-X)*, 21 September 2005 [POL-0084540] [754315a4037a6ea4c1ec7ee070b7d170]

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4.49 Daily batch processes are responsible for aggregation of data from the main transaction store. This is stored as aggregated data that should facilitate calculation of the stock units and branch totals for declarations and the information required for the rollover processes (transitioning from one accounting period to the next). Declaration totals will also be stored in this area.

Recovery Data

4.50 The recovery data store in the BRDB is used to capture events that need to be recorded in case of errors mid transaction, to define the appropriate behaviour of the counter on recovery.

Audit Data

4.51 A separate audit record of transactions and events is maintained that contains the raw data received in the message from the counter. I understand that this was archived.

Transaction Auditability

4.52 Horizon was designed so that auditable messages from the counter were stored, together with their digital signature and other key attributes in the 'Audit table' (also known as the Message Journal) in the BRDB. Each day the contents of this database table should be copied from the BRDB to a number of serial files. A check should be made that there was no missing or duplicate Journal Sequencing Numbers (JSNs) for any counter.

4.53 The files are then copied to the audit system where they are sealed digitally and held for seven years during which time they may be retrieved and filtered to produce the relevant audit for a particular branch.[26]

[26] Witness Statement of Gareth Jenkins.pdf, *Witness Statement of Gareth Jenkins,* 05 October 2012 [C0003632] [b544230cf07249c189cf664fcba6d899]

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Legacy Horizon / Horizon Online Counter Processes

4.54 Whilst many core counter processes remained largely the same, technical processing of certain counter activities changed through the introduction of Horizon Online.

Recovery

4.55 Disconnections and screen freezes for Horizon Online are recorded as being dealt with differently to Horizon (pre-Horizon Online).[27]

4.56 Subpostmasters are informed through the above quick reference guide to ensure they *"do the right thing at the time the counter becomes unavailable."*

4.57 Therefore, where a connection to the data centre is lost, users are presented with a 'Retry Communication' message displayed on screen. Users are encouraged to select the 'Retry' option a maximum of two times to see if data centre connectivity has been restored.

4.58 The Recovery process is stated as one of the procedures to ensure data integrity remains in the event of a failure.

4.59 In the event the data centre connection is not re-established from the retry action, the system should settle the session automatically printing three copies of a Disconnected Session receipt (unless there is a hardware failure and/or system freeze). Where a connection to the data centre has been lost before a Basket has been settled the system treats the transactions as either:

a. Recoverable

b. Non-Recoverable[28]

4.60 If a transaction is deemed recoverable, then information about that transaction is recorded in the BRDB. Recoverable transactions are

[27] Tab 12 - Recovery - Horizon Online Quick Reference Guide.pdf, *Recovery - Horizon Online Quick Reference Guide*, ca. 2010 [POL-0001727] [34331e3a952d2fb4921aeddf5d1f90d6]
[28] Recoverable and Non-Recoverable items are defined in the Glossary

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noted as:[29]

a. All banking transactions

b. All Credit / Debit Card transactions

c. All E Top up transactions

d. All reversals

e. Selected APADC transactions

Reversals

4.61 Horizon Reversals are transactions that are effectively 'undone' either initiated by a Subpostmaster or electronically through the system[30].

4.62 If a transaction has been entered and the customer session completed, the transaction can be reversed (for example, if the transaction has been entered incorrectly, or if a customer requests a refund).

4.63 Reversals are also initiated following system failures. These are documented later in this report as there is evidence that reversals were problematic in Horizon and affected branch accounts[31].

4.64 A reversal does not result in transaction information in the journal being amended but causes the insertion of additional, compensating and correcting transactions.[30]

4.65 It is recorded there are four types of reversal:

a. An Existing Reversal - performed when a customer wants a refund for which there is a receipt, the user must enter the transaction session number to initiate the reversal.

[29] HorizonOnlineDataIntegrity_POL.DOC, *Horizon Online Data Integrity for Post Office Ltd,* 28 March 2012, (Version: 0.1b), [POL-0221055] [5e05904c2f271098da69b31806d4053c]
[30] CSPRO021_2.doc, *NR2 ELECTRONIC POINT OF SALE SERVICE: Processes and Procedures Description*, 30 June 1999 [POL-0049668] [5b45d4ba533d9092293476bc6911e863]
[31] 1.6 6. Horizon Data (status Draft) - the _Helen Rose Report_.pdf, *Horizon data Lepton SPSO 191320*, 12 June 2013 [POL-0221677, POL-0221678, POL-0221679, POL-0221680, POL-0221681] [f296f6880e1b8418f37d3e344374c42a]

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b. A new reversal - performed when a customer wishes to obtain a refund for a purchase for which they have no receipt. New reversals do not require the original transaction to be identified.

c. A transfer reversal - performed if it is necessary to reverse a transfer out that has not yet been transferred in to the receiving stock unit.

d. A remittance reversal - performed when a transaction for stock that has been remitted in or out needs to be reversed.

Horizon Support Service & Facilities

4.66 The support model utilised for managing issues and potential bugs/errors/defects in Horizon/Horizon Online is based on four levels of support[32]:

The Role of Each Support Level

4.67 1st line support (currently provided by POL's subcontractor ATOS) – log incidents either by directly interacting with the user (typically the Subpostmaster) or from monitoring systems. They document incident symptoms and aim to resolve all issues where the cause is user training or environment. 1st line resolve incidents by the identification of knowledge base entries and the application of defined scripts. A new incident is raised for each critical event that is not already documented and passed to 2nd line support teams for action.

4.68 2nd line support (provided by Fujitsu) – use symptoms documented by the 1st line to understand errors and gather additional information. They use expert knowledge to identify a root cause and a solution or alternatively to develop procedural workarounds. They also

[32] SVMSDMPRO0875_1.DOC, *End to End Application Support Strategy*, 28 July 2011, [POL-0122492] [db0644e4d5e11b5cce3ed381cb108a88]

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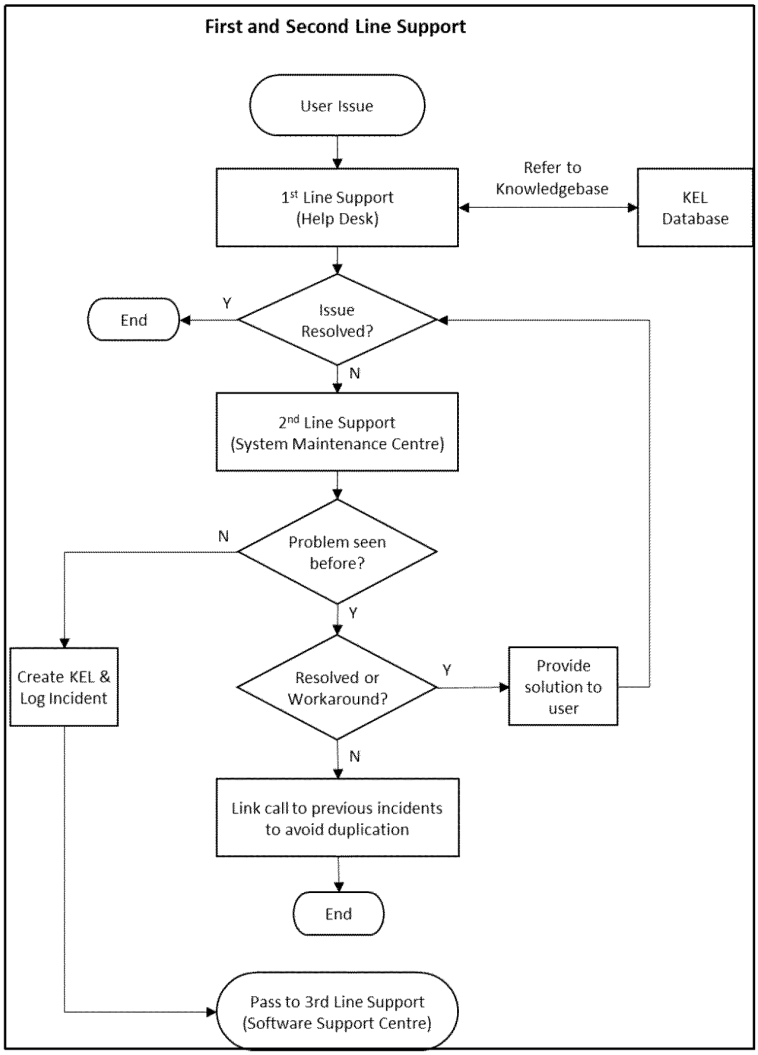
create/update the knowledge base and pass new incidents to the 3rd line team for further investigation.



4.69 3rd line support (provided by Fujitsu) - apply analytical skills to the symptoms and evidence gathered by 1st and 2nd line and undertake in-depth investigation into incidents. They should have detailed knowledge of the system based upon documentation and source code inspection and they can produce interim workarounds. They identify a

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cause and probable solution for incidents which are being passed to the 4th line team. Responsible for the implementation of any workarounds that require data changes to the live system, they are the only unit with authorisation and sufficient physical security controls to perform this function.

4.70 4th Line Support (provided by Fujitsu) should have detailed knowledge of the system and are responsible for the investigation and resolution of new incidents through the production of permanent fixes to repair the root cause of an incident or a problem in the live application.

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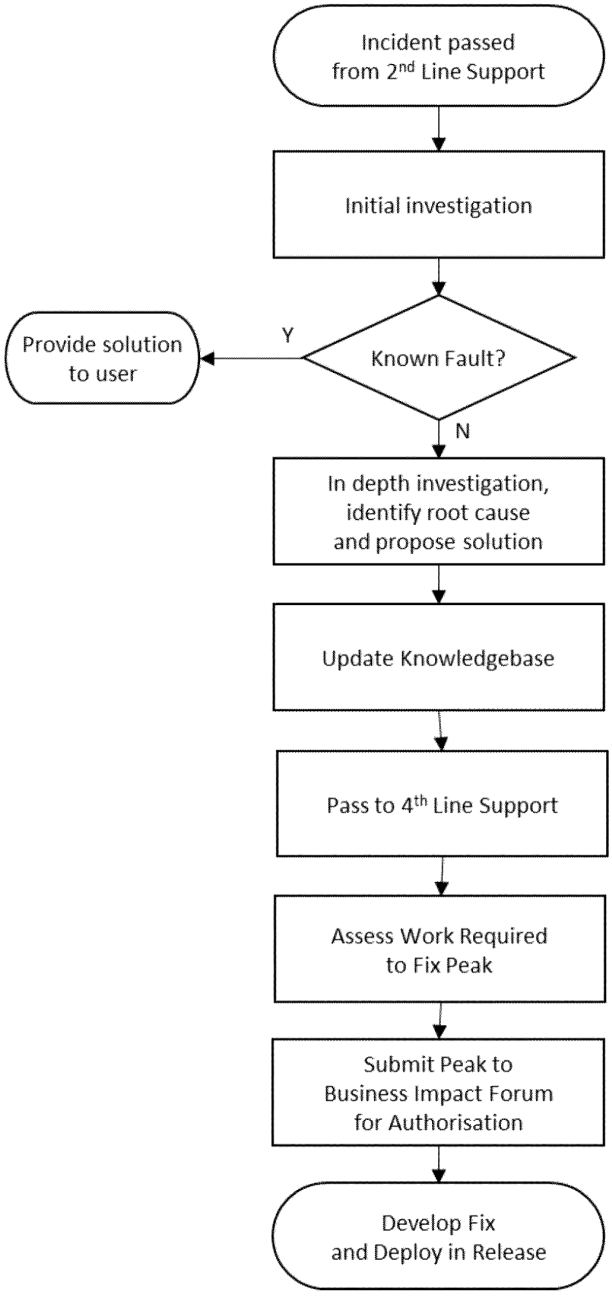
Third and Fourth Line Support



4.71 The details of the support model provision changed between the rollout of the original Horizon application (circa 1999) and when Horizon Online went live (circa 2010).

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Support Services Provision in 2001

4.72 In 2001, 1st line support to the Horizon system users was provided by the Horizon System Helpdesk (HSH), run by the Operational Services Division (OSD) of ICL.

4.73 2nd line support was provided by System Management Centre (SMC), also run by OSD.

4.74 3rd line support was provided by the Software Support Centre (SSC).

4.75 4th line support was provided by a combination of Pathway Development, Escher, OSD and Eicon.

Support Services Provision in 2010

4.76 By 2010, HSH had been renamed to the Horizon Support Desk (HSD) and was run by Fujitsu.

4.77 SMC had become more of a 1st line support unit and there was no dedicated 2nd line support unit. Instead, the 2nd line responsibilities were being fulfilled between the 1st line and 3rd line units providing a "virtual" 2nd line function.

4.78 SSC continued to provide 3rd line support.

4.79 4th line support had been streamlined to the Fujitsu Application Support Service (ASA). ASA would then liaise with Fujitsu Services' subcontractors/suppliers, or Post Office's suppliers as appropriate.

Support Services Provision from 2014

4.80 Atos took over the first line support of the Horizon service from 17 June 2014, as part of the Post Office re-procurement of the IT Supply Chain in 2014.[33]

[33] SVMSDMOLA3308_2.5.DOCX - FUJITSU - HORIZON SERVICE OPERATIONAL WORKING AGREEMENT [POL-0128502] [cdd379390652be400250cf319c7bbdb8]

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Incident Tracking Systems

4.81 In 2001, 1st and 2nd line support teams used the Powerhelp helpdesk system from Astea Inc. to log incidents.[33]

4.82 3rd and 4th line support teams used PinICL as a call management system and diagnostic database.

4.83 Calls from 2nd line support were transferred from Powerhelp to PinICL via an Open Tele service Interface (OTI) link, and updates to the PinICL calls were transferred back to second line support using the same mechanism.

4.84 By 2010, the 1st and 2nd line support Powerhelp system had been replaced by a system called Triole for Service (TfS) to record incidents and PinICL had been replaced by PEAK, an in-house developed Fujitsu services incident and release management system.[34] An individual incident so recorded is referred to as a PEAK.

4.85 OTI was still used to link the TfS and PEAK systems, although TfS has a limit of 4000 characters within a single update which potentially exposed a loss in information.

4.86 From 2014, all 1st line tickets were logged into Atos' SDM12 service desk application and if not resolved on first call, were transferred to a 2nd line (or higher) team within Fujitsu. This transfer was provided by an automated interface into Fujitsu's Triole for Service (TfS) tool.[35]

Known Error Logs (KELs)

4.87 The principle of the KEL has been used since 2001 to record information and workarounds for known issues. This has evolved into a database maintained by SSC that is available to all levels of support.

[33] CSQMS004_2.doc, CS Support Services Operations Manual, 29 January 2001 [POL-0061572] [bb842d86176aa926d3b9fff25e0fc248]
[34] SVMSDMPRO0875_1.DOC, *End to End Application Support Strategy,* 28 July 2011, [POL-0122492] [db0644e4d5e11b5cce3ed381cb108a88]
[35] SVMSDMOLA3308_2.5.DOCX - FUJITSU - HORIZON SERVICE OPERATIONAL WORKING AGREEMENT [POL0128502] [cdd379390652be400250cf319c7bbdb8]

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4.88 1st line support utilise the KEL database to check for known issues and available workarounds before passing incidents on to 2nd line support. Where no KEL is found, 2nd line support create a new KEL to record a workaround or as part of raising a new incident on the PEAK system for 3rd line support to investigate.

4.89 Information on the KEL is updated by all levels of support as work to resolve the incident progresses. Any creation or update of a KEL must be authorised by SSC before it can be seen by all users.

4.90 All new PEAK incidents should be accompanied by a KEL.

4.91 It is possible for a KEL to be linked to multiple PEAK incidents and for a PEAK incident to reference multiple KELs.

Release Management

4.92 There are three types of release:[36]

a. Major Releases – these will normally be to deliver significant new functionality

b. Emergency fixes – implemented as required to resolve operational bugs/errors and defect issues

c. Maintenance Releases – applied frequently to address minor bugs/errors/defects or security issues and the mechanism by which Fault PEAKs are usually resolved.

[36] -0138750] [
[37] -0138750] [

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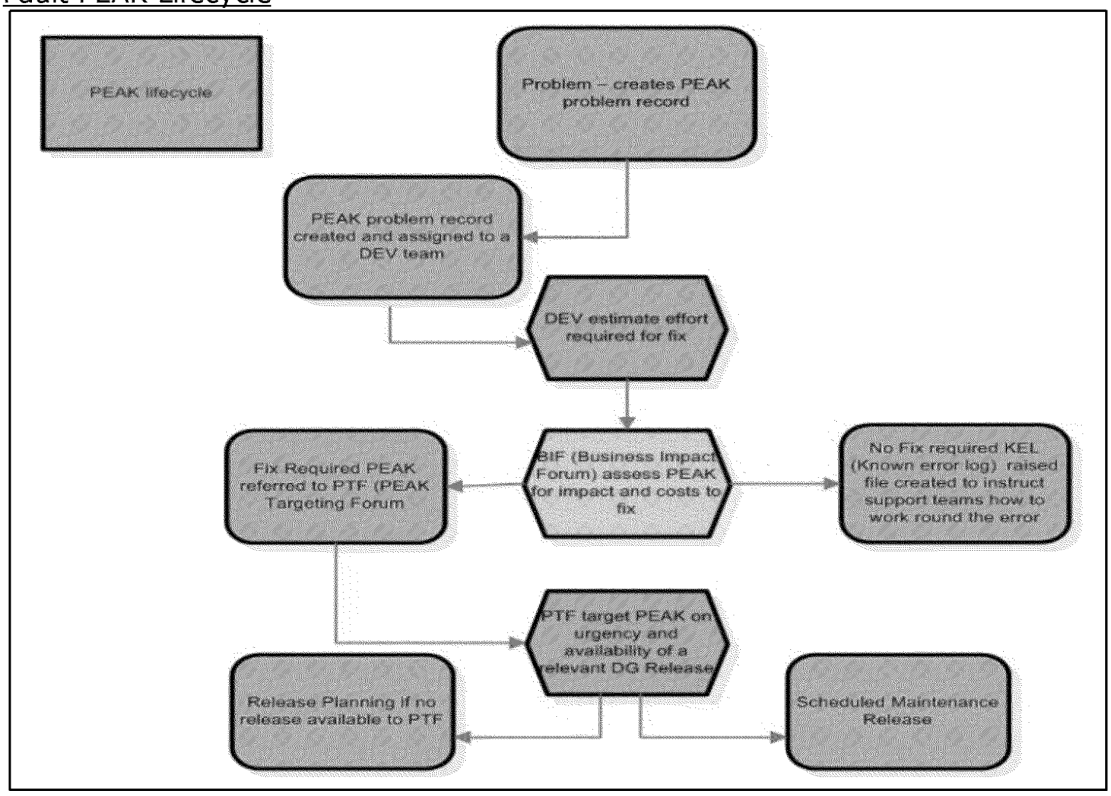
Fault PEAK Lifecycle[37]



4.93 The basic Fault PEAK Lifecycle is as follows:

i. Open - Initial state of a PEAK call

ii. Pending - Incident is being investigated

iii. Final - Investigations have finished –Final response is sent back for approval

iv. Closed - Final state – call is closed on the PEAK system.

4.94 If a PEAK has been sent to a team it is that team's responsibility to monitor it, send it on for investigation, fix it or release it to the correct PEAK stack (queue).

[37] -0138750] [

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Assignment of PEAK Incidents to Maintenance Releases

4.95 Fault PEAKs are investigated and if a fix is required it is sent with an assessment of the time to fix and any issues to the PEAK stack for the Business Impact Forum (BIF).[38] The BIF convenes weekly to review outstanding PEAKs for consideration of the business impact.

4.96 If the BIF decide that a fix is not warranted for cost or other reasons, the Known Error Log (KEL) is updated and the PEAK is closed.

4.97 If the BIF decide that the PEAK should be fixed it is submitted to the PEAK stack for the PEAK Targeting Forum (PTF).

4.98 The PTF convenes weekly and considers new Fault PEAKs and PEAKs that have previously been deferred, as well as PEAKs which introduce business change associated with approved Change Proposals. These PEAKs will be targeted to a specific maintenance release[39] taking into account timing, other development activities and associated factors.

4.99 The PEAK is then sent back to Development to deliver the fix for incorporation into the maintenance release.

[38] Terms of Reference for POA BIF and PTF,30 July 2014, [POL-0032912] [52536a2c7ab381b9773db136ebb9042b]
[39] -0138750] [

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5. Horizon Bugs/Errors Defects and Controls

Issue 1 - To what extent was it possible or likely for bugs, errors or defects of the nature alleged at §§23 and 24 of the GPOC and referred to in §§ 49 to 56 of the Generic Defence to have the potential to (a) cause apparent or alleged discrepancies or shortfalls relating to Subpostmasters' branch accounts or transactions, or (b) undermine the reliability of Horizon accurately to process and to record transactions as alleged at §24.1 GPOC?

Issue 3 - To what extent and in what respects is the Horizon System "robust" and extremely unlikely to be the cause of shortfalls in branches?

Issue 4 - To what extent has there been potential for errors in data recorded within Horizon to arise in (a) data entry, (b) transfer or (c) processing of data in Horizon?

Issue 6 - To what extent did measures and/or controls that existed in Horizon prevent, detect, identify, report or reduce to an extremely low level the risk of the following:

a. data entry errors;

b. data packet or system level errors (including data processing, effecting, and recording the same);

c. a failure to detect, correct and remedy software coding errors or bugs;

d. errors in the transmission, replication and storage of transaction record data; and

e. the data stored in the central data centre not being an accurate record of transactions entered on branch terminals?

5.1 There are several areas where Bugs, Errors and Defects could occur. Some of these are set out below:

a. Failure of a software component (counter software, Horizon data centre components)

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b. Error in Reference Data

c. Failure of a hardware component at counter (CPU, PIN pad, touch screen, keyboard, counter scanners, network router)

d. Failure of a hardware component at PO data centre (Database servers, communication servers)

e. Errors in various communications which need to take place for Horizon to function:

i. Transfer between counter and PIN pad,

ii. Transfer between counter and Branch Database (BRDB),

iii. Transfer between Branch Database and Post Office back end systems,

iv. Transfer between Authorisation Agent and Post Offices External Clients.

f. Those areas as set out in Section 5 'Horizon Robustness' and Section 6 'Reconciliation'.

5.2 As agreed in the Joint Statement of experts, evidence exists that bugs/errors/defects have caused actual discrepancies and/or shortfalls relating to Subpostmaster branch accounts.

5.3 Identified common failure points throughout Horizon are demonstrated at Appendix H. This list is not exhaustive but is based on the review of evidence undertaken to date.

Known Errors/Bugs Defects acknowledged by Post Office

5.4 It should be noted that there are several known bugs/errors/defects previously acknowledged by Post Office that have affected branch accounts. These are known as the "Payments Mismatch" defect, "Calendar Square / Falkirk" bug, and the "Suspense Account bug".[40]

[40] 1.4. 6. Letter of Response - Schedule 6.pdf, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON* (Page 97), ca. 2017 [368e44cc103e58561c5785014597d8f9]

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Calendar Square / Falkirk Issue[41]

5.5 This defect was discovered in 2005 and fixed in March 2006 and involved Horizon failing to recognise transfers between different stock units. In summary, stock units receiving transfers could not "see" them, resulting in branch account discrepancies.

Payments Mismatch

5.6 This bug affected at least 62 branches and related to the process of moving discrepancies into the local suspense account. The majority of incidents are recorded as occurring between August and October 2010.

5.7 The bug was documented in a report from Gareth Jenkins 29 September 2010[42] where it was stated:

> *"This has the following consequences: There will be a receipts and payment mismatch corresponding to the value of discrepancies that were lost. Note that if the user doesn't check their final balance report carefully they may be unaware of the issue since there is no explicit message when a receipts and payment mismatch is found on the final balance (the user is only prompted when one is just detected during a trial balance)"*

5.8 This issue is reported as causing discrepancies showing at the Horizon counter which disappeared when branches followed certain process steps. However, these discrepancies still appeared within the back-end branch account. It is noted that the issue occurred if a branch cancelled the completion of the trading period and then, within the same session, continued to roll into a new balance period.

5.9 PEAK PC0204765[42] is a "Master PEAK" that records branches which were thought that have been affected.

5.10 KEL wrightm33145J[43] identifies the workaround but also states:

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[42] 3429 SM BP Correcting Accounts for Lost Discrepancies - 102000790 - CD1.pdf, *Correcting Accounts for "lost" Discrepancies*, 29 September 2010 [POL-0010769] [804ea47c166870b7ed0359e4765e0265]
[43] Wrightm33145J.html, *HNG-X KEL wrightm33145J,* 23 September 2010 (last updated 01 April 2016), [POL0040409] [1f025ec713c287ee7a5b17accd25b42f]

> *"Unfortunately the workaround cannot be done after the problem has occurred at the office! In this case the branch accounts need to be corrected."*

5.11 It is not clear how many corrections were required to fix all instances of this (or even that all instances were indeed fixed) or when a full audit was completed.[42]

Suspense Account Bug

5.12 The suspense account bug caused Horizon to erroneously replicate suspense account items. It appears that the bug caused Horizon to use 2010 monthly Branch trading figures for 2011 and 2012.

5.13 It is reported that POL later investigated and identified the same bug as being the cause of the issue in January 2013[44] suggesting that the bug may have been resident within Horizon for an extended period.

5.14 POL-0215998[45] lists the 14 affected branches identified in the occurrence of the bug in 2013.

Further Bugs / Errors / Defects not acknowledged by Post Office

5.15 The following errors are observed to have occurred within the Horizon system, however they do not appear to have not been acknowledged as system wide issues by POL in the same manner as those listed above.

Dalmellington

5.16 This defect relates to the example that occurred specifically in 2015 at the Dalmellington Branch in which a Subpostmistress performed a cash remittance from a core branch to an outreach branch.[46] The acceptance at the outreach branch resulted in quadruple remittance transactions[47] resulting in a £24,000 discrepancy.

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[44] 1.4. 6. Letter of Response - Schedule 6.pdf, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON* (Page 97 – Para: 4.5), ca. 2017 [368e44cc103e58561c5785014597d8f9]
[45] Initial Report from Gareth LocalSuspense.docx dated 10 May 2013 [POL-0215998] [84b7fac96c5b77ed13642d885b7de2a4]
[46] 11.Email thread between ATOS and CWU.pdf [C-0005343]
[47] 1.Dalmellington Branch duplicated receipts.pdf [C-0005350, C-0005342]

5.17 It is reported in the email thread between Atos and a Helen Baker of CWU that the remittance team in Chesterfield were aware of the fault (as this is noted as occurring a "couple of years ago") and that Transaction Corrections could be issued for the 'extra' remittances.

5.18 The email thread further states (by Atos) that the root cause was identified as the user forcing log off when post log in checks had not fully completed and it was therefore considered as a process issue and not a technical one. However, this is not consistent with the event logs that do not indicate it was as a result of forced log off.

5.19 Further, Atos refer to release of *"a code change that will avoid further instances of this across the estate"* to be included within Release 13.05 to be deployed in March 2016 (five months after the incident). The fact that Atos made a change to the Horizon system to prevent reoccurrence is therefore consistent with this being a software bug.

Cash Declarations - Cash Management

5.20 I have identified several Known Error Logs (KELs) that document occurrences of varying forms of cash declaration discrepancies having the ability to affect branch accounts reportedly due to system problems.

5.21 KEL acha1233J[41] - Discrepancies between branch cash declarations and the amount received by the cash management system (SAP) were identified. In the data communication channel between Horizon and the cash management system, an incorrect adjustment was being made which added together the "branch cash in pouches overnight"

[41] acha1233J.html, *HNG-X KEL acha1233J*, 22 June 2012 [POL-0039066] [af95a66a92d17269b535e89644017582]

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figure to what the branch has actually declared. The KEL states this is not a user error or anything that can be corrected at branch level. This is therefore consistent with the problem being due to the existence of software bug.

5.22 KEL acha1717T[42] - Whilst possible causes and a suggested process for investigation of this issue by the support team is highlighted, there is nevertheless an acknowledgement that there is the possibility that cash declaration discrepancies could be due to an "*Unknown system problem*". It is worth noting what the Horizon support team consider a discrepancy in this instance as:

> *"A discrepancy is the difference between the cash system thinks the branch should have, based on a previous balanced figure and the transactions recorded since, and the cash declared by the branch".*

5.23 There is also evidence of cash declaration discrepancies arising from clerks duplicating remittance in transactions ("Rem-in") because of wrong messages being presented on the Horizon counter screen (acha621P[43]). This would result in incorrect cash amounts being declared. This is again likely due to a bug because a software fix was applied on 12 January 2016. However, this was not a retrospective fix and therefore any similar, previous discrepancies were not remedied. It is unknown how many other Post Office branches were affected or if any communication was sent out by the Post Office to other branches to prevent further occurrences prior to the fix being applied.

5.24 KEL LKiang3014S[44] reports an issue with how the Horizon system behaves when a Subpostmaster makes multiple cash declarations and then runs a trial balance report. The calculation displayed for the resulting trial balance was incorrect. The support department was

[42] acha1717T.html, *HNG-X KEL acha1717T*, 30 July 2010 (last updated 10 February 2015) [POL-0040033] [5588ce13eb6fa9bbbdf986c912267fc0]
[43] acha621P.html, *HNG-X KEL acha621P*, 15 October 2015 (last updated 14 January 2016) [POL-0040340] [7518fc27f6357689c500a302358d4452]
[44] LKiang3014S.html, *HORIZON KEL LKiang3014S*, 27 November 2002 (last updated 22 February 2007) [POL0035520] [19f87982637c6851bf104504935dfd39]

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unable to identify the root cause of the discrepancy although it was reported that a correction could be made at the Post Office counter level by redoing the cash declaration using the same amount already declared. The KEL remains unresolved and is also cross referenced by Fujitsu with MScardifield2219S[45], which identifies the underlying software bug being caused by "cached data" not being updated via Riposte. This resulted in incorrect data being presented in any discrepancy, variance and balance reports. It is reported that the problem should clear itself overnight and/or a manual workaround was possible. In either case this scenario is in my opinion likely to be confusing for the Subpostmaster and could lead to them making modifications which are unnecessary if they are unaware that the problem should clear itself overnight. It was stated in November 2007 that a fix was being piloted with a view to it being released in January 2008 but it is unknown if this took place and/or was successful.

5.25 Errors within cash pouch delivery could have also affected branch accounts. In DSeddon5426P[46] a failure in pouch delivery resulted in a cash gain when the Subpostmaster carried out a branch cash declaration.

5.26 In acha194L[47] a problem affecting around 15% of kiosk branches prevented these branches from being able to automatically make cash declarations. The message being presented (Code: 2303 - Incorrect Transaction Amount) was misleading since the totals were in fact correct and the transaction amount checks were failing due to incorrect data types. A bug fix was proposed for the second half of 2015, but it is unknown if this took place and what further communications went out to affected branches.

[45] MScardifield2219S.html, *HORIZON KEL MScardifield2219S*, 15 July 2005 (last updated 27 November 2007) - [POL-0035721] [657dca342292a1eaee72e1f7f34a4582]
[46] DSeddon5426P.html, *HORIZON KEL DSeddon5426P*, 26 June 2006 (last updated 10 October 2006) [POL0035379] [ce2e6481384a7fe307e96bbc62f36048]
[47] acha194L.html, HNG-X KEL acha194L, 18 November 2014 (last updated 01 April 2016) [POL-0040058] [9a134a453319f4b473b37070dd7fb467]

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5.27 I am also aware from the witness statement of Pam Stubbs[48] prepared for the Common Issues trial that other potential problems with kiosk operations could have potentially affected branch accounts.

Bureau & Decimal Point Issue

5.28 Post Office has disclosed a PEAK which highlights a fault with bureau transactions where an omitted decimal point in the "euro" line caused a discrepancy. In this particular PEAK[49] the Subpostmaster declared €57,865.00 (expressed as "euro 5786500"), but the sterling equivalent was £0.00 (expressed as "0.00"). When the Subpostmaster tried to reverse the transaction, the figure doubled. It was noted in the call log this problem had been seen on a couple of other occasions and caused significant accounting problems. It was due to be fixed as part of the S80 release.

5.29 A detailed PEAK log is available at Appendix A.

Reference Data Errors

5.30 Reference Data is changed frequently within Horizon, I understand at least once per day. Post Office reported that until 2017[50] the process of changing Reference Data was conducted without being subject to formal controls. Evidence suggests that Reference Data has been found to be incorrect within Horizon and that this led to discrepancies within branch accounts. Within the document, 'Counter Type X Reference Data Definitions'[51], it is explained that *"Counter Type Reference data... will usually only change on the back of a Change Proposal or Live PEAK fix".* Examples have been found in KEL/PEAK records of Reference Data having an impact upon daily counter activities (DSeddon314Q[52]). These

[48] Pam Stubbs (174) – Witness Statement and Exhibit.pdf
[49] PC0098844.html, Peak PC0098844, 6 February 2004 [POL-0270879] [050c1d940ddd970bf7ed304afc494faf]
[50] Operations Board 21 July 2017.pdf, *Operations Board 21 July 2017*, 21 July 2017 [POL-0221328] [9c45e0be3ff2b6773447cc6e41db5f46]
[51] DESGENSPE0003_2.doc, *Counter Type X Reference Data Definitions*, 21 October 2010 [POL-0118364] [ac2409e9e7be10cf2ca62c338b8bd82c]
[52] DSeddon314Q.html, *HORIZON KEL DSeddon314Q*, 14 March 2016 [POL-0035128]

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vary in severity and these errors are passed to the data reference team for rectification.

Supporting Documentation

5.31 Errors in Reference Data and/or Reference Data validation has affected counter activities in several different ways. By way of an example in johnbascoG5222H[53] an Automated Payment transaction was reported as having failed due to "Unknown Agent Code 3046". Client account code 3046 was found to not exist in Reference Data and the fault was not reproducible when the problem was analysed and tested. It was acknowledged that, due to the business impact, a fix would be provided to check and validate the client account code exists in Reference Data before the transaction is committed.

5.32 KEL acha10L[54] documents how branches were unable to accept cards for rent and council tax payments due to incorrect Reference Data, although in this circumstance no impact on the branch accounts in terms of discrepancies would occur as the cards were just rejected completely.

5.33 KEL MWright1458Q[55] illustrates where withdrawn products (with withdrawn Reference Data) can affect a branch accounting position because the Subpostmaster will have products that cannot be accounted for as there is no remaining reference for them to later declare that stock item in the accounts.

5.34 Identified in KEL wbra5353J[56], the customer was charged twice for the same transaction which was reported to be a side effect of errors within Reference Data.

[12a0d196f1ba8968780b9eb845fa575f]
[53] johnbascoG5222H.html, *HNG-X KEL johnbascoG5222H*, 11 July 2017 [POL-0040923] [05ee26859196eff653a7830d82da7db1]
[54] Acha10L.html, HORIZON KEL acha10L, 01 April 2009 [POL-0036378] [ed3160ac33e6f72cde5387980224249b]
[55] MWright1458Q.html *HORIZON KEL MWright1458Q,* 15 June 2000 [POL-0035611] [2cf4ea95b637e9acea61f7c771ffb355]
[56] wbra5353J.html, *HNG-X KEL wbra5353J*, 10 April 2014 (last updated 17 April 2014) [POL-0039777] [abac77a5158c65e27b40fc528d985bf4]

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Duplicate Transactions

5.35 There is evidence of duplicate transactions existing within Horizon due to incorrect processing.

5.36 The error appears to have occurred when payment data was being harvested prior to being transmitted to an external client. The harvesting process should have identified duplicate transactions and dealt with these appropriately. However, any disruption in service can cause the harvesting process to send duplicate payment transactions.

5.37 This would result in a discrepancy between POL and the external client where client summary payment files were submitted to an external client prior to the duplication issue being noticed.

Supporting Documentation

5.38 GMaxwell3651K[57] and surs357P[58] both demonstrate that any failures or interruptions in service with the harvesting process can cause duplicated payment transactions to be processed. In the latter case Streamline, the external third party, received a payment file with 835 duplicate payment transactions totalling £76,564.53. In this instance Streamline identified the duplicates and prevented payment processing. However, identification occurred after the transaction data had been transmitted from Horizon and despite any processes designed to prevent this.

Failed Recoveries

5.39 The recovery process is outlined at section 4.54 above and the importance of this and the error scenarios where recovery might apply are further highlighted in a report by Gareth Jenkins.[59] Any failure in the recovery process can affect transaction data integrity and to

[57] GMaxwell3651K.html, *HORIZON KEL GMaxwell3651K*, 22 December 2004 (last updated 8 May 2006) [POL0035194] [654f590f7d2119bf963a3216607311cf]
[58] surs357P.html, *HORIZON KEL surs357P*, 3 April 2009 (last updated 6 April 2009) [POL-0036388] [4404b260b27528c3caa99a6ac8aaff3a]
[59] 1.9 9. Horizon Online Data Integrity for POL, Gareth Jenkins.pdf, *Horizon Online Data Integrity for Post Office Ltd*,2 April 2012 [POL-0021989] [0690d38ae4f1d9c949aaf1618c732d06]

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attempt to mitigate against this a failed recovery report exists to set out any instances where this has occurred.

5.40 The witness statement of Angela Burke[60] documents a recovery process failure within Horizon. Communication issues within Horizon resulted in a transaction that authorised and processed at the counter failing to recover within the Branch's accounts. This subsequently resulted in a discrepancy that Mrs Burke had to seek to reclaim from Post Office in order to balance the discrepancy.

Supporting Documentation

5.41 The Horizon KEL jharr832S[61] acknowledges that the recovery process is a complex area:

> *"Clerk needs to follow POL business rules properly. It is a complex area and various factors can affect whether recovery happens or not depending on exactly when it crashes and what the clerk replies".*

5.42 KEL cardc464Q[62] reports the difficulty the clerk may have faced when trying to process recoverable transactions. In this case, recovery was attempted but failed. Whilst the recoverable transaction appeared on the failed recovery report, it is now out of the hands of the Subpostmaster. In this instance recovery failure had no impact on branch or customer accounts as settlement had not written to the BRDB. Had recovery run successfully, a zero-value transaction would have been written to the database which should not affect branch accounts as it is simply a record entry with zero financial value.

5.43 KELs seng2037L & acha959T[70,71] describe how various transactions states may also indicate a failed recovery or an incomplete transaction awaiting recovery.

[60] Witness Statement of Angela Burke 28.09.2018.pdf

[61] jharr832S.html, *HORIZON KEL jharr832S*, 05 March 2007 [POL-0035531] [4f4c42852071f3957a69eb4a6dbceb8e]

[62] cardc464.html, *HNG-X KEL cardc464Q*, 30 April 2010 (last updated 12 January 2011) [POL-0038234] [24fe6e3e3901ace35658ba1d3bdc420e]

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5.44 dsed4733R[72] provides an example where transaction recovery failed due to a wrongly named recovery script. This was a Horizon system error arising because of incorrect Reference Data that had to be corrected by the Reference Data team. It is unknown when this was corrected but, in the meantime, SSC would need to have cleared the failed recoveries daily.

5.45 There appears to be a high risk of failed recoveries arising because of a failure to follow correct procedures or lack of understanding of the recovery process. The failed recovery report should pick up these recoverable transactions but by this point it is no longer something that can be resolved at the counter.

5.46 There are a number of PEAKs[73] PC0203676, PC0263451, PC0266575 & PC0273046 (detailed PEAK logs available in Appendix A) which identify recurring failed communications issues subsequently resulting in failed recoveries and consequently branch discrepancies. In these situations, manual reconciliation was required, and Fujitsu needed to clear the failed recovery transaction.

Failed Reversals

5.47 Reversals are set out in Section 4.61. In summary, they are the 'undoing' of transactions to reverse the value of it.

[70] seng2037L.html, *HNG-X KEL seng2037L*, 1 February 2013 (last updated 7 February 2013) [POL-0039307] [bb773d730ae5943330329bc96d2a0fac]
[71] acha959T.html, *HNG-X KEL acha959T*, 28 February 2010 (last updated 19 October 2017) [POL-0041091] [698d3dbfe4181592c650af60f92c1a11]
[72] dsed4733R.html, *HNG-X KEL dsed4733R*, 25 July 2013 [POL-0039482] [78f45c50b543fb3673d9a18fe442eb37]
[73] PC0203676.html, Peak PC0203676, 31 August 2010, [POL-0373467] [9c65a8e1e33e636bc6ae372aefed3690], PC0263451.html, Peak PC0263451, 19 October 2017, [POL-0430967] [981b785aa6f78e75a5f19c8a2c70aff5] PC0266575.html, Peak PC0266575, 26 January 2018, [POL-0433904] [8d02a629313fa13f86f853d49e55dcc7] PC0273046.html, Peak PC0273046, 15 August 2018, [POL-0439981] [c4330f4fcc4ea9f37368e4c692730828]

5.48 Whilst there is evidence of failures in respect of the electronic processing of reversals (discussed in Section 4 above), it is observed that there

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were also issues with interpretation and identification of system reversals.

5.49 The document ("Helen Rose report")[63] refers to an incident where a Transaction Correction was issued which the Subpostmaster duly settled financially despite the Subpostmaster denying conducting the reversal.

5.50 The report appears to show that the material that Post Office initially reviewed did not identify that it was the system that initiated the reversal rather than the Subpostmaster and therefore the Transaction Correction making the Subpostmaster liable was issued in error. Since this is effectively a failure to appropriately reduce the risk of error this is also dealt with further at Section 5.167.

Supporting Documentation

5.51 There is evidence that there were software issues resulting in Horizon applying the wrong mathematical sign when reversing transactions (i.e., a plus (+) rather than a minus (-)). This was identified in PSteed2847N[64]. In this instance, the issue resulted in the doubling of a remittance value in transactions that should have been reversed, effectively to zero. It is unclear when this software bug was fixed or how widespread the problem was.

5.52 KEL cardc5756N[65] provides an example where the system failed to reverse all items in a multi-line pouch and only the first item was reversed. It was reported that the clerk had appeared to have followed the correct process, but the problem could not be reproduced on a test counter. A Transaction Correction was required to reverse the remaining

[63] *Horizon data Lepton SPSO 191320*, 12 June 2013 [POL-0221677, POL-0221678, POL-0221679, POL0221680, POL-0221681] [f296f6880e1b8418f37d3e344374c42a]
[64] PSteed2847N.html, *HORIZON KEL PSteed2847N*, 28 April 2003 (last updated 20 June 2003) [POL-0033658] [1912a565b4a3c4d601bd18b62b15ce04]
[65] cardc5756N.html, *HORIZON KEL cardc5756N*, 19 February 2008 [POL-0035846] [6f87ead560bbed157b55348b32214c73]

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items. The KEL remains unresolved and it is not known whether any further examples of this were reported.

Uncategorised Bugs/Errors/Defects

5.53 There are various KELs and PEAKs relative to errors that have not been categorised as those above. Similarly, no cause or resolution is identified within the KEL to assist with further determination.

Supporting Documentation

5.54 Foreign currency discrepancies were noted in GCSimpson1049L.[66] All currencies on hand doubled up following successful balancing eight days previously. The KEL record stated the issue as being "under investigation" but there is no detail of the results of any analysis.

5.55 There is evidence that in certain investigations there was insufficient diagnostic data to be able to fully diagnose an issue. In KEL MHarvey3527I[67] an apparent successful transaction failed to be validated due to a change of mode. It was reported that the change of mode that had occurred could not be explained as the APS code would not allow this and there was no other way to diagnose the issue. The associated PEAK (PC113202) was closed as no further progress could be made and it was treated as a "one off".

5.56 In CObeng1123Q[68] [69] unexplained discrepancies (gains) for different stock unit types (Cash and Stamps) was reported. Horizon system memory faults appear to be the suspected cause in this case, but no suitable alternative causes or factors were analysed, and the incident remained unexplained. No advice is detailed to have been provided to the Subpostmaster.

[66] GCSimpson1049L.html, *HORIZON KEL GCSimpson1049L*, 29 April 2004 (last updated 5 May 2004) [POL0034206] [77ee561a4d4b623b80b2fc1626f1ce9e]
[67] MHarvey3527I.html, *HORIZON KEL MHarvey3527I*, 21 January 2005 [POL-0034494] [82a49bbb9951410fedf65d51e314a091]
[68] CObeng1123Q.html, *HORIZON KEL CObeng1123Q,* 14 August 2000 (last updated 15 January 20014) [POL-
[69]] [cceaa39cee86736e8a4735e44ae328ac]

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5.57 There are a number of PEAK records (i.e., PC0063723 & PC0084116[70]) which were believed to be system related bugs causing discrepancy transactions to be calculated twice. The examples highlighted both refer to KEL DRowe1625K which (according to the log in PC0084116) was never properly resolved. It is also worth noting that there are many more PEAK records associated with this KEL and the examples highlighted span a period from March 2001 to November 2002. This appears to be an issue that has never been fully resolved despite having been passed to development to analyse further. There appears to have been a workaround put in place, but it is not known how the workaround was communicated and if or when the underlying cause was ever resolved. A detailed PEAK log is available at Appendix A.

5.58 Similarly, in PEAK PC0027887[71] a known but unresolved software error caused a doubling up of values in cash account periods. It is not clear from the call logs how Fujitsu resolved the branch discrepancies and the PEAK was closed after 12 months with the following comment:

> *"Closing call on basis of insufficient evidence. As this is such an old call I have not contacted the call originator. I suggest that this call remains closed!"*

5.59 In PEAK PC0203131[72] differences between volumes and values in a branch office snapshot was identified as a bug in Horizon carried forward to Horizon Online. Since this was a pre-migration bug (as acknowledged by Gareth Jenkins) the PEAK was closed. It may be that this issue was resolved in Horizon Online but this cannot be confirmed on the existing evidence.

[70] PC0063723.html, Peak PC0063723, 10 March 2001, [POL-0238257] [1efaafc05039eea7a5e5e09d1d50226c] & PC0084116.html, Peak PC0084116, 23 November 2002, [POL-0256970] [fc868322664da1770b9416c6443bb468]
[71] PC0027887.html, Peak PC0027887.html, 21 July 1999 [POL-0221773] [93af66e221ecfde6fcaad8a5ac14eca4]
[72] PC0203131.html, Peak PC0203131, 18 August 2010 [POL-0372925] [6ea70fc9c6b34cbcd61b2a7b2ddb2628]

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Hardware Errors

5.60 Throughout the lifespan of Horizon, it is observed (particularly through Second Sight reporting commissioned by Post Office[73]) that counter equipment was unreliable. This observation was reinforced in a Post Office IT risk register document[74] which identified branch IT hardware as being very old and requiring urgent replacement.

5.61 The issues are broadly categorised as:

i. Printer failures

ii. Screen misalignment (pressing one on screen button but resulting in the system selecting a different function)

iii. Failed communications links

5.62 A detailed self-help manual[75] [76] for troubleshooting and replacing peripheral hardware equipment (keyboard, printer, monitor and PinPad) appeared to be available for Subpostmasters. However it is not known how widely this was distributed to Subpostmsaters and how often it was updated.

5.63 A Spot Review report[77] conducted by Second Sight Support Services Limited gives further credence to the possibility that hardware issues could have been responsible for branch discrepancies (shortages and surpluses). In the example highlighted in the report, following a sudden spike in branch discrepancies the Subpostmaster implemented rigorous control improvements including performing twice daily balances and installation and review of CCTV and CCTV film. Despite this, no root cause was ever identified and there was no evidence that

[73] POL Interim Report Signed.pdf, *Interim Report into alleged problems with the Horizon system* (Page 6), 08 July 2013, [POL-0022308] [8dd44e3f1cc26efc1c27e09ee960d737]
[74] IT risk register 2011 09 19 updated.xls, v1.2 – Risk Ref: 29, [POL-0219381] [ec517091d83be38a59b167f5cffa02ad]
[75] Self Fix Manual final.docx, *Peripheral Trouble Shooting and Replacement Guide,* 8 December 2011, [POL-
[76] 9] [aaf6a16dfa038ee20e77bcf4bb26f95d]

[77] 6.8 58. Spot Review 25 – Paul Popov – Mysterious shortages – v4.pdf, *Horizon – Spot Review,* [5852c951bde464932c83764d1a0dadb1]

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POL had conducted any root cause analysis. The Subpostmaster had suspected that faulty Horizon equipment could be the cause, but no firm evidence was ever provided. The Subpostmaster had asked for replacement of old hardware, but this had been refused by Post Office. Subsequently the branch was flooded, and hardware was replaced due to flood damage. Following the hardware replacement and the reopening of the branch with the same staff and processes no further shortages occurred and all transactions balanced. If this evidence is correct, it would be consistent with the Subpostmaster's view that suspect faulty hardware was responsible for causing his shortages.

5.64 Second Sight also considered hardware issues in their report[78] and were unable to draw a firm conclusion on whether faulty equipment could be responsible for otherwise unidentified branch shortages, but they also recognised this could be a possibility. I have noted that hardware replacement often seemed to be a "fix" of last resort where no other explanation could be given, and therefore there is certainly a possibility that hardware was at fault.[79]

5.65 Problems relating to the condition of the electrical power supply to the branches has been acknowledged by Post Office, for example an internal Post Office email POL-0030971 reports:

> "…was too scared to accept a cup of tea in case the Horizon system crashed cos [sic] the electric supply is still a live (excuse the pun) issue… It is Horizon related – the problems have only arisen since install & the postmistress is now barking & rightly so in my view".

5.66 Further documentation also uncovers issues in respect of PIN pads and base unit failures. In addition, unexplained system behaviour related to

[78] 0.2 11. Second Sight – Briefing Report Part 2 (final).pdf, *Initial Complaint Review and Mediation Scheme – BRIEFING REPORT – PART TWO* (Page 45 – 23. Hardware issues), 09 April 2015, [3b79161b842d035f9b952bf70eb9433b]
[79] RColeman4733L.html, *HORIZON KEL RColeman4733L,* 18 November 1999 (last updated 08 January 2004), [POL-0033974] [5654ca357e27272f66887cdefab472f8]

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branch hardware was also reported[80] and which lead to payments crediting the wrong accounts. By a process of elimination conducted by the Subpostmaster, this was narrowed down to a single branch terminal card reader. The Romec engineer who subsequently visited advised this was a "*known Horizon error*" and the card reader needed to be rebooted. It is not known how widespread this issue was and how many transactions were affected and/or when the underlying cause of this error was fixed.

5.67 POL-0032853[81] (authored in 2004) sets out the "*lessons learnt*" in respect of the entire lifecycle of the S60 (software) release of which there are many hardware related issues. In particular, ID No 36 documents an "Epson Printer Issue" resulted in Subpostmasters being unable to declare their cash accounts.

5.68 There is a recurring theme relating to errors arising from PIN pad failures. A selection of these can be seen in the following KELs dsed525Q[82], surs3941P[83] and BrailsfordS239K[84]. In each case there was a failure in the Subpostmasters being able to transact various types of transactions including payment transactions using a PIN pad. An error message and code were generated, and a new PIN pad was the recommended solution.

5.69 cardc219R[85] appears to indicate that any PIN pad related issues would usually result in the recommendation of a new PIN pad whatever the error. In this case a transaction had been declined by the PIN pad but did not get reversed. An older version PIN Pad (Hypercom) was being

[80] Petersfield.pdf, *Report of upcoming loss at next T/P,* 14 September 2014, [POL-0219802] [b81bc528975e821221743fdd3d1edd28]
[81] POL-0032853 *Lessons Learnt from the S60 Release* 15 December 2004 [POL-0032853] [182f6b865d7707bd058328bf1f2f8c38]
[82] Desed525Q.html, *HORIZON KEL desed525Q,* 09 July 2009, [POL-0036489] [352690d6c7d9a258bc02a6df75d37254]
[83] SURS3941p.html, *HNG-X KEL susrs3941P,* 14 April 2010, [POL-0037407] [ce6e4d2bb070aea212d132d196bc3aba]
[84] BrailsfordS2239k.html, *HNG-X KEL BrailsfordS2239K,* 14 June 2010 (last updated 01 July 2010), [POL0037615] [30f83d46131ffd5d61d80a2b86c94cec]
[85] cardc219R.html, *HNG-X KEL cardc219R,* 11 May 2011 (last updated 31 October 2013), [POL-0039594] [3e0e7a8604a8f093bec033f9c69c766e]

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used and a new version (Ingenico) was suggested and any reoccurrence of the error would then need to be reinvestigated. It is not clear in this case when or if a new PIN pad was issued and if this fully resolved the issue. In this instance there could be an impact on branch accounts if no reversal takes place and reliance then shifts to reconciliation reports to pick up these discrepancies.

5.70 There are variety of other examples of counter hardware issues[86] [87] where replacement equipment was the recommended solution. Hardware (keyboard, screen & screen cable) replacement was also suggested as a solution for an issue with "phantom" sales lines appearing on the transaction that had never been selected.[88]

5.71 Additional power related Horizon issues are discussed in relation to the Recovery and Reversal process discussed above.

5.72 A 2004 document[89] describes the procedure to calculate the Mean Time Between Failure (MBTF) for each component of hardware within the Horizon Service Infrastructure deployed within Post Office branches. This is stated to *"allow Post Office to calculate the actual failure rates applicable to each item of hardware."*

5.73 Section 4.2 of the document states:

> *"Fujitsu Services have applied adjustments to base unit data to account for known problems within the Horizon System Infrastructure, which have caused spurious fluctuations which should be ignored for the purpose of forecasting the annual change. During the distribution of release CSR+ and BI2, many base units were swapped out due to software failure rather than specific hardware fault. They have since*

[86] RColeman566K.html, *HORIZON KEL RColeman566K,* 04 April 2000 (last updated 08 January 2004), [POL0033986] [65dbfc2631c46aafd78dbb69419431b3]. PCarroll2243R.html, *HORIZON KEL PCarroll2243R,* 06 April
[87] (last updated 23 August 2005), [POL-0034763] [6e1dcee9b64aa61e07ad694e1329cb06]
[88] PSteed145J.html, *HORIZON KEL PSteed145J,* 07 January 2000 (last updated 06 January 200400, [POL0033869] [56234dae4303708631c499c596bec86f]
[89] CSPRO149_3.1.doc [POL-0079278] [c4bff08def03773e0501a4726d9f255a]

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been recirculated into the estate and Fujitsu Services have therefore excluded them from the MTBF calculations."

5.74 Annex 2 of this same document illustrates the MTBF results for January 2002 to December 2003. This annexure is not fully understood as there are missing column identifiers that prevent confirmation as to what the rates represent.

Fujitsu Closed Problem Records

5.75 Post Office has disclosed a contemporaneous spreadsheet entitled "Copy of Fujitsu closed problem records.xls"[90] which sets out around 200 issues which have been closed by Fujitsu in one year comprising of both hardware and software issues. For example:

a. Issue ID 19 in the spreadsheet states in relation to a reconciliation issue:

"Issues with First rate control files provided by Fujitsu. First Rate Travel Service (Third Party) reconciles all Bureau de Change Transactions and are currently unable to reconcile reversals against original transactions due to this issue. The issue currently is caused by HNG-X Bureau de
Change Transactions transferred from Branch Database to TPS host."

b. Issue ID 78 refers to "Camelot file mapping issue causing discrepancies".

c. Issue ID 197 refers to token ID mismatches and states specifically:

"Following an AP Ref Data update being enabled on Wednesday 1st February. Post Office Card Account (POCA) transactions were unable to complete and token IDs matched incorrectly for a number of Automated Payment (AP) transactions, E Top Up cards and bank cards."

[90] Copy of Fujitsu closed problem record.xls, [POL-0215915] [765f3677a7246da5dc9eafabc84f570a]

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5.76 As above, there are nearly 200 other issues contained in this spreadsheet which have been tracked by Fujitsu. However, the spreadsheet only appears to cover the period relevant to 2010 and 2011. My assumption is that Fujitsu would have had these (or similar) trackers throughout the entire period that Horizon and Horizon Online have been live, as this is how issues are tracked and fixed on a typical project (and that appears to be the function here as well). However, I have not yet been provided with similar trackers for other years.

5.77 I have filtered the content that appears to be relevant to the issues in this matter and have set them out in Appendix F below.

5.78 In consideration of various witness statements, predominantly Richard Roll, there were a wide ranging variety of possible bugs / errors / defects within Horizon.

5.79 In the witness statement of Richard Roll[91] he recalls:

> *"Any errors made by the Subpostmasters would be relatively easy to identify and would normally be picked up by 1st or 2nd line support. If an error was referred to us, then it was extremely unlikely to be due to a mistake made by a Subpostmaster, the vast majority of errors I dealt with were due to coding errors or data corruption."*

5.80 He goes on further to state at Paragraph 9:

> *"We regularly identified issues with the computer coding in the Horizon system. We would then flag those issues to the Fujitsu IT software developers. The developers would then work on a fix" while we monitored whole estate in relation to that issue"*

5.81 In respect of financial discrepancies at Paragraph 10 he states:

> *"My recollection is that the software issues we were routinely encountering could, and did, cause financial discrepancies at branch level including shortfalls being incorrectly shown on the Horizon system. If we were unable to find the cause of the discrepancy then*

[91] Witness Statement Of Richard Roll, 11 July 2016. (Para: 8, Page 2)

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this was reported up the chain and it was assumed that the postmaster was to blame."

Horizon Robustness

5.82 For the purposes of this report, and in line with my definition given in the Joint Statement, robustness is summarised as:

"The ability to withstand or overcome adverse conditions, namely, the ability of a system to perform correctly in any scenario, including where invalid inputs are introduced, with effective error handling."

5.83 It is important to note that robustness does not equate to a guarantee that software is bug or error free. A system's reliability can be improved by rigorous testing and debugging (provided no further bugs are consequently introduced through this process)[9293] however, complex systems can never be completely tested or ever entirely free of bugs.[100]

This is due in-part to the fact that no software can ever be truly perfect
[101]

5.84 The following statistics were reported in a Post Office presentation[102] created circa 2017:

a. More than 47 Million transactions per week were undertaken in Post Office Branches from 18 Million customer visits;

b. 22 Million banking transactions every month and 2.5 Billion transactions a year with a cash value of £100 Billion;

c. Circa 11,800 Branches;

d. Post Office cash supply chain collect and deliver on average £42 Billion cash, foreign exchange and secure stock each year.

[92] F. Bott, A. Coleman, J. Eaton and D. Rowland, Professional Issues in Software Engineering, Boca Raton: CRC Press, 2000.
[93] A. Hunt and D. Thomas, The Pragmatic Programmer, Reading: Addison Wesley Longman, Inc., 1999. [102] 2.2 12. Presentation_The Post Office, An Insight_.pdf, *The Post Office-An Insight, Angela Van Den Bogerd,* circa 2017, [05e2ac28f7b36b04dd83ab301edf9f91]

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5.85 In a document last reported as edited on 20th August 2010[94] Post Office compares the error rate or "exception handing performance" of Horizon compared to Horizon Online. In the document it is explained that, *"…the figures are averages over the whole system and do not claim that they will be evenly distributed".*

5.86 A number of failure analysis statistics are reported:

a. Counter Peripheral failures [in Horizon Online] – These are largely the same as Horizon, estimated at approximately 1 failure per counter per year.

b. Counter PC Failures [in Horizon Online]- These are largely the same as Horizon, estimated at approximately 0.1 failure per counter position per year that could cause loss of data. Note that Power failure at the branch accounts for 80% of these cases.

c. Transient failures (< 2 minutes) impacting online transactions [in Horizon Online]- These are reduced for Horizon Online (estimated at 6 per counter position per year) compared to Horizon (estimated at 11 per counter position per year).

d. Transient failures (< 2 minutes) impacting settlement [in Horizon Online]- This is a new exception category for Horizon Online that does not apply to Horizon. The estimate is 15 incidents per counter position per year."

5.87 The document also records an ongoing error, "Loss of Basket transaction Data held in PC memory" which results in an estimated loss of transactions in a basket per counter, per year of 0.1 and in Horizon Online of 0.097.

5.88 In my position as an expert I am unable to estimate the level of the Horizon system's robustness. Given the size and age of Horizon, I

[94] HNG-X Branch exception Handling Strategy- Agreed Assumptions and Constraints. [POL-0116897] [6511184272a83cc7c16127dff44ac807]

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would however make the expert assumption (based upon systems of similar magnitude), that there are not many people who could. The sheer enormity of the task to garner a thorough understanding of the code, which would be required to estimate robustness is, in my opinion, nearly impossible.

5.89 This is compounded by the agreed facts that there were 19,842 release notes for Horizon between 29 November 1999 and 8 August 2018 and each of these introduced changes could affect a system's robustness.

5.90 For context, 19,842 changes over a 19-year period is approximately 1000 a year or 19 changes per week. It is readily apparent that keeping on top of a constantly evolving system's robustness is a somewhat insurmountable task. It would not be possible to determine whether a change to fix an area of the code did not:

a. Create a new issues/bugs with older areas of the legacy code or;

b. Add brand-new issues/bugs to the system.

5.91 Instead, I have estimated the likely level of the robustness of Horizon and benchmarked this against industry standards based upon a review of the evidence available including the known error log (KEL) and PEAK system.

5.92 Several KELs exist that identify failures of internal mechanisms in place to ensure integrity of data. For example, dsed4733R[95] identifies multiple failed recoveries occurring because of a wrongly named recovery script. From the section above, a robust system has to *"perform correctly in any scenario despite the introduction of invalid inputs"*. Clearly this KEL details an issue that is at odds with this definition.

[95] dsed4733R.html, *HNG-X KEL dsed4733R*, 25 July 2013 [POL-0039482] [78f45c50b543fb3673d9a18fe442eb37]

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5.93 Further, obengc5933K[96] from 2010 shows that following network banking (NWB) withdrawal transactions and printing of the customer receipts, there was a loss of communications resulting in a message to the data centre timing out. Consequently, the Subpostmaster was asked to follow recovery but the transaction was only able to recover partially.

5.94 It goes on to state:

> *"It appears that the order in which txn [transactions] are recovered is by recovering the most recent, then working backwards; however, the oddity about this particular recovery process is the fact that the 5.00 txn (00-215704-1-4273066-1), the first in the session, was recovered fully, whereas the £169.31 txn NOT!"*

5.95 Clearly this shows potential for discrepancies but also a lack of absolute robustness in Horizon. This is consistent with my opinion above that it is unrealistic to expect any large IT system to be completely robust or bug free.

5.96 Post Office themselves have established a department called the Data Reconciliation Service. This department's purpose is to deal with Horizon system problems which have resulted in unreconciled transactions which require some level of manual intervention. Post Office report that 10,000+ transactions per week are processed by the Data Reconciliation Service.

5.97 The fact that numerous processes and workarounds are in place to allow Fujitsu to modify data already recorded by Horizon is consistent with a lack of internal integrity within the Horizon system and the high level of need to 'correct' this lack of robustness manually.

5.98 Post Office acknowledge the need to improve in a "Finance Roadmap Project" document published in September 2012[97] where under the heading of "process and system gaps" it reports;

[96] obengc5933K.html, H*NG-X KEL obengc5933K*, 12 May 2010 [POL-0038204] [c24012c95dc42ac17b9ad2a2be2461b2]
[97] Phase 2a) consolidated output.pdf, Finance Roadmap Project – Phase 2a) Project Outputs, 3 September 2012 [POL-0215782] [ac4469b27e384fe4440f351c115d8108]

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- "Multiple finance systems and a lack of automated controls…" and
- "Significant amount of manual intervention in core Finance processes."

5.99 It is common ground between the experts that that each time there is a change there is a potential to introduce new bugs/errors/defects.

5.100 The frequency of updates indicates the level of bugs and level of change to which that Horizon was subjected to.

5.101 As discussed above, Post Office's response to my request for information confirmed that there have been 19,842 release notes, I can see from POL-0219318[98] a brief note on each of these releases and to which bug (PEAK) they relate. Therefore, Horizon has been subjected to 19,842 changes which have been applied during its operation.

5.102 The graph below is taken from the data contained within POL-0219318 and displays the bug fixes by year.

[98] Copy of CallTypeR_080818-ReleaseNotes (2).xls, [POL-0219318] [e621d43d3f3b629be26536c6584c53d7]

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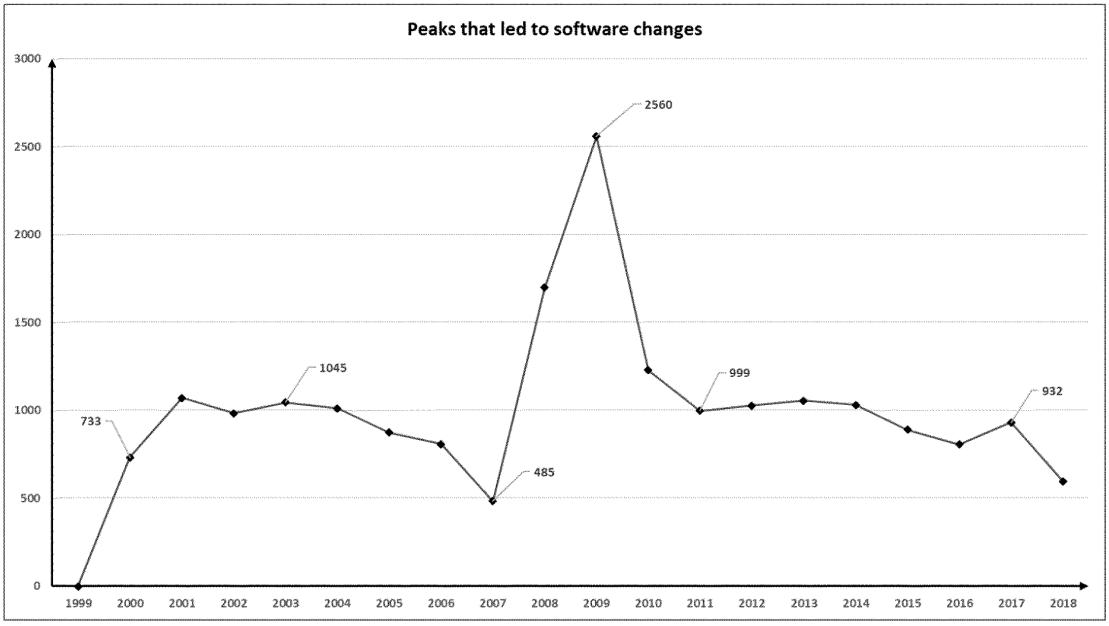

5.103 As noted in paragraph 4.21 above, the apparent ability prior to July 2017 to alter Reference Data without any formal consideration as to the impact of this change could have had a potentially very significant effect upon Horizon's reliability and robustness.

5.104 Transaction Corrections also have the potential to affect the robustness of the Horizon system. Torstein Godeseth's witness statement[99] states these are one of four sources of transactions that make up transaction data within Horizon. Therefore, any human intervention within the Transaction Correction process has the potential to introduce errors and therefore affect the robustness of the Horizon system.

5.105 In addition to this, I have observed a summary of Transaction Corrections between the years 2013 – 2014[100] which shows approximately 20% of all Transaction Corrections raised appear to have been deemed by Post Office as: "not caused by the branch". I have also noted that a different summary of Transaction Corrections

[99] Witness Statement of Torstein Olav Godeseth 27 September 2018
[100] TC summary by Product full year 2013-14.xlsx, *Summary of transaction correction causes,* 22 October 2014 [POL-0221563] [9e326d06b05870f076dd6fe8b69015c7]

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issued in 2010/11 sets out that the net value of Transaction Corrections which were not categorised as "caused by branch" was £7.4m[101]. Clearly, if potentially erroneous Transaction Correction data (or error notice data pre-Transaction Corrections i.e. Horizon Online) is entered into the Horizon system, this will affect its reliability and robustness. Furthermore, if these erroneous Transaction Correction transactions were not caused by the branch and entirely unknown to the Subpostmaster there is a significant risk and issue that could impact branch accounts.

Horizon Uptime

5.106 As maintained above, it is technically challenging and expensive to achieve high availability of large systems. Horizon is a nationwide system made up of many parts, which makes achieving the industry standard of 99.5% difficult and the gold standard "five nines" (or 99.999%) almost impossible.[102]

5.107 The 2013 Agreement between Fujitsu and Post Office[103] (at page 12) aimed to achieve 99.53% Branch Availability.

5.108 I have seen reported examples of downtime across the Horizon system. A Post Incident Report dated 09 December 2015 detailed a 'POLSAP Filesystem Incident' on 5 January 2015 that resulted in a POLSAP application outage for approximately 49 minutes.[104]

5.109 Likewise, there was an outage to Banking, Card Payment, E Top Up and Automated Payments Out Pay (APOP) on 7 November 2016 for two

[101] NEW TC PACK P10 2011.xlsx, *Summary by Period*, 15 February 2012 [POL-0221536] [e1a3c3394d348ab3355302b35cfd63ab]
[102] This is a common term used to describe percentages of a particular order of magnitude. For example, a system or service that is delivered without interruptions 99.999% of the time would have "five nines" reliability. See also POL Risk and Resiliency Review v1 5.pptx*, Post Office Limited IT Risk and Resilience Review Final v1.5*, 08 June 2012, (Page 66), [POL-0219408] [25eef3b7ee67ce3fcfdcbf2dec402c9b]
[103] Horizon OLA between POL and Fujitsu v0 2.pdf, *Operational Level Agreement (OLA) Between Post Office Ltd & Fujitsu for the Horizon Service*, 22 July 2013[POL-0215475] [0700cd4e673159d3f251fcaa72323307]
[104] SVMSDMINR2690_1.DOC, *Post Incident Report: POLSAP Filesystem Incident 5th January 2015*, 9 December 2015, [POL-0143426] [5c6f3d6e2a51cd3dd8c263f85493cd04]

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minutes[105] in addition to a Tivoli Work Scheduler Batchman outage for approximately six hours on 7 February 2017.[106]

5.110 In my opinion whilst these instances show that Horizon is not infallible nor totally robust, it still places Horizon with a good level of availability overall.

5.111 Overall, from my review of the evidence it is likely (whilst putting aside the large number of often required manual processes) that the electronic processes within Horizon are relatively robust based upon the literal, contextual, definition. Certainly, both instances of Horizon (Horizon and Horizon Online) appear to be in-line with other IT systems of similar size and industry.

5.112 However, this does not mean the Horizon system (as a whole) is infallible and certainly does not imply the software is bug-free nor its accounts free from errors. The extent to which Horizon is robust, in my opinion, is reasonable but not a guarantee of no shortfalls or branch account accuracy.

Likelihood of shortfalls in branches

5.113 Whilst controls and integrity checks are identified within Horizon, it is evident that the Horizon system itself and errors within it have been the cause of shortfalls attributable to branches. Although correcting transactions are capable of being issued, the issuing of such so that a Subpostmaster does not suffer the loss is largely dependent upon a) the cause of shortfall being accurately identified b) the reporting and logging facilities to identify such being a true picture of events and c) the actual event being detected in the first instance. As evidenced throughout this report, and in consideration of the Claimant's witness statements prepared for the Common Issues trial, there are examples

[105] SVMSDMINR3299_1.DOC, *Post Incident Report: Banking, Card Payment, E Top Up and APOP outage*, 11 September 2017 [POL-0151983] [0eeec8be8128ea7ace5034bacc2c714d]
[106] SVMSDMINR3343_1.DOC, *Post Incident Report: Batch processing outage*, 22 September 2017 [POL0152261] [10b424479186ab4b0e1e750460231f57]

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of various instances where part or all of a), b) and c) may not have been effectively conducted.

Extent of errors in data recorded within Horizon arising from (a) data entry, (b) transfer or (c) processing of data in Horizon

5.114 Regarding the extent of potential errors within Horizon I have analysed 5114 Horizon Known Error Logs (KELs) to determine the scope of potential bugs or 'PEAKs' (as they are referred to by Post Office and Fujitsu). Of these 5114, I have found that 163 contain PEAKs that could be of significant interest and of these 76 are referred to in the report. The KELs disclose that there have been actual errors in data recorded within Horizon arising from transfer, processing of data in Horizon and data entry. The potential for such errors therefore must exist. See Appendix G (Failure Point spreadsheet).

5.115 Evidentiary findings in respect of points a), b) and c) (above) are set out below. However, they do not fully identify the extent of errors in data recorded within Horizon, only a section of those reviewed thus far.

Further, it is not clear what the true extent of errors recorded within Horizon is since the quantification of undocumented issues is not fully known, for example bugs / errors /defects not reported by a Subpostmaster but possibly accepted as an accounting error on their part.

Errors that are Potentially the Result of Multiple Issues

5.116 KEL wrightm33145J[107] [108] (raised September 2010) entitled 'Office has Non-Zero Trading Position (Receipts/Payments mismatch)' states:

> *"This issue was fixed in November 2010. For new occurrences see KEL ArnoldA2153P." (raised on 08 October 2009).*

[107] wrightm33145J.html, *HNG-X KEL wrightm33145J*, 23 September 2010 (last updated 01 April 2016) [POL-
[108]] [1f025ec713c287ee7a5b17accd25b42f]

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5.117 It should be noted that although the Horizon error in wrightman33145J was fixed and new occurrences were referred to ArnoldA2153P,[109] the latter KEL generates the same Receipts and Payments mismatch error message but in fact relates to a mismatch during the balancing of a stock unit that contains withdrawn product (relative to Reference Data issues). There is no mention in the KEL if this was communicated to branches as part of the Receipts and Payments mismatch issue. Therefore, it appears a single "defect" could present itself as an error in many ways.

5.118 Another example of a Receipts/Payments mismatch issue was raised in ballantj1759Q[110] (February 2010) detailing a "Counter APP ERROR" that has been caused historically by:

a. Falsely reported for the Office Snapshot, when a transfer is in progress. Fixed by PC0194381 in April 2010;

b. Pressing Cancel at a certain point during stock unit rollover. See wrightm33145J; and

c. Training Office producing a balance snapshot where data hasn't been reset for a very long time (PC0210277).

5.119 What can clearly be seen here is that there are at least three issues within Horizon that cause a Receipts/Payments mismatch that will directly affect branch accounts. Further, the KEL goes on to state that: "*Instances of this error must be investigated. If the error is as a result of a new problem, please add the details to the list of causes above*", demonstrating that the true effects of this known bug may still be unknown.

5.120 On a similar theme incorrect reporting of discrepancies can arise resulting in incorrect stock declarations. See acha1357Q.[111] It is not

[109] ArnoldA2153P.html, *HNG-X KEL ArnoldA2153P*, 08 October 2009 (last updated 29 March 2016) [POL0040401] [fbf8040b134636ad64f8e68fbf4d706d]
[110] Ballantj1759Q.html, *HNG-X KEL ballantj1759Q*, 12 February 2010 (last updated 17 May 2011) [POL0038508] [f4c2a317d57451cdc91ba81dc1072002]
[111] acha1357Q.html, *HNG-X KEL acha1357Q,* 14 February 2011 (last updated 16 June 2017) [POL-0040896]

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clear how many branches were affected but it appears that it is possible for discrepancies to have been accepted by the Subpostmaster based upon incorrect declarations. The problem could arise due to old stock declarations not being automatically removed from the system. These could only be removed by making zero-value declarations or deleting the stock unit then waiting overnight before balancing. As a result, it was possible if a declaration existed for a current period, it would be used when the discrepancies button was pressed, or when a balance report was produced, even if it had not been used for a year.

5.121 The KEL above indicates that the issue was passed to development via PEAK: PC0208335 and the recommendation was for the Subpostmaster to be contacted for advice on corrective actions. acha3145Q[112] which pre-dates acha1357Q by over year provides a full support solution for this issue of incorrect stock declarations and discrepancies. It would seem that the problem was known for at least 12 months before being passed to development and it is not known if the issue was subsequently

fixed and/or how widely the corrective support actions/process was communicated.

In relation to a) Data Entry

5.122 It is evident that data entry was clearly a significant problem at the branch counter. We can see from the Service Level Agreement (SLA) reports (i.e., SLA Summary New WE 06072014[113]) and filtering for "Correcting Horizon Errors" or "Miskeying" that there are numerous instances of data entry errors made each week (Annex A). An SLA is a commitment between a service provider and a client in respect of

[8109c05bc69b18eed896e45c3a2115a5]
[112] Acha3145Q.html, *HNG-X KEL acha3145Q*, 18 May 2010 (last updated 02 October 2015) [POL-0040263] [44b786a9d63674c53510487e50771172]
[113] SLA Summary NEW WE 06072014.xls, *NBSC Incident SLA Summary - Week ending 6th July 2014*, 14 July 2014 [POL-0031909] [2a6e1fbd3ef5d76899a9f21957d65011]

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aspects of the service to be provided e.g. helpdesk response times. In this instance the report can be used to analyse the type and reason for calls made to the helpdesk.

5.123 An internal feasibility study report, carried out in 2012[114], was commissioned to investigate the issue of mis-keyed transactions and the options for preventing this problem. The report noted the following financial impact:

> *"A further statistic, which was recorded on Friday 6th July 2012, refers to the value of mis-keyed Banking Deposit transactions amount to over 60 PER WEEK. The total of investigations that become necessary as a result of mis-keyed transaction equates to £10 millions per annum (approx.)."*

5.124 Further, an internal presentation from Post Office[115] looking into efficiency gains reported: "*a significant portion of demand at FSC is driven by errors and mistakes made in branch with entering in data into horizon. Part of these errors can be avoided with relatively small changes to horizon*". The presentation goes on to set out four changes that could be made to Horizon that would save time for the Subpsotmaster and reduce data entry errors in Horizon.

5.125 A further internal presentation from Post Office[116] references the findings of external consultancy firm McKinsey. This presentation repeated the statement made previously that relatively small changes to Horizon could avoid errors/mistakes made in branch. The presentation suggested that the ease of implementation of such changes as; "*Medium. There exists an interdependency on IT for changes in Horizon to reduce errors coming from upstream*" with the next steps described as; "*Assess costs for Horizon changes*". The

[114] Feasibility Study – *Mis-Keyed v0 1.doc, G-231 Mis-Keyed Project – Feasibility Study V0.1*, 15 May 2012, [POL-0217750] [8e9f114b3c4106d0f5255f906b742731]
[115] Review of Mid-Term Initiatives [POL0217407] [670bcc305bb2ee89d5a7546faa0e86e9]

[116] Business transformation – Finance Wave 1 [POL-0218441] [a26a0ec0f6c8dbc20b753b200de725bb]

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presentation is focused upon delivering costs saving to Post Office, through reducing support costs and did not appear to investigate any saving which might be achieved by Subpostmasters.

5.126 An external information security review[117] was carried out in 2008 by Infosec as part of POL's adoption of the International Standard BS ISO/IEC 17799:2005. The resulting report recommended various system improvements after concluding:

> *"The Post Office, its agents, clients and banking partners are suffering the consequences of a high level of transaction disputes and customer claims across many financial, and all banking products due to a lack of source data integrity, i.e. values entered only once without validation; transaction value not presented to customer for validation……banking deposits are not visually presented for confirmation by the customer…..bill payment and other transaction values are not presented to customer…."*

5.127 The report also highlighted the short time period available for archived data (180 days) hampering the ability of disputes to be resolved in a timely manner and it recommended an increase to at least 540 days. It

is not known if or when all the report's recommendations were completed by POL.

5.128 Similarly, in a fraud solution report[118], it was noted that the POL had a limited number of data queries (approximately 750 per year) which it could request relating to transactional data in the branch database which had been archived after two months. Beyond this number of queries, each request became chargeable (£400-£500). It is not known what impact the time limits on archived data and limits on the number of non-chargeable data queries had on POL's willingness to

[117] Information Security Review – Post Office Ltd, v1.2, 15 TH July 2008, [POL0217567] [3dd3d32cb258ecf5895d94b2d205ee9d]
[118] NRRA1207.01 D001 – Post Office Fraud Solution report.pdf. *Driving business benefits through the consolidation of data review – Post Office Fraud Solution,* 18 May 2012, [POL-0219392] [5eb6f3175483e47d760c4fd44a6c06b5]

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investigate all branch discrepancies on behalf of Subpostmasters, however, the fact that business constraints existed could give an inference that there may have been limits on the numbers and types of investigation of Subpostmaster discrepancies.

Supporting Documentation

5.129 allend1645p[119] provides an example of Horizon's weak interface controls and lack of data entry validation. In a single sales transaction the clerk was able to select and enter different methods of payment (Debit Card and Fast Cash). Horizon allowed the transaction to be settled via Fast Cash when the Debit Card payment method had already been selected. Although the KEL confirms this is expected system behaviour and to advise the caller of the same, it is my opinion that controls should be in place to restrict user input error in this scenario. There is nothing in the KEL to indicate if this could be considered for a future system enhancement.

5.130 In acha621P[120] the correct screen to successfully process a cash pouch did not appear resulting in the clerk in an outreach branch inadvertently doubling up the amount of cash recorded. The issue appears to have been caused because of an earlier system logout or inactivity which in turn resulted in incomplete checks being conducted by Horizon post logon. There was a system fix applied for this on 12 January 2016, but this did not retrospectively correct the affected branch accounts. It is not known how many branches were affected by this bug/data entry validation issue and/or what communications were sent out by Post Office. The KEL log remains in a status of 'Unresolved'.

[119] allend1645P.html, *HNG-X KEL allend1645P*, 24 June 2011 [POL-0038584] [8a983ddfa657b62026d5bfc7ad78ba04]
[120] acha621P.html, *HNG-X acha621P*, 15 October 29015 (last updated 14 January 2016) [POL-0040340] [7518fc27f6357689c500a302358d4452]

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5.131 This issue looks to be part of the same scenario analysed in a detailed Fujitsu report[121][122] prepared for the Post Office. The underlying symptom (duplicate transactions) caused either because of a "Forced Log Off" or use of the "Previous" key during the remittance process analysis covered a period of five years (2010 – 2015). It was found that 88 different branches had duplicate pouches over this period. Although most occurrences appear to have been accounted for and corrected by the Post Office the fact that three "fixes" over five years (the last being in January 2016) is indicative that the issue was never fully resolved, albeit most occurrences happened between 2010 and 2011.

5.132 EJohnson3937R[123] demonstrates the lack of Horizon interface controls which enabled Subpostmasters to carry out "Rem In" transactions without a value being entered. Despite the system check message, I would expect controls to be in place to restrict user input error in this type of scenario so that a user cannot complete the transaction. There is nothing in the KEL to indicate if this could be considered for a future system enhancement.

5.133 PSteed145J[124] highlights an issue reported on several occasions with "phantom" sales items appearing on the Horizon counter screen but which had not been selected by the Subpostmaster. In this instance it was recommended to replace both the keyboard and screen and it was also noted that another similar case had been caused by the cable connecting the screen and base unit. Instructions on how to deal with environmental issues and hardware are contained in pcarroll1235R[125]

[121] Outreach BLE Extract Findings v6 091215.pptx, *Branch Outreach Issue (Initial Findings),* 10 December
[122] , [POL-0220141] [33ab9fe9c4b2bcd600fb50b7aff7bd8a]
[123] EJohnson3937R.html, *HORIZON KEL EJohnson3937R,* 27 January 2005 [POL-0034505] [2d7cfc706e00fbd9d7d7d64021b1dd04]
[124] PSteed145J.html, *HORIZON KEL PSteed145J,* 07 January 2000 (last updated 06 January 2004) [POL0033869] [56234dae4303708631c499c596bec86f]
[125] Pcarroll1235R.html, *HORIZON KEL pcarroll1235R,* 05 April 2000 (last updated 05 October 2006) [POL0035366] [3b14d838abd6aa7273dad4894aafcbdd]

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but it is not known how widely these instructions were communicated/distributed to Subpostmasters.

In relation to b) Transfer (of data)

5.134 Evidence shows various issues with the transfer of data within Horizon.

Supporting Documentation

5.135 cardc219R[126] records a transaction authorised by the bank but cancelled by the Horizon counter PIN pad and the transaction did not get reversed. The error is noted to have occurred due to missing key transaction information and possibly due to issues related to Hypercom PIN pads. It is not clear if the underlying cause was pinpointed to the Hypercom PIN pad and/or if the later switch over to the Ingenico PIN pad resolved the issue.

5.136 jharr1323L[127] records an unresolved example of a successfully recorded transaction initiated in a Post Office branch (where a customer receipt was generated) which failed to appear in the Post Office Data Gateway (PODG)[128][129] file and consequently was not transferred to the relevant third party (Environment Agency). The PODG file should contain all transactions to be transferred to the third party. In this case the Environment Agency failed to send the customer his license as they had no record of any purchase. Post Office's failure to hold logs for more

than 30 days affected Fujitsu's ability to fully investigate the root cause of this specific incident. The incident remained unexplained.

- The ability of Horizon to erroneously record the same transaction twice after a session transfer to a different counter was recorded in

[126] Cardc219R.html, *HNG-X KEL cardc219R,* 11 May 2011*,* (last updated 31 October 2013) [POL-0039594] [3e0e7a8604a8f093bec033f9c69c766e]
[127] Jharr1323L.html, *HNG-X KEL jharr1323L,* 29 September 2016, [POL-0040563] [afeb10ec3e6c812eecf9c7011abaaad4]
[128] 1.3 3. High level architectural overview of Horizon Online.pdf, *Horizon Solution Architecture Outline* (Page
[129] – 2.2.2.4.1)*,* 07 April 2016 [C-0003645] [7b6cf8cf69bec90f674b9b10a64f04e8]

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KEL MArris3433I.[130] This happening with both NS&I (National Savings & Investments) and Network Banking (NWB) transactions was acknowledged. The KEL was passed to a development team to provide a bug fix as part of the S60 rollout but it is unknown if this was ever resolved.

In relation to c) Processing of data in Horizon

5.138 There were various issues with the processing of data within Horizon.

Supporting Documentation

5.139 KEL CharltonJ2752T[131] identified a Horizon bug which became apparent when any counter level corrections made via the "Previous" key led to both the old value and amended value being stored and used in error in the transaction. According to the KEL, a fix was released in the Live environment eight days after the issue was first raised. It is not known how many undetected records were affected and if any further instances were reported following the fix.

5.140 A recently introduced Post Office service "Drop & Go" was shown[132] [133] to have the ability to credit cash ("*money out of thin air*") to the branch account in circumstances where the session had timed out. It is not known how widespread the issue was, but the referenced document discusses the various options the Post Office were looking at to resolve this and other issue with the Drop & Go service.

5.141 SSur343P[134] records an example of a declined network banking transaction that nevertheless resulted in money being taken from the customer's account. The transaction was automatically reversed correctly at the counter but continued to be processed further through

[130] MArris3433I.html, *HORIZON KEL Marris3433I,* 10 December 2003 [POL-0033825] [0e0193f167f883fd85bd79236da96913]
[131] CharltonJ2752T.html, *HNG-X KEL CharltonJ2752T*, 04 October 2011 (last updated 16 April 2013), [POL0039383] [01e9c3402e3301825e37cc68e61b08ca]
[132] Overview v004.pptx, Drop & Go – *Settle to Cash Resolution – issues and options*, 07 October 2016, [POL-
[133]] [4266a3c3129dc5f258dfe7df888b446b]
[134] SSur343P.html, *HORIZON KEL SSur343P*, 30 April 2003 (last updated 16 June 2004), [POL-0034256] [f4355bfbba9c34885a97bc7c9f096671]

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Horizon, resulting in the customer account being debited. This incident would have required the raising of a BIM (Business Incident Management). The eventual discovery of a root cause and resolution of this issue is not known but clearly there were errors in data transfer.

5.142 There are a number of examples[135,136] of E-Pay transactions crediting the customer account twice although only one payment has been taken. The error arose because both Horizon system authorisation agents were incorrectly active at the same time (normally one is active and the other on standby). This error should have been detected via an E-Pay report for reconciliation but remains outside of the control of the Subpostmaster, who would have been unaware of the initial error.

5.143 PEAK PC0063227[137] (detailed PEAK log available in Appendix A) highlighted a bug within the Horizon messaging service (Riposte) which prevented 401 transactions with a total value of £11,708.08 from being processed and impacting on branch reconciliation. A workaround was applied as a short-term fix pending testing of a long-term fix.

5.144 POL-0216412[138] documents the POLSAP outage that occurred in January 2016 resulting in millions of pounds worth of transactions failing to process causing backlog and discrepancy for both Post Office and its customers.

5.145 The attempted system recovery prevented access to the majority of system functionality. Completion of all accounting recovery actions was due by 29 January. It is not known what actual impact this had on branch accounts, other than not being able complete any transactions.

[135] LKiang3526R.html, *HORIZON KEL LKiang3526R*, 25 August 2004 (last updated 7 April 2005) [POL0034590] [67efbfdfc186487e866a8d701cd353e4]
[136] SSur5310P.html, *HORIZON KEL SSur5310P*, 14 May 2004 (last updated 09 October 2006) [POL-0035378] [0d473f335a3b09f8c60f0c9ba08a7ad7]
[137] PC0063227.html, Peak PC0063227, 28 February 2018, [POL-0237798] [8c84cd6299903d0d3bbe0e05de44b924]
[138] POLSAP outage 25-26January 2016.docx, POLSAP outage - 25th& 26th January 2016, 29 February 2016 [POL-0216412] [daf7cd352274946c5dfe164e326bc4c0]

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Uncategorised Horizon Concerns

5.146 A Post Office incident summary document in 2015[139] highlighted a number of high severity incidents between May and June 2015 one of which included a financial deficit found in Global Payment transmission and resulted in a £20 million shortfall within the system (cash flow deficit for Retail and Bureau transactions). The precise underlying cause of this incident is not known and/or whether or how it was rectified.

5.147 An independent technical review[140] carried out in 2010 midway through Horizon Online rollout highlighted some issues and concerns in respect of recoverability following interruptions in service. The report stated:

> *"There is clear evidence from the solution that both Horizon (as a result of the PCI changes) and HNH-X are not able to recover correctly from failures.*
>
> *The most worrying are reconciliation BIMS exceptions – these are failures that require manual intervention by both Fujitsu and Royal Mail. Many of these failures result in end customers of the Post Office not being paid money (the exception shows that a bank believes it has paid out the money, whereas the Horizon/HNG-X system knows it did not pay out in reality".*

5.148 These issues could directly impact branch accounts and covered the period both pre and post Horizon Online rollout. The report went on to state that due to the high volumes of recoverable data the exception workload was causing significant (and unsustainable) workload on both Fujitsu and Royal Mail.

5.149 The risk of data loss arising because of incorrectly shutting down equipment and/or replacing equipment is evident in several scenarios.

[139] Incident Summary – June 2015 v3.pptx, *Incident Summary – Trend Analysis*, June 2015, [POL-0221065] [ef2216b67d7ea7576fc14f5f7369dfb3]

[140] RedAlert_April2010.doc, *Post Office Red Alert – Independent Technical Review, James Stinchcombe, Principal Architect,* 27 April 2010, [POL-0220516] [465299cf1a171e7b871e4b5f11b2f9ba]

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A Post Office training slide[141] specifically outlines this issue in Slide 5 regarding the Horizon Online kit used in outreach branches. The same is true with branch terminals being swapped out[142][143]. In this case incomplete transactions held on the hard drive of a branch terminal that was swapped out were lost when the engineer failed to recover the data from the hard drive; this resulted in data being lost.

5.150 At the Post Office Board meeting of 25th September 2013[148] it was reported that:

> *"Operations Issues – Fallout from Horizon issues seriously damages public and government confidence in the Post Office… Further operational issues uncovered (but considered lower risk and lower impact)"*

5.151 The disclosed document is heavily redacted and therefore it is not clear what "operations issues" were being discussed.

5.152 Appendix H is a constructed summarisation of the processing components within Horizon that have been identified as common points in which discrepancies have been recorded. A selection of the KELs referred to in this report have been used to illustrate points in Horizon where anomalies have either been detected or have failed to complete the full processing.

Extent Conclusion

5.153 It has not been possible to measure the full extent of errors in data recorded within Horizon arising from a) b) and c) above since:

i. it is possible that there are further reports and statistics that might indicate further extent of errors which have yet to be disclosed;

[141] Core & Outreach Brief HOL v1.pdf, *Core & Outreach Brief*, June 2010, [POL-0176232] [594a4d1508f124dc307797c92b1d3aed]
[142] PC0093382.html, *Peak Incident Management System*, 5 August 2003, [POL-0265630] [c3393ab177a14280dfe535b7b34282a6]

[143] Post Office Limited Board Single pdf Final.pdf, *POST OFFICE LTD BOARD MEETING,* 25 September 2013, [POL-0215589] [13ebf71fb7ca3ac8a8e08a7ba48dfafd]

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ii. The information contained within documents such as KELs etc is not complete or comprehensive in respect of the extent of the issue recorded in the first instance (or the full impact across the estate and on the Subpostmaster);

iii. It is not clear from those PEAKs (bugs/errors/defects) that have been added to a software release whether the symptoms identified in the first instance may have manifested and been recorded under a new/different KEL/PEAK.

5.154 However, from the documented examples of known errors evidenced in this report alone (aside from those unknown), it is clear that significant errors in data recorded within Horizon have occurred.

Measures and Controls to prevent/detect/identify/report/reduce errors in Horizon

5.155 There are various methods and controls implemented within Horizon by means of electronic system checks and manual business processes which sought to prevent/detect/identify/report and reduce errors in Horizon. Namely (not exhaustive):

a. Reconciliation reports and processes (Section 6, Page 96)

b. Alert messages at the counter (Section 7.1, Page 118)

c. System alerts for Fujitsu (Section 8.1, Page 127)

d. Horizon Support Service Facilities, chiefly TfS and PEAK systems (Section 4.66, Page 33)

e. Known Error Logs (Section 4.87, Page 38)

f. Software releases for bug fixes (Section 4.92, Page 39)

g. Audit Systems (Section 4.51, Page 30)

h. Journal Sequence Numbering (Section 4.52, Page 30)

i. Audits and Conformance to Quality Standards Checks

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5.156 The Post Office Account Customer Service Problem Management Procedure document[144] identifies the process metrics and key performance indicators required for measuring the effectiveness of the process and service specifically in relation to Problem Management. The Problem Management Procedure is set out in more detail at Appendix E (Section 15.33, Page 194). Relevant to this section and Issue 6 are the metrics and KPIs to measure/control and reduce the risk of failure to detect, correct and remedy Horizon errors or bugs:

a. Number and impact of incidents occurring before the root cause of the problem is identified and resolved

b. Number of repeat incidents following any corrective action

c. Number of problem records arising from proactive actions and trend analysis

d. Number of changes arising from proactive actions

e. Percentage of problem records without an action plan

f. Average length of time to resolve problems

g. Number of incidents closed without a KEL

h. The number of Problem Records arising from Managed Change (MSC, CP) activities

i. The number of Problem Records arising from the implementation of new services / major releases.

5.157 From the above, it is my opinion that Post Office should be aware of all recorded bugs/errors/defects in addition to those previously acknowledged by them, from the process metrics compiled above.

5.158 Of specific interest is the POL monitor that tracks the number of records arising directly as a result of managed change activities[145]. No

[144] SVMSDMPRO0025_5.doc, *Post Office Account Customer Service Problem Management Procedure*, 12 July 2016 [POL-0146787] [fe6a96a3615a63e094682c7efaa33090]
[145] SVMSDMPRO0025_5.2.doc, *Post Office Account Customer Service Problem Management Procedure - Version*

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disclosed logs have been found in respect of these problem records that are listed as being reported monthly.

5.159 Requests have been made in relation to making such Management Information reports. At the time of writing, these have not been made available for analysis.

5.160 The Witness Statement of William Membery[11461147] (POLs Head of Quality and Compliance) states:

> *"The Horizon system (both Horizon Online and Legacy Horizon) are and have been subject to audits to internationally recognised standards. These audits check both technical aspects of the system and the working practices of Fujitsu around Horizon. They provide assurance that Horizon and Fujitsu are working within a robust system of control measures. The audits review both the design of the controls and their implementation in practice. Completion of these audits provides assurance to Fujitsu, Post Office and other third parties (e.g clients of Post Office) that the financial information within Horizon can be relied on."*

5.161 Whilst both Horizon and Horizon Online contain a number of measures and controls designed to check system integrity, these mechanisms have been shown to have failed. This is a point agreed upon in the Joint

Statement. It has been identified that known issues/bugs were often deferred and dealt with on a cost/benefit basis. The Risk and Compliance Committee meeting minutes of 18 September 2013[148] highlight an instance particularly in relation to an audit performed by Ernst & Young:

> *"It was reported that following the recent Ernst & Young external audit four risks [sic] been identified. Three of the risks raised had been*

[146] *.2*, 15 September 2017, (1.4 – Process Metrics and Key Performance Metrics), [POL-0512874] [dbe89de2e88cfb6494d3820228e17f0e]
[147] Witness Statement of William Membery – 28.09.18.pdf
[148] R&CC Minutes 18th September 2013.docx, *Risk and Compliance Committee (R&CC) Reference: R&CC/MIN/SEP13*, 18 September 2013 [POL-0217378] [4d23226da8aca4bc0aa3940b9f450325]

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addressed however the final risk, relating to the communication by Fujitsu of changes made to the Horizon system, was still outstanding.

It was identified that it would cost over a £1m to implement the mitigation being suggested by the audit and that this was not proportionate to the risk being managed".

5.162 The Ernst & Young management letter arising from the 2011 audit[149] [150]recommended changes to strengthen the change management process. They noted that POL was not usually involved in testing fixes or maintenance changes to the in-scope applications (which includes Horizon Online) and they were unable to identify an internal control with the third-party service provider to authorise fixes and maintenance changes prior to development for applications. The risks were outlined as follows:

"There is an increased risk that unauthorised and inappropriate changes are deployed if they are not adequately authorised, tested and approved prior to migration to the production environment"

5.163 Further, as referenced at 5.188, there is evidence that despite procedures being in place, these were not being followed by Fujitsu.

5.164 In the circumstances, whilst bugs/errors/defects may have been identified, they were not necessarily fixed instantaneously, and control was not retained over the process of fixing. The risk of error was therefore not reduced as far as possible, but rather it was subject to a commercial assessment.

5.165 It is acknowledged that simple fixes ought and were implemented to either fix bugs or provide additional data validation checks pothapragadac4359R[151] & Marris4123N.[152]

[149] POL Management Letter FINAL.docx, *Post Office Limited – Management Letter for the year ended 27 March* [150] , (Section 4 – Current Year Recommendations – IT Specific) [POL-0219218] [9d7862698d2a0f6af2a3c55590763bb7]
[151] Pothapragadac4359R.html, *HNG-X KEL pathapragadac4359R,* 19 April 2011 (last updated 16 August 2011), [POL-0038695] [f0a4dd0a787be69689f36b84a2b5753c]
[152] MArris4123N.html, *HORIZON KEL MArris4123N,* 28 November 2003, [POL-0033810] [9b0bb96d10e84cc47f2cf4bd0d271f37]

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5.166 Review of 'S80 Release Note - Deferred PEAKS List - Counter[153] which is an addendum to the S80 Release Note (dated 2005) details the PEAKS which remained outstanding once S80 was to be implemented (this is pre-Horizon Online rollout and suggest that only PEAKs that impact the Horizon counters are included). Whilst many are cosmetic low severity items, PC0121925 reports an incident caused by a problem in Riposte which is an "existing and very intermittent" problem in 'Live' (it is assumed this relates to the Production Horizon Live data environment). It further states that the underlying cause would require Escher to deliver software code not available for S80 or S80R (suspected further release). The document further states that "*Development will continue to investigate to identify whether a 'work round' [sic] change*" could be made in the code.

Failures of measures and controls to prevent/detect/identify/report/reduce the risk of errors

5.167 Whilst controls were in place, as per the Joint Statement, it is agreed that evidence exists to show that these automated mechanisms have failed to detect and record anomalies. Similarly, applied manual processes are reported to have been subject to variations of quality (operation outside of process).

5.168 [154] An internal presentation from the Post Office[157] shows the helpdesk error processing workflows (at slide 9). Whilst one of these work flows shows the process when an error is detected internally by the Post Office, the four other workstreams deal with errors from different external sources, namely:

a. "Branch discovers error/unbalance and calls NBSC"

b. "Client discovers error"

[153] CSREN032_1.doc, *S80 Release Note - Deferred PEAKS List - Counter*, 13 October 2005 [POL-0083919] [1aa524ee9a53955ee392e5621f0ee4df]
[154] Finance L3 pack.pdf, *Business transformation Finance Wave 1,* 1 October 2014 [POL-0218441] [a26a0ec0f6c8dbc20b753b200de725bb]

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c. "Customer discovers error and call customer care"

d. "Branch discovers error and calls FSC directly"

5.169 The concern with the above is that if the Branch, Client or Customer do not detect and therefore do not report the error, then this could well have an impact upon Subpostmaster branch accounts without their knowledge.

5.170 "Review of Key System Controls in POLSAP"[155], an internal Post Office document, highlighted procedural issues occurring in respect of transaction data, access to software and change management. The risks and implications identified included errors not being identified or resolved leading to potential discrepancies in client balances.

5.171 A Detica NetReveal report issued in 2013[156] indicates, in its key findings at section 1.2, four areas contributing to risks in relation to policy, processes and information used by the Post Office to track and manage the compliance of branches:

a. Widespread non-conformance to Post Office policy and processes by branches, with an institutional acceptance that errors, workarounds and non-conformance exists;

b. Complexity and fragmentation of information systems which hamper efforts both to gain an insight into branch behaviour and root causes;

c. Ineffective process, policy and working practice in the central operational teams to gather information, prioritise and act in a coordinated manner;

d. Technology available to central operational teams was not fit for purpose; analysis of large data sets in performed on an ad-hoc

[155] AR12.037.ppt, *Review of Key System Controls in POLSAP*, November 2012 [POL-0217341] [dc5b5ce76e817ce54cadb2d511c4ce11]
[156] NRRA1207 10D007-0 50 Draft.doc.docx, *Fraud and Non-conformance in the Post Office; Challenges and Recommendations*, 1 October 2013 [POL-0216106] [f41e9587582dc4691967c8e22d4aa64e]

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basis of data subsets copied into Excel and tasking of teams is initiated and managed through email.

5.172 Given that process, and policy adherence is crucial for effective management and resolution of shortfalls and discrepancies within Horizon, the report indicates that levels or risk were not managed as appropriately as was possible.

5.173 Referring to the instance identified at paragraph 5.49 above; it is observed that additional human operated manual processes could contribute to electronic errors affecting branch transactions.

5.174 The End to End Reconciliation Reporting document from 27 February 2012[157] states:

> *"There is no formal reconciliation produced between the POLSAP System and the Credence transaction stream. The Credence stream should therefore not be used to verify financial integrity and Post Office should ensure the POLSAP System Transaction information is used for this purpose."*

5.175 The report regarding the reversal dispute conducted by Helen Rose states:

> *"On looking at the credence data, it clearly indicates that the reversal was completed by JAR001 (Subpostmaster) at 10:37 04/10/2012 and was reversal indicator 1 (existing reversal) and settled to cash."*

5.176 It is therefore relevant to question why Post Office were using Credence data to initially investigate disputed transactions. Whilst it is evident that it was understood by Post Office in this instance to request assistance from Fujitsu for further material to investigate this dispute, there appears to be further issues with the data provided by Fujitsu.

5.177 Observations of the disclosures illustrates that the initial report states "a transaction at 10:42", whereas the credence data file shows 10:32

[157] SVMSDMSD0020_2.2.doc, *End to End Reconciliation Reporting*, 27 February 2012 [POL-0124572] [aaedd5051156619c50296d04f6b2e779]

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with the reversal at 10:37. Fujitsu's data states the transactions are at 9:32 and 9:33 and reversal timestamp is 9:37.

5.178 Whilst this hour difference between the data sets might be easily traceable for Fujitsu, it is not clear how easily it would have been to investigate issues where the Subpostmaster was not sure of what time things went on erroneously in the system, or that it was a reversal specifically.

5.179 Further to this point, an Ernst & Young review of Post Office's systems of internal control conducted in March 2011[158] identified (amongst other issues) various issues with the Credence application.

5.180 Particularly, weak change controls within the back end of the systems allowing Logica developers (the third-party provider) to move their own uncontrolled changes into the production environment, which I understand to be both Credence software code and the data within Credence used for audit evidence. Further documentation to approve fixes and patches applied to Credence outside of the release process were lacking, therefore linking changes to issue tickets to record the original request for the bug fix was not possible.

5.181 Front end change process weaknesses were also observed. The following noted:

> *"During our walkthrough of user administration of the front end of Credence we noted several users with administrator rights, including some generic users (this is noted below as a separate point). These users have the access rights to create and amend reports, including those which may be relied upon for audit evidence. These users can change report design, and processing without documented request, test or approval. When users have the rights to change reports that are used by the business for reconciliation, exception reporting or other processing, there is the risk that the reports are manipulated either intentionally or accidentally."*

[158] POL Management Letter FINAL.docx, *Management letter for the year ended 27 March 2011*, August 2011 [POL-0219218] [9d7862698d2a0f6af2a3c55590763bb7]

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5.182 This is consistent with my opinion 5.99 in regard to manual fixes where all manual entry activities enhance the likelihood and potential for error.

5.183 Poorly handled changes introduced by Post Office to processes in Horizon have also caused errors in accounts. A presentation[159] made to the Post Office Operations Board in 21 July 2017 explained (at page 86) that changes were instructed (in 2015) as to the way that "MoneyGram" is dealt with by the Subpostmasters. These changes included acceptance of Debit/credit card payments. The presentation reported the impact of this new working practice, including;

a. "Branches retrying transaction that had failed due to timing out

b. Branches reversing a transaction but not cancelling the AP part of the transaction

c. General lack of understanding in the Branch of how the process works, especially for refunds…"

5.184 The same presentation also referenced that *"Camelot – Operation simplification has gone live… early indication that this has accounted for*

50% of the issues". No detail has been provided as to what the Camelot issues were, but up until this point in the chronology Camelot was shown as the most frequent cause of Transaction Corrections being raised to modify branch accounts.

5.185 The witness statement of Akash Patny[160] refers to his experience of imbalances whilst dealing with Moneygram transactions. This witness statement supports highlighted reconciliation issues due to timeouts occurring between Post Office and Moneygram[161]. As acknowledged in

[159] Operations Board 21 July 2017.pdf, [POL-0221328] [9c45e0be3ff2b6773447cc6e41db5f46]
[160] Witness Statement Of Akash Patny, 28 September 2018, (MoneyGram Issue – Page 3)
[161] Items at Half-Year.docx, *Watchlist Items (continuing from Q1/2),* 2016, [POL-0220630] [7ac18146eb4f0ced505db4b34bac6724]

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the document this could affect branch accounts due to reconciliation differences.

Supporting Documentation

5.186 acha2230K[162] highlights a problem with additional checks which were implemented to identify system errors/inconsistencies when balancing during branch In this instance the additional checks caused account balancing errors on rollover. The note issued by SSC states, *"This should never happen - something has gone horribly wrong. Or possibly the checks haven't been implemented as intended."* This suggests a recurring issue since the checks themselves appear to have failed. It is not known how or/if this was resolved going forward.

5.187 dsed2049S[163] highlights the lack of system communication and/or support communication in respect of certain system features which could subsequently result in errors. In this case withdrawn products were converted to cash on rollover but the loss was carried forward into the next period instead of being dealt with there and then. The bug continued until a fix was applied 6 months after the KEL was raised (ensuring an alert was raised warning the Subpostmaster of the occurrence). However, it is further noted in the log that POL failed to

tell branches to "rem out" some products before they were withdrawn leading to a cash loss that would not become apparent until the stock unit was balanced again.

5.188 Fujitsu themselves were also open to mistakes. It is recorded that a Fujitsu engineer failed to follow the correct process when replacing a branch terminal resulting in multiple customer bills not being paid[164].

The PEAK log states:

[162] Acha2230K.html, *HNG-X acha2230K,* 18 October 2013 (last updated 25 October 2013), [POL-0039583] [49a4bca2b1c898a29ea2223960574d9]
[163] dsed2049S.html, *HNG-X KEL dsed2049S,* 14 June 2011 (last updated 03 October 2013), [POL-0039549] [34dfdbd02c7e909cbbefaebd5a4743df]
[164] PC0093382.html, *Peak Incident Management System,* 5 August 2003, [POL-0265630] [c3393ab177a14280dfe535b7b34282a6]

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> *"I believe that we shall have to confess to POCL that we have not followed the correct procedure and we should advise that POCL make manual payments….."*

5.189 The reconciliation process used by POL to assist with identifying any accounting differences is not able to easily identify genuine differences and/or differences resulting from external APS transactions from old trading dates. This is evidenced in acha3250R[165][166] which, when submitted to the development team, was considered too complex to fix and was subsequently closed. This would add greater complexity to managing the reconciliation process and having an accurate picture at branch level of APS transactions.

5.190 There are various documented examples of circumstances in which Horizon erroneously created duplicate Journal Sequence Numbers ("JSN") against the same transaction.[167,168,169][170] JSNs should be (by design) always unique as explained by Gareth Jenkins':[171]

> *"…At this point a check is made that indeed there are no missing or duplicate jsns for any counter and should any be found an alert is raised.*
>
> *Note that this could only happen as a result of a bug in the code or by somebody tampering with the data in the BRDB and this check is included specifically to check for any such bugs / tampering"*

5.191 It is not currently clear how it would be determined whether duplicate JSNs arose because of a bug or tampering. However, the existence of duplicates in the first instance is in itself a failure of measures and controls.

[165] Acha3250R.html, *HNG-X KEL acha3250R,* 14 February 2013 (last updated 10 February 2015) [POL-
[166]] [3675c6282d759025c44475aeed0b6c70]
[167] GCSimpson2242L.html, *HNG-X KEL GCSimpson2242L*, 08 March 2006 (last updated 05 December 2010) [POL-0038135] [cd3dcd109ec897a07328c70ca9d125d6]
[168] MithyanthaJ1937S.html, *HNG-X KEL MithyanthaJ1937S*, 06 May 2010 (last updated 09 August 2016) [POL0040508] [d56a274636043f38e96d2e9f3609d949]
[169] DRowe5415Q.html, *HORIZON KEL DRowe5415Q*, 08 October 2002 (last updated 14 December 2012) [POL-
[170]] [4e885614e11d9c4abf33cfbc4f6ef86a]
[171] Horizon Online Data Integrity for POL, Gareth Jenkins.pdf, 2012 [POL-0021989] [8dbd13d4aae9179dcaea4f62f3ab3572]

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5.192 Aside from instances where bugs/defects and errors are recorded to have affected Horizon branch accounts, a document entitled 'Transaction Correction - Bramptom.doc[172]' indicates that due to a fraudulently programmed credit card, Subpostmasters cash declarations indicated shortfalls. This affected several branches and it appears it was through the Subpostmaster's diligence that the issue was finally concluded.

5.193 Therefore, the assumption that POL's processes would detect anomalies by way of shortfalls/discrepancy investigations on behalf of the Subpostmaster appears to be incorrect. It is evident that in a number of circumstances it is the Subpostmaster who highlights the anomaly and pursues rectification often after disputing the initial response from Post Office. This is further reinforced in consideration of the Common Issues Claimant's witness statements.

5.194 In a recent strategic and financial plan[173] it was acknowledged that Horizon was designed two decades ago for an environment very much different to the one we have today. In addition, both branch and back office systems were also acknowledged as being end of life. A recent Board Paper[174] also concluded that it was operating with a far higher operational risk profile than is accepted by the Post Office when making investment and project decisions. It is difficult to see how the Post Office could improve things further and mitigate against risks of issues impacting on branch accounts without a substantial investment in modernising their IT systems.

5.195 The Post Office cash management proposals contained in a report dated 4 August 2017[175] suggests that they were actively considering ways to

[172] Transaction Correction - Brampton.doc, *Email correspondence between Mark Baker and Karen Arnold*, March/April 2008 [POL-0018081] [7754e449931156b8339040a17cd3f3cb]
[173] Post Office Strategic and Financial Plan 2021 – Board approved & final.pdf, *Post Office Strategic and Financial Plan 2018-2021,* November 2017, [POL-0219032] [90e37c6a1ff574eb1d8f8007f26ed336]
[174] Back Office Tower Transformation – Board Decision Paper 24 Nov 2016_v02.docx, 29 September 2016, Page 4, [POL-0221162] [78261d52e6ce57c368546592c99fadf5]
[175] Cash Management Programme -Business Case June 2017 v1.5.docx, *Business Case – Cash Management*

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improve processes impacting on many of the issues raised above. It is my opinion that, whilst the Post Office was looking at ways to improve cash management, it is also indicative that the system was generally far from perfect and there existed a real risk of bugs/errors/defects adversely impacting on branch accounts despite the processes in place at the time to prevent this.

Opinion Summary

5.196 In light of the above observations and findings aside from the acknowledged bugs/errors/defects that Post Office have recognised, I opine that it was highly likely for bugs/errors/defects to have the potential to both (a) cause apparent or alleged discrepancies or shortfalls in relating to Subpostmasters' branch accounts/transactions and (b) undermine the reliability of Horizon to accurately process and record transactions.

5.197 As highlighted by select Known Error Logs (KELs), issues thought to have been fixed recurred in different circumstances, therefore the reliability of Horizon to accurately process and record transactions is questionable.

5.198 It is clear that in some instances it is not always apparent whether recurring discrepancies were as a result of system bugs or the Subpostmaster's own actions, or other things beyond the control of the Subpostmaster.[177,178] However the fact that the SSC support team were unable to assist or identify the root cause does undermine the credibility of Horizon itself.

5.199 Whilst both Horizon and Horizon Online contain many measures and controls for ensuring system integrity, these mechanisms do/have failed. It has been identified that known issues/bugs were often deferred and dealt with on a cost/benefit basis. Therefore, whilst

Programme, 04 August 2017, [POL-0221342] [2687475ac747f28a22c51c53bbc50f30]

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bugs/errors/defects may have been identified, they were not necessarily fixed instantaneously, therefore the risk of error was not reduced as far as possible, but commercially assessed.

5.200 Similarly, processes designed to ensure controls and measures were effective are identified as requiring improvement.

[177] Call Details E-0602230104.htm, *Post Office Account S70 Archive4.1 Call E-0602230104*, 23 February 2006 [POL-0011223] [cc0ec7afd6adfe07758adcfa4f4573ca]

[178] 105000759.pdf, *Post Office Account NWB01 Archive4.1 Call E-0402251077*, 25 February 2004 [POL0019675] [f513c96c9a72b75c3bb263c07a851a69]

6. Reconciliation and Transaction Corrections

Issue 5 - How, if at all, does the Horizon system itself compare transaction data recorded by Horizon against transaction data from sources outside of Horizon? Issue 15 - How did Horizon process and/or record Transaction Corrections?

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6.1 The process by which Post Office compares transaction data recorded by Horizon against transaction data from sources outside of Horizon is known as Reconciliation. End to end reconciliation is the mechanism by which Post Office establish which transactions are complete and correct and which are not.[176]

6.2 Post Office states[177] that:

> *"…each and every reconciliation error is the result of some systems fault. That fault might, for example, be a software fault (introduced through either design or coding), a system crash, or a telephone line being dug up. Such faults may affect transactions, thus it is the job of the reconciliation service to detect when and how any transaction is affected by any system fault.".*

6.3 In the same document Post Office state:

> *"…not all system faults will lead to corrective action and this is generally done on a contractual and/or cost benefit basis"*

6.4 Reconciliation reports and the known system components to facilitate it are set out further in Appendix E of this report. For a diagrammatic representation of the business applications applied to reconciliation as at 2010 see Appendix B (Figure 5). In summary, reconciliation is a complex process involving many system components of which there are both electronic and human interactive process elements.

6.5 It should be noted that as Horizon progressed to Horizon Online the reconciliation systems and processes continued to be developed.

Horizon Architecture

6.6 Dated 2010, Horizon architecture diagrams show that there are four main areas within the Horizon Architecture:[178]

[176] SVMSDMPRO0012.doc, *Reconciliation and Incident Management Joint Working Document*, 18 March 2013 [POL-0032909] [b13d82f1ad57d0105cefbc3bfe7406c3]
[177] SVMSDMPRO0012 - Reconciliation and Incident Management Joint Working Document.doc, *Reconciliation and incident Management Joint Working Document*, 18 March 2013 [POL-0219191] [7ccc36ff81ef72450f60a1275c1153a5]
[178] POL-0003093.pdf, *Horizon Architecture Diagrams* (Page 3), 8 March 2010 [POL-0003093]

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a. POLFS - financial accounting system based on SAP (later becoming

POLSAP)

b. Reference Data Proving - environment in which changes to Reference Data are proved before releasing into live (Reference Data controls things such as which products are sold, their price and where in the menu hierarchy they are displayed).

c. Branches

d. Core Horizon - the central systems that support Horizon

6.7 Core Horizon Components for Transaction Processing:

a. Batching Services enable Post Office to send branch data (either all transactions or in a summarised form) to external systems. It also receives batch data from external systems for distribution to branches. The systems to facilitate this within Horizon are:

i. TPS (Transaction Processing System) - provides daily data to other systems including POLFS, POLMIS and HRSAP. Also provides a feed to First Rate for Bureau transactions

ii. APS - (Automated Payment System) - provides daily data to AP clients (British Gas, BT etc).

iii. LFS (Logistic Feeder Service) - provides data on pouch collections and receipts at branches to SAPADS on an hourly basis. Also, nightly data on cash held in branches.

b. The systems that receive data from external systems within Horizon are:

i. APS - receives customer and tariff data for Quantum and Water

Card service once per day

[00195d1cbb0017bd34e7c68b7930c1cf]

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ii. LFS (Logistics Feeder Service) - receives planned order data (once per day) and pouch contents information (potentially hourly).

iii. RDMC (Reference Data Management Centre) - receives Rates and Margins data for Bureau service.

c. Reconciliation and Enquiry services for online authorisation Horizon specific systems are:

i. DRS (Data Reconciliation Service) - reconciles individual transactions for the DCS, ETU and Banking Services.

ii. TES (Transaction Enquiry Service) allows Post Office to query transactions status for banking (only)

iii. DWH (Data Warehouse) contains banking, ETU and DCS data

iv. APS (Automated Payment System) which reconciles transactions between itself and TPS (Transaction Processing System).

External Systems/Clients

6.8 As per POL-0003093[179] (2010), Core Horizon communicates with the following systems:

a. Banks (LINK (Vocalink) A&L (Santander), CAPO) for online authorisation of banking transactions (DCS for debit and credit card authorisations) and transaction data used for reconciliation

b. Online Clients (e-pay, Streamline, DVLA) for online authorisation of transactions and (for e-pay and Streamline) data used for reconciliation

c. SAPADS - A Post Office system that handles cash and Foreign Currency logistics. Data includes cash on hand statements from

[179] POL-0003093.pdf, *Horizon Architecture Diagrams* (Page 3), 8 March 2010 [POL-0003093] [00195d1cbb0017bd34e7c68b7930c1cf]

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each branch, planned orders, replenishment deliveries and delivery/collection data

d. HRSAP - A SAP system that handles remuneration to the branch franchises and 'multiples' such as Tesco.

e. POL MIS - An Oracle based system to provide MI reporting to Post Office.

f. First Rate - Provides bureau rate information. It is also passed all bureau transactions to allow First Rate to undertake MI.

g. Siemens Metering - Provides Rates and Customer data for Quantum gas pre-payment card.

h. AP Clients - Transaction information for Clients where payment information is collected by Post Office.

i. Royal Mail and Parcel Force Worldwide - track and trace information for parcels and letters taken in branch.

j. RDS - Post Office system that provides Reference Data

6.9 POL-0219319[180] illustrates a more detailed breakdown of external service components. See Appendix B Figure 8.

6.10 In 2012 Post Office described[181] the "Core transactional Finance Systems" as:

[180] HorizonContext.jpg, *Horizon Service Context Diagram*, 9 August 2018 [POL-0219319] [0005427fe3eec69b47bce277611df037]

[181] Phase 2a) consolidated output.pdf, Finance Roadmap Project, 3 September 2012, [POL-0215782] [ac4469b27e384fe4440f351c115d8108]

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"... Essentially stable from a technical perspective but have been built up organically overtime and are potentially integrated in an inefficient manner with multiple interfaces" and "… in some instances the systems still do not provide the functionality required by the business and manual interventions and rudimentary technologies have had to be implemented"

Transaction Acknowledgements

6.11 Some Post Office transactions (e.g. Lottery, Paystation, ATM) are not transacted through a Horizon terminal but instead via separate machine. However, cash taken, and stock vended for these transactions needs to be accounted for on Horizon as part of the overall branch cash and stock holdings. To ensure that Horizon is kept synchronised with the records on the third-party equipment a 'Transaction Acknowledgement' (TA) is often used.[182]

6.12 Overnight the third-party equipment reports the volume / number of transactions to Post Office.[183] Post Office's data centre then sends an overnight electronic message to each branch's Horizon terminal which contains details of the volume / number of transactions conducted within the branch on the third-party equipment. This is the transaction acknowledgement.

Reconciliation Processes

6.13 Reconciliation processes utilise a set of printable electronic reports.[184]

6.14 Each day, branch account transactions are harvested and processed through the Horizon system in order to inform Post Office Finance of the aggregated totals for products and services sold. This enables Post

[182] Factfile.DOCX, *Initial Complaint Review and Mediation Scheme DRAFT Factfile*, 16 April 2014 [POL-0022996] [d24556f1009f1881f42a2dbb5b8154de]
[183] Factfile.DOCX, Initial Complaint Review and Mediation Scheme DRAFT Factfile, 16 April 2014 [POL0023002][Hash d24556f1009f1881f42a2dbb5b8154de]
[184] SVMSDMPRO0012_3.doc, *Reconciliation and Incident Management Joint Working Document*, 30 April 2012 [POL-0125134] [ad897ac9ff5edb2de37bfb8c4e9dc362]

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Office to provide settlement figures to their clients. Reconciliation is therefore used by Post Office Ltd to provide financial and business reconciliation at transaction level to demonstrate that each transaction is complete and correct and report on any transaction that is not.[185]

6.15 The Horizon system contains integrity checking functionality to monitor transaction progression and integrity of transactions as they flow through the system.

6.16 The 'state' of transactions is recorded as they travel through the system with any exceptions (transaction anomalies) harvested along the way in order that they can be dealt with using largely manual processes.

6.17 Various report sets facilitate the reconciliation process within Horizon for both those transactions to/from approx. 130 external clients[186] and within the core Horizon components themselves (these are further set out in Section 8 and Appendix E.

6.18 A Horizon Service Reconciliation Exceptions document states:

> *"Due to the potential dynamic nature of the Reconciliation Service, where there is the potential for new exception types to be generated as a result of software errors within new releases or reference data, it has been agreed that these procedures will be documented outside of the formal Reconciliation & Incident Management CCD document set."*

6.19 Where there is a need for manual intervention due to bugs/data corruptions/incidents/errors, Post Office and Fujitsu teams interrogate transaction data and reports to establish and modify any erroneous data.

6.20 Reconciliation is therefore also used by the Reconciliation Service to check that the corrective action is effective.[188]

[185] SVMSDMPRO0012_3.doc, *Reconciliation and Incident Management Joint Working Document*, 30 April 2012 [POL-0125134] [ad897ac9ff5edb2de37bfb8c4e9dc362]
[186] Witness statement of Angela Van-Den_Bogerd

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6.21 Since reconciliation facilitates the core operations of Post Office, there are various services, departments and processes that comprise it. Many of which have evolved through the lifespan of Horizon to Horizon Online.

Reconciliation Services/Departments

POL Finance

6.22 The POL Finance department is responsible for reconciling data within Post Office central systems which relate to enquiries from Post Office Clients[187]. They are also responsible for generating Business Incidents in the event of error discovery.

6.23 In Horizon Online POL Finance use the CTS (Client Transaction Summary) as the basis for settlement with Post Office Clients. If the CTS file is not delivered by Fujitsu, POL Finance are to use the APSS2133b file to manually calculate any settlement due.

Fujitsu Management Support Unit (MSU)

6.24 The MSU Unit are responsible for resolving exceptions arising within the Horizon estate.

6.25 MSU are responsible for various reconciliation reports namely; *"A&L Reconciliation File Delivery Report", "CAPO Reconciliation File Delivery Report", "LINK Reconciliation File Delivery Report"* and the *"DRS Reconciliation File Delivery Report"*.[188] The reports are produced For the MSU, generated by system processing.

Fujitsu Third Line Support (SSC)

6.26 Within reconciliation, Service Support Centre (SSC) are responsible for repairing any corrupted or exception transaction data within the Horizon system.

[187] CSPRO111_5.doc, *TPS Reconciliation & Incident Management*, 17 October 2005 [POL-0083720] [2079d9210ce25f44a77a55ee3efb67eb]
[188] NBLLD079_0.1.doc, *TES Reconciliation File Delivery Reporting Low Level Design*, 20 August 2004 [POL0077442] [8606de4f0ea60322502ed8a00de43b1e]

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6.27 The tools and methods by which this is carried out are covered under Section 9 below.

Reconciliation Exceptions

6.28 Where transactional data does not conform to its expected format or in comparison to copies of itself or corresponding records then it causes a reconciliation error.

6.29 Post Office acknowledge that errors may occur within counter transactions or during the harvesting process. In addition to errors highlighted by Fujitsu Services within the TPS Report Set, errors may also be discovered by Post Office Ltd Finance (POL Finance) when reconciling data within its central systems or which relate to enquiries from Post Office Clients.

6.30 In September 2012 an internal Post Office document[189] reported; "*There is a data reconciliation service delivered by Fujitsu to reconcile the APS and TPS streams. A suite of reports is produced*". Against this section are the report are "*Issues/Risks*" which state; "*Actions to resolve some differences are not well understood and can be lengthy to resolve eg BIMs*". Post Office record the business impact as; "*Manual posting are needed. Protracted branch and customer enquires*".

6.31 Reconciliation and Incident Management documentation identifies that an incomplete transaction is not necessarily a Reconciliation error, but it might become one if it is not completed in a timely manner.[190]

6.32 It also further states that (regarding reconciliation errors arising from system faults):

> *"It is acknowledged that not all system faults will lead to corrective action as this is generally done on a contractual and/or cost benefit basis."*

[189] Phase 2a) consolidated output.pdf, Finance Roadmap Project, 3 September 2012, [POL-0215782] [ac4469b27e384fe4440f351c115d8108]
[190] SVMSDMPRO0012.doc, *Reconciliation and Incident Management Joint Working Document*, 18 March 2013 [POL-0032909.doc] [b13d82f1ad57d0105cefbc3bfe7406c3]

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Data Reconciliation Service (DRS)

6.33 The Data Reconciliation Service is the system used to reconcile transactions carried out with Financial Institutions.

6.34 For a transaction to be reconciled and considered in a 'complete' state it is necessary that the DRS finds three components to it:

a. C112 (A transaction sent from TPS to Post Office Finance System and received by the DRS)

b. C12 (Transformation of a Confirmed (C1) message as written to the DRS)

c. C4 or D (C4 = Confirmed Client Transaction authorised, D = Transaction reconciliation difference highlighted and notified to DRS)

6.35 If one of the above components is incomplete, corrupt or duplicated it is recorded as being in an exception or error state and should appear on the Network Banking report NB102.[191]

6.36 The following reports are critical to reconciliation and are recorded as produced daily:

a. NB000 - DRS Summary

b. NB101 - Network Banking Settlement Statement

c. NB102 - Exception Summary

6.37 An F99 transaction is a transaction state that indicates that a reconciliation error has been reported but POL has advised that the issue has subsequently been resolved. This state is set using the DRS Workstation application that is used by Fujitsu Security Operations team.[192]

[191] POL-0032841.doc, *Network Banking Reconciliation and Incident Management Processes*, 26 February 2003 [POL-0032841] [907539a6845da640795b670f2015199b]
[192] POL-0032990.doc, *End to End Reconciliation Reporting*, 4 September 2017 [POL-0032990] [7f79ebcdead957d0d4019672976d25f4]

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6.38 Post Office reported in response to my Request for Information that 10,000+ transactions per week suffer from problems and are not automatically reconciled. Such transactions require manual intervention for the reconciliation to take place. Where there is manual correction applied within the system, there is the potential for input error that may impact the financial status for the branch and/or end client.

6.39 Appendix G

[See Spreadsheet]

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6.40 Appendix H provides a pictorial summary of the processing components within Horizon which have been identified as the most common points in which discrepancies can be captured.

Transaction Disputes

Enquiry Based Banking Transaction (EBBT)

6.41 Where Fujitsu has received notification from Post Office Ltd via the HSD that it wished to query a particular transaction.

Disputed Banking Transaction Notice (DBTN)

6.42 Raised by POL Finance via HSD after notification from either a Post Office branch or Network Business Support Centre (NBSC).

6.43 Where Fujitsu has received notification from Post Office Ltd via the Enquiry Service following a query by the 'End' customer relating to the state of his / her account.

Reconciliation Summary

6.44 Although there are various integrity check points and manual processes observed within the reconciliation process, this has been an evolving progression since Horizon was first introduced. Reconciliation processes have developed further with the system and technological progression of Horizon Online.

6.45 Whilst the reconciliation process within Horizon handles the integrity checking of transaction data and potential anomalies through the various report sets, it does not necessarily ensure all anomalies or discrepancies are resolved as this becomes a more manual process. Further, manual processes applied to correct data anomalies also have the potential to introduce further errors.

6.46 In consideration that Branch account positions were interpreted and reviewed from data flows through to Post Office back end systems (which would determine whether Transaction Corrections were to be applied), the following is considered relevant:

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> *"POLSAP – Following investigation by Fujitsu, Logica and Ingenico, the root cause of a long outstanding problem with missing data within POLSAP was identified as out of range dates which failed the Credence validation (in excess of 90 days). Ingenico has corrected the data and P&BA has advised that the mismatches have been cleared within the accounts. A permanent preventative measure is now being developed by Ingenico."*[196]

6.47 It is not clear whether or what branches this "missing data" might have affected.

Transaction Corrections

6.48 As per Operations Manual version 7[197] the introduction of the new Post Office Ltd Finance System (POLFS) in Product and Branch Accounting (P&BA) Chesterfield, resulted in finance teams no longer being able to adjust client accounts on site.

6.49 Prior to 2005, branches were required to balance weekly and produced a Horizon generated "Cash Account". Discrepancies were, with authorisation from the Post Office, placed in the branch "Suspense section" of their cash account. The discrepancy was held until enquiries into it were concluded and it was then removed by the issuing of an error notice (now known as a Transaction Correction) by Post Office or by the Subpostmaster putting the money into the branch to cover the loss or removing the value of the gain from the branch so as to balance the account.[198]

[196] 10 Monthly Service Management Performance Period 10.xlsx, *Monthly Service Management Performance Measures – January 2012*, 10 February 2012 [POL-0219354] [8807960c4e4ce6c7671d1f8254ed18b7] [197] 1.5 5. Operations Manual version 7 December 2006 - pages 9-13.pdf, *Processing any outstanding Transaction Corrections*, 7 December 2006 [POL-0184501] [9f8351ecf4b5bd1d4fd39452bef8026f]
[198] Email from Angela Van-Den-Bogerd (PO) to Ron Warmington (Second Sight) and Ian Henderson (Second Sight) Subject: FW: Factfile [BD-4A.FID20472253] Date: 16 April 2014 [POL-0022995] [ca88fee778bee2b78ab05bc62cf6fe2c]

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6.50 A Transaction Correction (TC) is defined as the accounting process through SAP/POLFS for P&BA to adjust a POL Branch account for discrepancies found.

6.51 According to POL-0032855[193], In summary, the whole process was designed to work as follows:

a. The central accounting function decides that it is necessary to make some adjustment to the Branch accounts. Such adjustments are to be made at branch when branch transaction data does not align with client or supplier data.

b. A Transaction Correction (TC) is defined which will carry out the necessary changes (i.e. the central user will define an amount to be transacted for a given Product in a given Branch and a corresponding settlement Product).

c. The Transaction Correction will also define a list of possible actions that the Branch Manager can take and also a message is presented to the Branch Manager informing him/her of the effect of carrying out any of these actions.

d. A daily file of such Transaction Corrections is generated from POLFS and passed to TPS overnight.

e. TPS receives this file, validates the data and performs the required translations using Reference Data (converting a SAP article ID into a Horizon Product).

f. TPS sends messages for the Transaction Corrections to the specified branches. A single message is written for the appropriate Branch for each Transaction Correction.

[193] DELLDO014_2.doc, *TPS Transaction Corrections*, 04 April 2005 [POL-0032855] [926e9f76cb06ba79277f62138309290e]

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g. Changes at the counter enable a person with the required role to be made aware of the existence of an outstanding TC and apply the correction at the counter.[194]

h. The result of processing a TC will normally be the creation of the specified Transactions, which will be returned to POLFS as part of the normal flow of Summarised Transaction data at the end of the Trading Day on which the TC was processed at Branch.

i. Subpostmasters are advised to log on to Horizon every working day to check for and process TCs as only those with Manager or Supervisor access should process them.

j. TCs can be dealt with at log on or left until a more convenient time later, but they must be processed before the last stock unit in a branch is balanced, otherwise the Branch Trading Period cannot occur.

6.52 It is recorded that it is not possible to reverse a correction transaction. However, an erroneous correction transaction could be negated by POLFS producing a fresh correction request with opposite sense.

Transaction Correction Options for the Subpostmaster[195]

6.53 TCs are issued electronically to the branch. At log on, the Subpostmaster is presented with a notification of any new TC. If the TC is suspended to be dealt with at a later point, Subpostmasters have menu button options to access the outstanding corrections (there may be more than one held on record to be accepted).

6.54 When a TC is presented on screen it is accompanied by the details of the transaction to which it relates.

6.55 There are a range of options presented for processing the TC. The options available are presented in the table below:[196]

[194] EAHLD009_0.1.doc, *TPS HR SAP Summarisation & Transaction Corrections HLD*, 25 May 2009 [POL0076419] [31d7f058bfa43c787c748e4acebfc8fc]
[195] EPSPG001_0.2.doc, *S80 Impact Release 3 EPOSS Counter Operational Support Guide*, 10 May 2005 [POL0081677] [44810915b02dc5e8c0d15604570c1f65]
[196] 1.5 5. Operations Manual version 7 December 2006 - pages 9-13.pdf, *Processing any outstanding*

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Option	Detail
W/O to P&L (F4) (Directly Managed branches only)	Directly Managed branches can use the "Write Off to P&L" option if the amount of the Transaction Correction is greater than the value they are expected to settle themselves, unless the correction states that the 'Make Good' option should be selected.
Ass Nominee (F4) (National Multiples only)	National Multiple branches must use the 'Assign to Nominee' option whenever they process a Transaction Correction, the only exception being if they use the 'Seek Evidence' option.
Seek Evidence (F3) (All branches)	You can select the 'Seek Evidence' option if the original information supplied by Product and Branch Accounting (P&BA), Chesterfield is insufficient for you to accept the validity of the Transaction Correction. In this case PB&A will provide additional evidence and issue a new TC that will not include the 'Seek Evidence' option.
Stock WO (F4) (All branches)	You should select the WO option for the following:

Transaction Corrections, 7 December 2006 [POL-0184501] [9f8351ecf4b5bd1d4fd39452bef8026f]

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<table>
<tr><td colspan="2"></td><td>

- Rem surpluses in stock from Hemel Hampstead
- Rem shortages in stock from Hemel Hampstead
- non-accounting data corrections (so that if incorrect volumes of transactions have been claimed they can be readjusted)

</td></tr>
<tr><td colspan="2">Cancel (F1) (All branches)</td><td>You should select the Cancel option if you have selected a TC but do not wish to process it immediately.</td></tr>
<tr><td colspan="2">Accept Now (F2) (All branches except National Multiples)</td><td>When this option is selected it leads to a picklist of further settlement options available to your branch. These vary according to the branch type and are displayed in the table below:</td></tr>
<tr><td>Option</td><td>Type of branch(es) applicable</td><td>Reason for Selection</td></tr>
</table>

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Make Good - Cash	All branches except National Multiples	Use this option if you are using cash to account for a Transaction Correction, or if the instructions accompanying the TC advise you to accept this option. Please remember: You may need to physically add or remove the cash from your stock or redeem from Rem Suspense to reflect this change, otherwise the
		discrepancy will remain in your accounts.
Make Good - Cheque	All branches except Directly Managed (even though the option may be shown on the system) and National Multiples	Use this option if you are using a cheque to account for a Transaction Correction Please remember: The cheque must be dispatched in your daily dispatch.
Settle Centrally (only available if a Transaction Correction is for £150 or over)	All branches except Directly Managed and National Multiples	Selecting this option allows you to make good a misbalance through the debt recovery process that is managed within P&BA. If selected, P&BA will contact you to confirm the next steps.

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Successful processing of a Transaction Correction

6.56 When a Transaction Correction is successfully processed on the Horizon Online system, a message will be displayed to confirm that the Transaction Correction has been successfully processed.

Unsuccessful processing of a Transaction Correction

6.57 It is recorded that the Horizon Online system process includes a check to see whether Transaction Corrections fail due to discrepancies between the validation of the transaction at the counter and the values held within the TC message.

6.58 Where this might be the case, the system displays a failed warning message and Subpostmasters are advised to contact NBSC. They will advise Product and Branch Accounting (P&BA) Chesterfield who will investigate the failure and issue a new TC.

6.59 In the event of any Connection failures when processing a TC, the process must be abandoned until the system is restored.

Branch Trading Statement

6.60 The total volume of TCs processed during a Branch Trading Period can be seen on the Branch Trading Statement.[197]

Disputing a Transaction Correction

6.61 Post Office documentation states that Subpostmasters have the ability to dispute any TC given. They are advised to contact the person who sent the TC as soon as possible.[198] Subpostmasters may be asked to give more information to support their dispute. If a TC is issued too close to a Branch Trading period end to be fully investigated, Subpostmasters are encouraged to call NBSC to ask for more time to

[197] 1.5 5. Operations Manual version 7 December 2006 - pages 9-13.pdf, *Processing any outstanding Transaction Corrections*, 7 December 2006 [9f8351ecf4b5bd1d4fd39452bef8026f]
[198] 1.6 16. Disputing a Transaction Correction & the Appeals process.pdf, *Branch Trading: balancing and despatch of documents - Balancing a stock unit*, 12 October 2016 [105f4315b879dd7810def967bde6bb15] same text appears in POL-0001515]

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gather and present supporting information. Where a dispute is accepted, a compensating TC is issued.

6.62 Where a TC or branch discrepancy is disputed, and the case is not allowed (this is not defined in in the document) Post Office state that Subpostmasters may make a written submission explaining why the loss (or gain) is not proper. This ensures that the debt recovery process suspended pending a written response.

6.63 A Subpostmaster is limited from disputing a TC more than once[199]. In the event of not being satisfied by the initial dispute decision, Subpostmasters were unable to electronically select further dispute actions. Any further action to dispute a TC would therefore be outside of any selectable counter options.

Transaction Correction Observations and Findings

6.64 There is evidence of POL themselves creating incorrect Transaction Corrections and sending these to Subpostmasters. One example identifies that a Transaction Correction was issued for 800 sheets of 100 stamps, rather than 8 sheets of 100 stamps. Some of these POL mistakes were not spotted and therefore accepted by Subpostmasters. The result of this POL error is the insertion of a discrepancy in the Subpostmaster's branch accounts.[200][201,207]

6.65 As identified from review of the witness statement of Angela Burke[202], Transaction Corrections were also documented against the incorrect financial institution. Mrs Burke was awaiting a Transaction Correction to correct a TSB withdrawal in branch that was lost in the Horizon system and when this was sent through it was documented as a Lloyds withdrawal correction due to there apparently not being *"a code*

[199] Transition Guide for Group A.PDF, *Branch Trading Transition Guide*, 26 September 2005 [POL-0171227] [b5d2cc8a4ffdfbd976d1651c909d8ef1]
[200] PC0131060.html, PEAK PC0131060, 17 January 2006 [POL-0301483] [fad49b305707d3deac31b9249ee5c761]
[201] .pdf, *Display Notes:* 12546000 03153512008001, 25 August 2010 [POL-0006283] [189c0e81e2064924aecfb5fcf281bf2e]
[202] Witness statement of Angela Burke 28.09.2018.pdf

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for TSB". Whilst the receipt of the TCV would ultimately rebalance the discrepancy for Mrs Burke it illustrates one example of error within the issuing of TCs.

6.66 An analysis of Transaction Corrections[203] displays Transaction Corrections between 26 March 2012 and 28 March 2013. The largest (in monetary terms) appears to be £810,000. Of interest, there is also a £-810,000 Transaction Correction for the same "Potters Bar" branch, indicating that the correction might have initially been in error.

6.67 Of the 84,217 TC's over this period 22,567 resulted from "Camelot" and 25,649 from "Cash Rems from Branch". Only a relatively small amount (945) of "ATM" TCs are referenced. Full table available at Appendix C (2012-2013 TC's)

6.68 TC queries were often raised with the PO helpdesk. 'SLA Summary NEW WE 15062014.xls (POL-0031913)'[204] shows that during one week 9421 calls were made to the helpdesk and 145 of these related to queries and disputes about Transaction Corrections (See Appendix D).

6.69 The witness statement of Adrees Latif[205] highlights an alleged failed Transaction Correction in respect of incorrectly issued Camelot scratch cards in Horizon. The correction should have reversed the stock amount but for reasons unknown to the Subpostmaster this failed. The issue remained outstanding at the time the statement was given, and the branch showed non-existent stock of Camelot scratch cards with a value of £1000.00 that was unable to be adjusted without incurring a shortfall.

6.70 Figures presented at the Post Office Operations board of 22nd March 2018[206] displayed that 3,546 branches had more than 1 TC per month.

[203] POL-0031763.xlsx, *Analysis of Transaction Corrections*, ca. 2013 [POL-0031763] [a9f7d9c47b7748522a182dbe2a114768]
[204] SLA Summary NEW WE 15062014.xls, *NBSC Incident SLA Summary - Week ending 15th June 2014*, 17 June 2014 [POL-0031913] [7fa41e4d5bcc4996e0bfe0bbbadf82f1]
[205] Witness Statement of Adrees Latif, 28 September 2018, (Para: 9-14)
[206] Operations Board - 22 March 2018.pdf, *Operations Board — 22 March 2018*, 23 March 2018 [POL-0220482] [638109a286e2e884dc735539687f7c35]

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6.71 The document 'SLA Summary New WE 06072014'[207] records an activity type of "Discrepancy" in relation to either Stock or Remittance differences against the advice note received from POL. I understand this to mean that POL have not dispatched the correct amount of Stock or Cash stated as dispatched on the advice note. This may indicate a potentially significant flaw in the Horizon system. If the Subpostmaster does not spot POL's error and therefore it goes unreported, this will

likely mean that the next time the Subpostmaster conducts a stock take it will show an accounting discrepancy which might lead to a TC.

6.72 The diagram in Annex B sets out a breakdown of potential reasons for the issue of a Transaction Correction. Note that this list is nonexhaustive and is based on the sheet headed "*Possible Reasons for TC's Issued*" within the document "NEW TC PACK P10 2011.xls"[208]. The categorisation as to whether these were caused by Subpostmaster or not is mine.

Opinion Summary

6.73 Reconciliation is a complex combination of electronical and manual processes. POL approximate that over 10,000 transactions per week are subject to manual corrections.

6.74 Alongside the electronic processing elements of reconciliation are various phases of analysis and decision making in respect of why/where flagged anomalies occurred. This scrutiny is crucial to determining both the reason for the anomaly in the first instance, and to remedy the effects of it.

6.75 Transaction Corrections at branch counter typically stem from incidents where either a transaction has been performed in error by the

[207] SLA Summary NEW WE 06072014.xls, *NBSC Incident SLA Summary - Week ending 6th July 2014*, 14 July 2014 [POL-0031909] [2a6e1fbd3ef5d76899a9f21957d65011]
[208] NEW TC PACK P10 2011.xls, *TC Glossary*, 15 February 2012 [POL-0221536] [e1a3c3394d348ab3355302b35cfd63ab]

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Subpostmaster and needs correcting or, a transaction anomaly has occurred at another point and needs adjusting not caused by the Subpostmaster.

6.76 It has not been possible to review the analysis, or reasoning applied to Transaction Corrections issued by Post Office, i.e. whether these were appropriately identified as issues in financial positions stemming from the effects of a bug/error/defect or third-party error or from a counter mistake.

6.77 Therefore, although reconciliation might identify transaction anomalies, and appropriately capture electronic distortion of transaction data, it does not ensure an infallible process in respect of appropriately handling potential shortfalls/discrepancies for Subpostmasters, since there are a range of other factors to consider in the processing and analysis of the data. It appears that the Post Office applied a cost/benefit approach to the remedying of reconciliation exceptions and certain bugs/errors/defects.

6.78 It is not clear from analysis of the various Known Error Logs whether bugs/errors/defects identified as affecting branch accounts then ultimately progressed to the issuing of a Transaction Correction for that branch or were confirmed by separate communications from the Post Office.

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7. Horizon Reporting - Facilities for Subpostmasters

Issue 2 - Did the Horizon IT system itself alert Subpostmasters of such bugs, errors or defects as described in (1) above and if so how.

Issue 14 - How (if at all) does the Horizon system and its functionality:

a. enable Subpostmasters to compare the stock and cash in a branch against the stock and cash indicated on Horizon?

b. enable or require Subpostmasters to decide how to deal with, dispute, accept or make good an alleged discrepancy by (i) providing his or her own personal funds or (ii) settling centrally?

c. record and reflect the consequence of raising a dispute on an alleged discrepancy, on Horizon Branch account data and, in particular:

d. does raising a dispute with the Helpline cause a block to be placed on the value of an alleged shortfall; and

e. is that recorded on the Horizon system as a debt due to Post Office?

f. enable Subpostmasters to produce (i) Cash Account before 2005 and (ii) Branch Trading Statement after 2005?

g. enable or require Subpostmasters to continue to trade if they did not complete a Branch Trading Statement; and, if so, on what basis and with what consequences on the Horizon system?

Horizon Alerts for Subpostmasters in respect of bugs/errors/defects

7.1 Post Office have advised[209] that in respect of the known Local Suspense Account Issue that Subpostmasters were notified however, how they were notified and if all affected Subpostmasters were notified is still subject to clarification from Post Office.

[209] Post Office's response to Jason Coyne's Requests for Information.pdf 08 August 2018

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7.2 [210] In a report from Gareth Jenkins 29 September 2010[216] (in connection with the known bug 'Receipts and Payments mismatch') it is reported:

> *"This has the following consequences: There will be a receipts and payment mismatch corresponding to the value of discrepancies that were "lost". Note that if the user doesn't check their final balance report carefully they may be unaware of the issue since there is no explicit message when a receipts and payment mismatch is found on the final balance (the user is only prompted when one is just detected during a trial balance)".*

7.3 Further, Post Office have advised[211] that they have "*made enquiries*" as to confirm how Subpostmasters were notified of this particular issue but have "*not been able to find relevant records so far*."

7.4 It is understood that in the event of certain counter processing errors, Subpostmasters would be presented with select on screen messages informing them of some form of error. This would not in itself notify Subpostmasters of the full extent of the potential implications of an error occurrence (i.e., the error ultimately resulting in a shortfall or discrepancy).

7.5 Some notifications would relate to procedures of which the Subpostmaster would be aware (a failed recovery for example), however these would only be at the counter. A Subpostmaster would not have visibility of any error occurring for any transaction processing past the point that a transaction was committed to the branch database (in respect of transaction data errors), nor any potentially occurring further within the processing systems.

7.6 KEL acha1941L,[212] identifies that during the recovery process, when some transactions recover but others fail to recover, it is only the recovered

[210] SM BP Correcting Accounts for Lost Discrepancies - 102000790 - CD1.pdf, *Correcting Accounts for "lost" Discrepancies*, 29 September 2010 [POL-0010769] [804ea47c166870b7ed0359e4765e0265]
[211] Post Office's response to Jason Coyne's Requests for Information.pdf 08 August 2018
[212] acha1941L.html, *HNG-X KEL acha1941L*, 11 July 2012 [POL-0039098] [f392eca2f015eab903154e7a3e7a31ee]

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transactions printed on the receipt. The disconnected session receipt should also identifyt those transactions NOT recovered. These are printed for the Subpostmaster to retain. This would alert the Subpostmaster to an instance of an error in counter processing in respect of a failed recovery (known potential Horizon incident). Alongside the printed receipts, it is further noted that upon an instance of recovery failure, the system might display:

> *"MSG90025: System Error - Error Code: 0058 has occurred Reason: System error. Please retry once. If the problem persists, contact the Horizon System Desk."*[213]

7.7 KEL surs1147Q[214] records another failed recovery issue to which the solution is advised as follows:

> *"Advise the PM to log onto the relevant counter, start the recovery process (MSG04024) but leave the counter displaying the System error message (MSG90025). It is important that they DO NOT confirm this message and that they just leave the counter to time out due to inactivity at this screen - which will take at least 1 hour 20 minutes. After this time, they can try to log on again - when there should be no prompts about recovery and no system error."*

7.8 Therefore, as witnessed above, it is apparent that in specific event circumstances, Subpostmasters were alerted to certain errors occurring at the Horizon counter. However, it must be noted that these relate to counter errors and therefore are not necessarily notifications of bugs and defects within the system.

7.9 Similarly, in wrightm33145j[215] as part of the process for rolling over to a new Balance Period or new Trading period; the Subpostmaster was

[213] KEL cardc1655P.html, *HNG-X KEL cardc1655P*, 26 July 2016 (last updated 2 August 2016) - [POL-0040501] [09bc61dfc66a102d149337df7ce42a93]
[214] surs1147Q.html, HNG-X KEL surs1147Q, 08 April 2010 (last updated 17 February 2016) [POL-0040368] [4f8fdc56faa1f96e3e84522f4c49da75]
[215] wrightm33145J.html, *HNG-X KEL wrightm33145J*, 23 September 2010 (last updated 01 April 2016) [POL0040409] [1f025ec713c287ee7a5b17accd25b42f]

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presented with a series of prompts and warnings if any discrepancies are found.

7.10 If the Subpostmaster chose to cancel the rollover prompt message (MSG31316) this could trigger a receipts/payments mismatch due to a bug in the code when "cancel" is pressed against this message. The workaround to avoid the bug was to press cancel a second time. However, it is unclear how widely this workaround was communicated. Subpostmasters would not be aware from the error message shown that this was indeed a bug affecting a wide variety of branches.

7.11 It appears that the process was largely for Subpostmasters to notice an error (either when trying to balance or after a communication outage) and phoning the helpline. This would occur before it was communicated or confirmed that there had been or was a bug/defect which might have affected the branch accounts.

7.12 Some KELs record making priority calls to branches however, it is not clear whether this occurred, and it is not noted that priority calls were made in the event of every notified error.

Bugs Errors Defects not alerted to the Subpostmaster

7.13 As above, in respect of the known receipts and payments mismatch bug, it does not appear that Subpostmasters were alerted, until perhaps an investigation of discrepancy was performed.

7.14 Further, in respect of the acknowledged Calendar Square / Falkirk Issue bug/defect it is not identified that Subpostmasters were informed.

7.15 As per the Joint Experts Statement, the extent to which any IT system can automatically alert its users to bugs within the system itself is necessarily limited.

7.16 Whilst Horizon has automated checks which would detect certain bugs, there are types of bugs which would not be detected by such checks.

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7.17 In respect of the Dalmellington bug referenced at 5.16, there is no indication that the Horizon system alerted the Subostmistress of this bug. Any rectification was therefore dependent upon correct initial diagnosis of the bug, proper handling processes by the Post Office and communication provided to Helen Baker and the Subpostmistress.

7.18 It will be a matter for the court to determine in due course whether those processes worked appropriately in relation to this bug.

How does Horizon enable Subpostmasters to compare the stock and cash in a branch against the stock and cash indicated in Horizon?

7.19 There are several reports a Subpostmaster is required to run at the end of each working day. These are designed to be checked against the appropriate documents to amend any errors accordingly. These reports are then 'cut-off' when the Subpostmaster is content they are correct.

The cut-off routine is mandatory.

7.20 Of note there is a procedural requirement for staff at branches to count and declare the cash stored in each stock unit at the end of each day in what is called a Daily Cash Declaration.

Daily Cash Declaration

7.21 After performing the Daily Cash Declaration, Horizon will show any discrepancy between the cash on hand and the amount of cash that should be in the branch for the branch to balance.

7.22 A 'Factfile' document sent from Angela Van-Den-Bogerd of Post Office to Second Sight[216] states that Horizon can assist the Subpostmaster with tracing or identifying discrepancies including event logs that are available for 60 days (42 days pre-Horizon Online).

7.23 In addition to the daily cash declaration there is also the optional Weekly Balance and mandatory Monthly Trading Period Rollover.

[216] Factfile.DOCX, *Initial Complaint Review and Mediation Scheme DRAFT Factfile*, 16 April 2014, (P17 – 94.1) [POL-0022996] [d24556f1009f1881f42a2dbb5b8154de]

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Weekly Balance

7.24 Although not mandatory the Weekly Balances are reported to be a recommended action of POL policy to execute on a weekly basis; this performs a full cash and stock account.

7.25 This should also help to detect any discrepancies. If a discrepancy is discovered and declared it will be moved into a suspense account until its resolution. The purpose of this is to act as a separate line in the branch accounts that records any surpluses or loses whilst allowing the daily trading accounts to balance. A Subpostmaster has until the Monthly Trading Period Rollover to resolve any discrepancy (this was carried out weekly prior to 2005).

Monthly Trading Period Rollover

7.26 The Monthly Trading Period Rollover is mandatory every month and as stated above requires all discrepancies, including all within the suspense account, to be resolved. At the end of this process a Branch Trading Statement is produced to reflect the cash and stock shown in the accounts matches the cash and stock held in the branch in addition to any declared discrepancy.

How does Horizon enable or require Subpostmasters to decide how to deal with, dispute, accept or make good an alleged discrepancy by (i) providing his or her own personal funds or (ii) settling centrally?

7.27 Post 2005 is dealt with under Section 6.48 above.

7.28 Prior to 2005 Horizon followed a similar process however branches were required to balance weekly and produced a Horizon "Cash Account". Discrepancies were, with the authorisation from the Post Office, held in a "Suspense Section" of the Cash Account (although I have also seen this referred to as a Suspense Account). Historically these were known as "Unclaimed Payments", "Authorised Cash Shortages" and "Uncharged Receipts", to be investigated.

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7.29 Following the conclusion of any investigation and in order to remove the discrepancy, Subpostmasters were issued with an Error Notice (now known as a Transaction Correction) by the post office or the Subpostmaster placed money into the branch to cover the loss or removed the value of the gain from the branch to balance the account.

7.30 The value of error notices had to be keyed in manually by the Subpostmaster on the Housekeeping menu of the Horizon system following notification from either a client or POCL. However, the losses or surpluses at the end of a balancing period could still be disputed.

7.31 According to the Complaint Review and Mediation Scheme documentation, I note that the ability to have a debt suspended pending an investigation has only been available since August 2005.[217]

record and reflect the consequence of raising a dispute on an alleged discrepancy, on Horizon Branch account data and, in particular:

7.32 This is covered under Heading 6 - Reconciliation and Transaction Corrections (Section 6.61, Page 113)

does raising a dispute with the Helpline cause a block to be placed on the value of an alleged shortfall; and

7.33 This is covered under Heading 6 - Reconciliation and Transaction Corrections (Section 6.61, Page 113).

7.34 See also the Witness Statement of Dawn Phillips[218] Page 2 paragraph 10 which confirms that a block is placed upon the account until the dispute is resolved. However, if branches do not return the completed "Branch Dispute Form" detailing the discrepancy within seven days, the shortfall is unblocked, and payment is once again requested from the Subpostmaster.

[217] 0.19 10. Post Office – Complaint Review and Mediation Scheme.pdf, ca. 2014 [POL-0025512_1] [6d54ae49b7132a421d48bbd941c64d39]
[218] Signed witness statement of Dawn Phillips.pdf (dated 28 September 2018).

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7.35 It should be noted however that the Branch Dispute Form has only recently been introduced in 2018 and the process of collecting key information from the branch has been in place since November 2016 by other means such as email and telephone communications[219].

7.36 It is not fully clear what totality of mechanisms were available for Subpostmasters to dispute discrepancies prior to 2016 although Appendix D illustrates there is clearly an option available to dispute a Transaction Correction.

is that recorded on the Horizon system as a debt due to Post Office?

7.37 A loss is recorded as a debt to the Post Office in the event the discrepancy is upheld by the Post Office following any dispute.

enable Subpostmasters to produce (i) Cash Account before 2005 and (ii) Branch Trading Statement after 2005?

7.38 As above the Cash Account were produced weekly after a mandatory weekly balance just as a Branch Trading Statement is produced after the Monthly Trading Period Rollover.

enable or require Subpostmasters to continue to trade if they did not complete a Branch Trading Statement; and, if so, on what basis and with what consequences on the Horizon system?

7.39 Subpostmasters are not able to continue trading until Branch Trading Statement process is complete. If the Branch Trading Statement is not completed and therefore, the Monthly Trading Period Rollover is not completed the Post Office will contact the branch in order to rectify the situation.

Opinion Summary

7.40 In many, but not all instances the Subpostmaster is alerted to a variety of system errors or warnings whilst processing transactions at the counter. However, these alerts and warnings do not necessarily alert

[219] Signed witness statement of Dawn Phillips.pdf (dated 28 September 2018).

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the Subpostmaster to the extent of the issue in the back-end processing systems or necessarily allow him/her to make any adjustments.

7.41 I have not seen any evidence as to how known issues and bugs were communicated to branches in advance of individual branches discovering the issue themselves. In the example highlighted above in (KEL wrightm33145j – Para: 5.10) there is no evidence any advice was communicated to branches.

7.42 Subpostmaster feedback[220] appears to highlight amongst many other things an absence of support and training to assist them with being able to find and resolve mistakes. In fact, this was expressed as follows:

> *"There is a perception that there is a reluctance to report a shortage or a balancing problem to NBSC as branches feel that the next stage will be an audit and then suspension"*

[220] Gaps and issues final 9.10.13.x/s, *Subpostmaster Feedback Spreadsheet*, 17 October 2013 [POL-0216108] [421233d56af42c063d50356a96a18e89]

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8. Horizon Shortfalls, Data and Reporting for Subpostmasters and Post Office

Issue 8 - What transaction data and reporting functions were available through Horizon to Post Office for identifying the occurrence of alleged shortfalls and the causes of alleged shortfalls in branches, including whether they were caused by bugs, errors and/or defects in the Horizon system?

Issue 9 - At all material times, what transaction data and reporting functions (if any) were available through Horizon to Subpostmasters for:

a. identifying apparent or alleged discrepancies and shortfalls and/or the causes of the same; and

b. accessing and identifying transactions recorded on Horizon?

Data and Reporting Functions for Post Office

8.1 The data and reporting functions available to Post Office can be primarily summarised by the following sources:

a. The TPS Report Set;

b. The APS Report Set;

c. The DRS Report Set;

d. Reports and Data Obtained via Business the Incident Management ("BIM") Process;

e. Reports and Data Obtained via the Problem Management Procedure;

f. Information Obtained via Fujitsu; and

g. Information Obtained from Subpostmasters.

8.2 Detailed descriptions of each of the above as set out in Appendix E to this report. Summaries of each are set out below.

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Official Sources of Information

8.3 The TPS Report Set - The TPS Report Set was made up of 3 reports (TPS250/254/257) which were designed to enable the reconciliation of transactions using branch infrastructure. They are all daily reports which show information relating to whether transaction outputs at branches matched transaction outputs at Post Office, whether there are exceptions in the BRDB copy process and which branches have a net total transaction (i.e. debit/credit) transaction total which does not equal 0.

8.4 The APS Report Set - The APS Report Set was made up of 10 reports that were designed to reconcile those transactions that were sent to both the POLSAP system and APS clients. The APS Report Set provides confirmation that the APS transaction account balances, a summary of transactions which have been delivered by APS, a summary of transactions which have not been delivered due to delay/quarantine, a reconciliation summary between transactions which flow through the APS host and TPS host and confirmation that all branches have been harvested / details of any that exist in relation to harvesting.

8.5 The DRS Report Set - The DRS Report Set (sometimes referred to as "Banking & Related Services Reconciliation") is made up of 3 reports which were designed to enable network banking transactions completed in Post Office branches to allow settlement to be made with Post Office clients (e.g. Santander, LINK, etc.). The DRS Report Set provided a summary of all reports that were not produced by DRS due to a lack of data, identified all C4 transactions received against each C4 settlement date and information relating to all exceptions.

8.6 Reports and Data Obtained via the Business Incident Management ("BIM") Process - The BIM system was designed to report progress on the resolution of Business Incidents to allow Post Office to complete reconciliation or settlement with its internal systems, clients and

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banks.[221] A "Business Incident" describes the effect of a system fault and can relate to any of the exceptions from the various reports or a settlement error discovered by Post Office. A "System Incident" describes the underlying cause of a Business Incident and is created to track the root cause of the same. A BIM Report is issued for each Business Incident in order to notify Post Office of issues and to assist in the reconciliation or settlement process. Note that BIM Reports communicate information concerning the resolution of an issue, and not the underlying cause (which would be dealt with via the Problem Management Procedure).

8.7 Reports and Data Obtained via the Problem Management Procedure - The Problem Management Procedure aims to eliminate the root cause of issues (e.g. System Incidents).

Additional Sources of Information

8.8 Information Obtained via Fujitsu - Most of the sources above will include significant involvement from Fujitsu and some, such as the TPS Report Set, will only be made available to Post Office if requested. However, it is important to note that the above only represents the formal sources and incident management processes. Post Office also had access to information simply by nature of the commercial and technical arrangements between itself and Fujitsu. In other words, there was nothing (other than cost) preventing Post Office from seeking further information from Fujitsu directly if, for example, the Problem Management Procedure did not yield a satisfactory conclusion. This is unlikely, as the reporting and management functions above are quite comprehensive and should cover the vast majority of issues, but it is possible.

[221] CSPRO111_4.1.doc, *TPS Reconciliation & Incident Management (Section 4.4.1; BIMS Reports/MER)*, 10 June 2015" [POL-0082393] [5ad9b694ade347339b5f5a2b49c88ea2]

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8.9 Information obtained from Subpostmasters - In addition to the above, the Subpostmasters themselves and any information available to them were sources of information available to Post Office. These are further considered below.

Conclusions Relating to Information Available to Post Office

8.10 The TPS, APS and DRS Report Sets along with reports produced in accordance with the BIM and Problem Management Procedures provided a comprehensive suite of reports which was available to Post Office. These reports should have allowed Post Office to identify the occurrence of alleged shortfalls in the Horizon system (of those that could be identified), and they were underpinned by formal processes which would provide further information in relation to the underlying cause of a given issue, and the best way to resolve the same. In addition, Post Office should have been able to obtain any additional information it required via Fujitsu or the Subpostmasters themselves.

Data and Reporting Functions for Subpostmasters

8.11 Subpostmasters had access to a much smaller pool of information. This is in line with what I would expect to see given that Subpostmasters are the users of the Horizon system, and therefore would not typically be given access to anything beyond what was necessary for them to carry out their 'business as usual' activities. In relation to this matter, that means being able to carry out the day-to-day transactions required to run a post office, which are dealt with via the "counter".

8.12 All the reports and receipts produced by the counter are set out in SD/DES/005[222] - note this document excludes reports and receipts which are not produced by the counter. It includes hundreds of reports relating to different aspects of running a Post Office branch (currency exchange, insurance, stock, etc.). The reports and receipts contain

[222] SDDES005_12.2.DOC, *Horizon OPS Reports and Receipts – Pathway – Horizon Office Platform Service,* 23 January 2003, (Version: 12.2), [POL-0069333] [3d8f3190f530f5e71916099859b31dbd]

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basic information relating to individual transactions (e.g. item, time, branch, etc.) and are therefore a useful source of information when performing normal reconciliation activities.

8.13 However, as these reports are specific to counters and contain no information beyond this, they would not allow a Subpostmaster to determine the cause of an issues that arise at anything beyond counter level (and possibly even those that arise at counter level).

8.14 For example, if an APS transaction reversal was carried out, the Subpostmaster would receive a receipt which looks something like the following:

Example content

```
          1         2         3         4
01234567890123456789012345678901234567890123
01 Feltham Post Office            FAD: 123456X
02 23/09/2006 10:47     TP:06   BP:01  SU:SH1
03
04              R E V E R S A L
05
06        *** Branch Copy - Retain ***
07
08 Checksum: 9062852
09 APS No: 010058010057
10 Client: Eastern Electricity
11 Scheme: EE MthBill               Svc: 8
12 Token Type: BC                  Entry: 1
13 Ref: 6331801325640003333
14 Amount: 5.00-         Cash
15 Product No: 7022
16
17 ------------------------------------
          1         2         3         4
01234567890123456789012345678901234567890123
```

8.15 This shows enough information for a Subpostmaster to balance a £5 reversal if it is assumed that all other factors are in order. However, there is no information relating to whether the transaction has reconciled at APS Host or at any other level (harvester, client, etc.). This could cause an issue which the Subpostmaster is effectively powerless to resolve.

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8.16 If, for example, the harvester failed to process the £5 reversal above then there would appear to be a £5 shortfall at the APS Host (and potentially at every other level above harvester). The Subpostmaster would have no way of identifying where the error occurred because, at counter level, everything would appear to balance, and they would not have access to any information beyond that. This essentially means that the Subpostmaster is completely reliant on either:

a. Horizon operating without any flaws (which is unlikely even in the case of a robust system); or

b. Where there is a flaw, it will be identified and linked to a problem transaction by Post Office / Fujitsu.

Additional Points to Note

8.17 There was no formal reconciliation process between the POLSAP system and the Credence transaction stream, so Credence could not be used to verify financial integrity. POLSAP system transaction information should have been used for this purpose.[223]

8.18 A Post Office cash management improvement proposal[224] recently acknowledged the lack of visibility for the Subpostmaster of any inaccurate cash declarations. The proposed cash management improvement proposal would give the Subpostmaster immediate visibility of any discrepancies and allow faster corrections/investigations to find the inaccurate transaction. It is not known if or when this change was to be implemented but it confirmed that the Subpostmaster has little control beyond counter level when trying to resolve any discrepancies.

[223] SVMSDMSD0020_2.2.doc, *End to End Reconciliation Reporting*, 27 February 2012 [POL-0124572] [aaedd5051156619c50296d04f6b2e779]
[224] Cash Management Programme – Business Case June 2017 v1.5 TW.docx, *Business Case – Cash Management Programme,* 4 August 2017, [POL-0220663] [8cd4dac4464197347c0fb2348a6e8f59]

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Issues 8 & 9 - Summary of Conclusions

8.19 The TPS, APS and DRS Report Sets along with reports produced in accordance with the BIM and Problem Management Procedures provided a suite of reports which should (subject to the above) allow Post Office to identify the occurrence of alleged shortfalls in the Horizon system. These reports were supported by manual processes which would provide further information in relation to the underlying cause and resolution of a given issue. In addition, there was nothing preventing Post Office from seeking further information from Fujitsu directly if, for example, the Problem Management Procedure was insufficient.

8.20 Subpostmasters had a much smaller pool of information available to them, which is in line with what I would expect given that they are the end users of the Horizon System. The reports and receipts available to Subpostmasters generally show enough information for a Subpostmaster to balance transactions if it is assumed that all other factors are in order. However, this information would not allow a Subpostmaster to determine whether a transaction has reconciled at APS Host or at any other level (harvester, client, etc.).

8.21 There is evidence that some reports available to Subpostmasters were reporting erroneous data because of changes made to stock units[225]. In this case some products were being double counted in a sales report. A code fix was scheduled in COUNTER_EPOSS 34_7 but it is not known if or when this was implemented.

8.22 In conclusion, Post Office had access to far more comprehensive information relation to the Horizon system. If an error occurred beyond counter level, Subpostmasters would need to rely on Post Office to identify and resolve the issue. If that issue or its was not

[225] CCard2053P, *HORIZON KEL CCard2053P,* 21 December 2005 (last updated 08 September 2006), [POL0035339] [92ccb572ff4ed5f357d3569a4b4121e2]

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properly identified for any reason, then the Subpostmaster would be at risk of being liable for a Transaction Correction.

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9. Remote Access and Alteration of Transaction Data

Issue 7 - Were Post Office and/or Fujitsu able to access transaction data recorded by Horizon remotely (i.e. not from within a branch)?

Issue 10 - Whether the Defendant and/or Fujitsu have had the ability/facility to: (i) insert, inject, edit or delete transaction data or data in branch accounts; (ii) implement fixes in Horizon that had the potential to affect transaction data or data in branch accounts; or (iii) rebuild branch transaction data:

a. at all;

b. without the knowledge of the Subpostmaster in question; and

c. without the consent of the Subpostmaster in question.

Issue 11 - If they did, did the Horizon system have any permission controls upon the use of the above facility, and did the system maintain a log of such actions and such permission controls?

Issue 12 - If the Defendant and/or Fujitsu did have such ability, how often was that used, if at all?

Issue 13 - To what extent did use of any such facility have the potential to affect the reliability of Branches' accounting positions?

Remote Access

9.1 A number of technical documents provided by Fujitsu identify that the Horizon estate was enabled to be managed remotely. This is not beyond expected requirements. The nature of providing a support service as Fujitsu do, would require as a design principle, that the Horizon solution should be completely remotely manageable.[226]

9.2 Document '1.8 8. Horizon Online Technical Network Architecture, Mark Jarosz.pdf' (dated 2010) at section 2.5.3 sets out the network facilities

[226] *POLSAP High Level Design*, 25 March 2010 [POL-0032871] [66768ce6f7144c10d1b68f1ec2d612f8]

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that allowed "Remote Access by Fujitsu services, users and systems".[227][228]

The document recorded that "*Support access to Counters is via SSH…"* further, the document shows that the Fujitsu sites Bracknell, Stevenage and Ireland were originally envisaged to have access.

9.3 A further document describing the Horizon Wide Area Network High Level Design[229] sets out:

> *"Remote support access to the counter will be provided through the implementation of an SSH service running on the counter which can then be accessed from the Secure Access Servers, in the data centre.… this will allow access to command prompt on the counter for the retrieval of logs and other data using secure copy (SCP)".*

9.4 It is therefore clear that Fujitsu had access to the servers which make up the Horizon estate, so as to access counters within a branch. This access was required to enable them to provide support and maintenance. 3rd line support had the greatest level of privileges to "*Support access on platforms operating system, hosting applications and database schemas*".[230] This level of access means that Fujitsu could practically access all elements of data recorded within Horizon.

9.5 Further to the above access facilities, helpdesk logs identify that 'Tivoli Enterprise Manager' (TEM)[231] and Tivoli Remote Control tools were specifically used for accessing Branch counters across the Horizon estate.[232] Whilst the End to End Application Support Strategy

[227] 1.8 8. HNG-X Technical Network Architecture, Mark Jarosz.pdf, *HNG-X Technical Network Architecture*, ca.
[228] [C-0003647] [4c0c965c5d6ca96a56059693625cf29c]
[229] 2.1 11. HNG-X Wide Area Network HLD, Stephen Wisedale.pdf, *HNG-X Wide Area Network HLD*, 19 December 2012 [C-0003646] [c86656726b30cea6fc1e2dfeccb4457a]
[230] 1.3 3. High level architectural overview of Horizon Online.pdf, *Horizon Solution Architecture Outline,* 07 April 2016 [7b6cf8cf69bec90f674b9b10a64f04e8]
[231] M100_POL_003_HSH Fujitsu logs_JHKD.xlsx, *Fujitsu Helpdesk Logs, 28* October 2014 [POL-0006655] [4120881082b106161bc4acbd75c15b7a]
[232] RKing5147Q.html, *HORIZON KEL RKing5147Q*, 8 August 2006 [POL-0035318] [1e2815966220f5c71ccd3c99bcf82c16]
[233] SVMSDMPRO0875_1.DOC, *End to End Application Support Strategy*, 28 July 2011 [POL-0122492]

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document[233] records at 1.5.1 "*Direct access to live Post Office counters is currently only available to the SSC.*"

9.6 Whilst the above documentation identified that counters could be accessed remotely for support purposes, it has not yet been identified that transaction data was altered at the counter.

9.7 However, it is my opinion that it was possible Fujitsu was able to access transaction data recorded by Horizon both within a branch (and also within the central BRDB database for Horizon Online). This was how the system was designed.

9.8 As evidenced above, it is entirely possible that Fujitsu could, as they could run commands on the counter machine accessing and querying the hard disk, perform modifications and deletions.

9.9 The witness statement of a Fujitsu chief architect[234] further confirms that Fujitsu can and have inserted a balancing transaction into a Branch Account, and in Legacy Horizon could inject transactions into branch accounts (which at the time would have been stored on the branch counter hard drive).

9.10 The Witness Statement of Richard Roll[235] further confirms that Fujitsu employees could and did remotely access branch accounts to perform modifications.

Further supporting evidence of remote access

9.11 A number of the Known Error Logs (KELs) refer to remote access activities between the branches and the Fujitsu support facility.

9.12 boismaisons1328M[236] [237] describes running commands on counters to assess disk space sizes. This therefore illustrates Fujitsu's capabilities to access the counter hard disk.

[db0644e4d5e11b5cce3ed381cb108a88]
[234] Witness Statement of Torstein Godseth, 27 September 2018 (Para 17.2 (d))
[235] Witness statement of Richard Roll 11.07.16.pdf dated 11 July 2016
[236] boismaisons1328M.html, *HNG-X KEL boismaisons1328M*, 24 April 2012 (last updated 20 March 2013) [POL-
[237]] [a7737d3b003d083b5a6c95c7edeef534]

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9.13 KEL acha2026Q[238] (last updated 27th September 2012) documents an issue recorded as "*Unable to connect to HNGX counter from ssn*". The reasonable conclusion being that normally Fujitsu (or other support personal) can connect to the Horizon counter from the Secure Access Server. The KEL explains that: "*SSC [Fujitsu Software Support Centre] will be unable to connect to this counter until problem has been resolved. Solution - ATOS*".

9.14 KEL MillerK1837J[239] illustrates that deletions in relation to Reference Data files could be made at counter level.

Global Branches

9.15 Fujitsu operate the Horizon Online Help Desk located at two sites (Bracknell and Stevenage). These sites contain 'global branches' therefore they are not physical instances of a Post Office but exist as 'virtual branches'. There are however, physical counters that perform within them.[240] The 'branches' operate with branch codes 999999, counter ID's 1 - 6 and 999998, counter IDs 7 - 12.

9.16 The HNG-X Counter Business Application Support Guide[244] further sets out how to perform an audit of which branch a global user last logged in at.

9.17 A register of branch codes (dated 2015)[241] identifies a further global branch recorded as WAK01 Branch Code 999993.

9.18 An instance of a global branch would allow Fujitsu to create global users and to input transactions within core Horizon systems as though they had been entered from a physical branch.

[238] acha2026Q.html, *HNG-X KEL acha2026Q*, 15 October 2010 (last updated 27 September 2012) [POL0039179] [6a5c608d2812487a3c044473fc6a9e45]
[239] MillerK1837J.html, *HNG-X KEL MillerK1837J*, 04 June 2010 (last updated 24 April 2015) - [POL-0040112] [1da69d5ae267f707c2702f926c2e4384]
[240] DEVAPPSPG0017_7.1.doc, *HNG-X Counter Business Application Support Guide*, 8 January 2014 [POL0134853] [97581900782d355b4965045331797cea]
[241] DESGENSPE0013_1.doc, *Register of Branch Codes*, 4 November 2015 [POL-0142404] [5536045daeaf587fec423f2782928123]

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9.19 It is entirely possible that investigation could be further conducted by Post Office to identify any transactions held within the BRDB containing the Branch Codes identified above. Such would identify where and what transactions had been performed by Fujitsu global branches and not a Subpostmaster.

Branch Transaction Data Rebuilds

9.20 It is understood that branch transaction data rebuilds did take place across the estate.

9.21 POL-0116724[242] documents the reasons for changing a counter base unit. Replacement of the counter base unit at 2008 would ultimately require the branch transaction data to be reinstated to the new machine. This would be carried out by both the engineer on site and automatic processes applied by the HSD (Horizon Service Desk).

9.22 Further, Richard Roll in his witness statement at paragraph 15[247] documents how it was relatively common to re-create branch databases in an effort to fix corruptions.

Transaction Correction Tools – Modification of Transaction Data

9.23 There are various identified points within the Horizon architecture where Fujitsu may need to perform data correction activities. This involves manually correcting data where it has become corrupted or is harvested as in an 'error' or 'exception' state.

9.24 POL-0219310[243] at Section 5.6.2 states:

> *"There is a requirement that the SSC will have ability to insert balancing transactions into the persistent objects of the Branch Database. There are reasons for SSC having to do so e.g. to rectify erroneous accounting data that may have been logged as a result of a bug in the Counter / BAL.*

[242] SVMSDMSTD0810_1.2.doc Engineer Handbook Base Units, 20 June 2008 [POL-0116724] [247] Witness statement of Richard Roll 11.07.16.pdf dated 11 July 2016 paragraph 15
[243] DESAPPHLD0020.doc Branch Database High Level Design, 22 February 2018 [POL-0219310] [e277e9fd3e3ad2dd17ab40afc0d2096d]

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SSC will have privileges of only inserting balancing /correcting transactions to relevant tables in the database. SSC will not have the privileges to update or delete records in the database.

Any writes by SSC to BRDB must be audited…"

9.25 When applying the corrective fixes, it appears that Fujitsu would utilise the branch accounting code of the branch for which the correction transaction was required.[244]

Branch Transaction Correction Tool

9.26 Host BRDB Transaction Correction Tool Low Level Design[245](applicable to Horizon Online).

9.27 The 'Overview' section (section 1.1) states:

"Warning: The use of this powerful tool has inherent risks. If the SQL statement is incorrect or badly written, it is possible to cause unintended consequences, some of which may cause serious problems to the Branch Database. It is expected that only a small number of skilled staff will run this tool and that they will have detailed guidance as to when and how to use the tool."

9.28 The document does not stipulate which staff within SSC have privilege to run the tool, nor document the guidance on specifically when the tool should be run. This has been the subject of a Request for Further Information.

Correction Tool auditing

9.29 The schema definition for the BRDB identifies the following auditability:[246]

[244] DESAPPHLD0020.doc Branch Database High Level Design, 22 February 2018, Para: 5.6.2 [POL-0219310] [e277e9fd3e3ad2dd17ab40afc0d2096d]
[245] DEVAPPLLD0142.doc, *Host BRDB Transaction Correction Tool Low Level Design*, 13 November 2007 [POL0032866] [e20de9a651b8baf1f84e10859455684b]
[246] DEVAPPLLD0199_5.DOC, *SCHEMA DEFINITION FOR BRANCH DATABASE, STANDBY BRANCH DATABASE AND BRANCH SUPPORT SYSTEM*, 01 August 2017 [POL-0151776] [456dd7c0f245946a2f1658cc759a527a]

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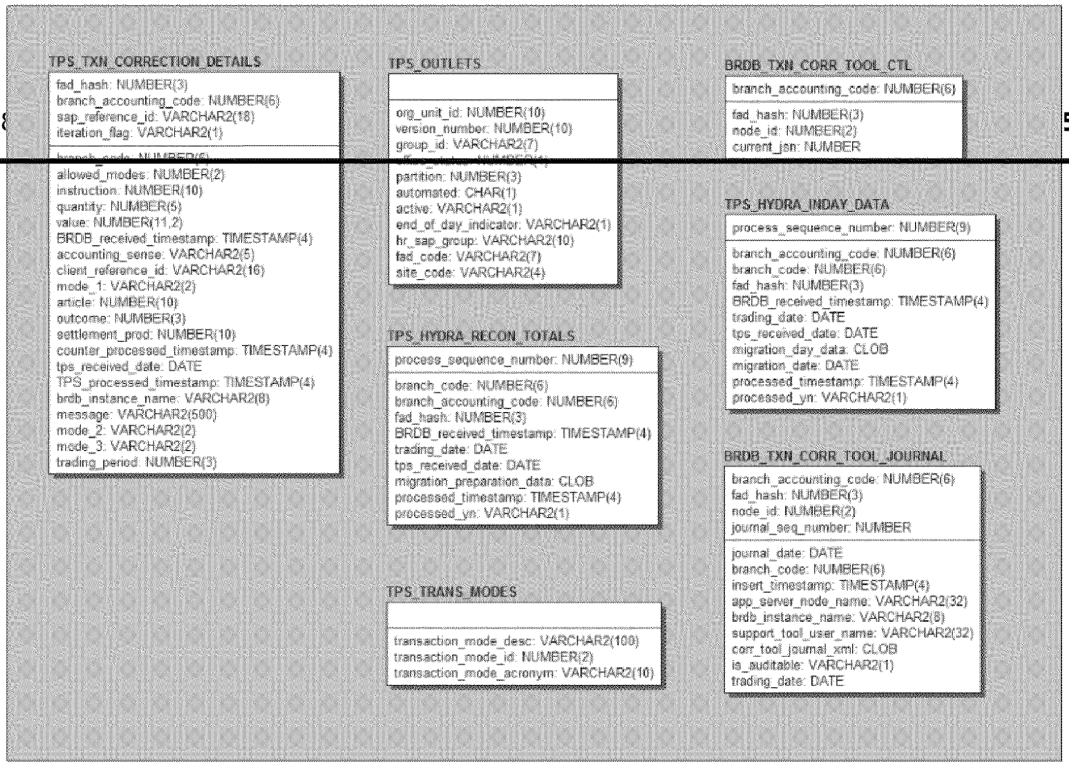

9.30 Users of the branch correction tool should be identifiable by its audit table BRDB_TXN_CORR_TOOL_JOURNAL (as above, bottom right table). The corrective transaction in the branch accounts should also be identifiable as an automatic 'SYSTIMESTAMP' should be recorded rather than a retrospective transaction time. 'SUPPORTTOOLUSER' should be reflected in the ID field.

9.31 It is entirely possible that investigations could be further conducted by Post Office to identify any transactions held within the BRDB_TXN_CORR_TOOL_JOURNAL table. Such would identify what corrective transactions have been performed. However, given file retention periods, it is unlikely that all corrective transactions will have been retained from the inception of Horizon Online.

9.32 A Request for Information issued to Post Office querying how many times the Host BRDB Transaction Correction Tool has been used was responded by Fujitsu stating:

> *"This process has only been used once, in relation to PC0195561, on 11-Mar-2010."*

TIP Transaction Repair Tool

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9.33 TPS - EPOSS Reconciliation - TIP Transaction Repair [247] documents a further maintenance tool that "...will assist SSC to repair EPOSS transactions processed at the counter but are unable to copy from BRDB into the TPS (Transaction Processing System) Host."

9.34 The repair tool is documented to assist SSC to repair/re-repair the transactions and send them to TIP (Transaction Information Processing) (the remote end-point of the File Transfer Management System (FTMS) service that delivers reconciliation reports to Post Office Limited / PON's (Post Office Network Banking) Transaction Information Processing System).

9.35 The above tool allows corrective actions to be performed upon data within Core Horizon after the counter has processed the transactions and they are flagged as erroneous as they are sent through the various processing systems.

9.36 The transaction repair is facilitated by a Form based tool that will:

a. read data from the TPS Host table holding Harvester Exceptions

b. allow the user to repair/re-repair the transactions, i.e., input any missing data or modify any invalid data

c. validate and insert the corrected transactions into a 65th TPS Host partition table

9.37 Further, at 3.2.1 the tool is stated to:

> *"Allow the user to do multiple repairs at speed with the minimum of user intervention i.e., if there is a common error among several records then the user can input the valid value just once and correct all the records having the similar error…"*

9.38 In relation to how often this tool was used, Fujitsu have provided the below response:

[247] PIDES008.doc, *TPS - EPOSS Reconciliation - TIP Transaction Repair*, 11 January 2017 [POL-0032939] [27249c8e2ccba0fecdc16223cdda8f7a]

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> *"There is a master MSC every 12 months, each time such a modification is carried out it is itemised as an MSC related to the master MSC; however master MSCs contain many various types of changes, to determine the number that relate to this particular modification type Fujitsu would have to carry out analysis of all individual tasks on all master MSCs. Whilst this type of action may have been taken by SSC it would have been in the context of an individual incident. All incidents are recorded but the system was designed to manage individual operations not for statistical reporting for when a particular action has been taken by a Support Consultant. Fujitsu will be able to answer questions on individual branch queries where the data is still available."*

9.39 The witness statement of William Membury[248] at paragraph 27 explains the use of the MSC toolset which is used to manage changes to Horizon Online. He explains that the MSC tool set "provides assurance" as to the changes made to Horizon. Whilst I have requested copies of the MSC documentation at the date of this report Post Office has refused to provide these.

Effects on Branch Accounting

9.40 The above tools are noted as having the potential to affect transaction data and potentially branch account data by way of incorrectly altering the transactions prior to entering the recipient systems such as POLSAP and External Clients (after processing by the counter). Thereby resulting in potential discrepancies being borne between recipient systems and those recorded in branch.

9.41 This could potentially result in the issuing of a Transaction Correction issued by Post Office who may be unaware of the error induced within

the processing of the corrected transaction. Once accepted by branch this ultimately modifies the branch's accounting position.

[248] Witness Statement of William Membury, 27 September 2018. (Para: 27)

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Notwithstanding, the possibilities of human input error exists, specifically if the aim is to perform "multiple repairs at speed".

9.42 Whilst 9 above states that transactions will be validated, this is interpreted as validated in terms of valid data types according to the check constraints imposed on those specific columns. For example, should a clerk enter a date into a value field, then it is assumed that that will fail validation however, if a clerk enters an amount of 900 where it is supposed to record 90, it is doubtful that the validation rules will interpret that as incorrect as the numerical value type is correct but there is no validation against the amount. Therefore, human error is possible. Projecting onwards, since these values are then sent onto clients, there is facility for discrepancy potentially resulting in a Subpostmaster being liable to pay for a discrepancy over which they have no control.

9.43 Therefore, in respect of Issue 10 point (i), it appears that Fujitsu did have the ability to insert, inject, edit and (potentially) delete transaction data and (ii) had the ability /facility to implement fixes in Horizon that had the potential to affect transaction data or data in branch accounts.

9.44 In respect of Issue 10 part (iii), no evidence of specific branch data rebuilding has been discovered however, since Fujitsu had the remote access capabilities it is entirely possible that it could have occurred, and the witness statement of Richard Roll refers to the ability.

9.45 Fujitsu had the capability and dedicated tools to alter transaction data held in the BRDB and Horizon processing systems remotely, therefore it is likely this would be without the knowledge or consent of the Subpostmaster (of the branch that the transactions applied within).

Further actions affecting branch accounting

[249] DEVAPPSPG0017_7.1.doc, *HNG-X Counter Business Application Support Guide*, 8 January 2014 [POL0134853]

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9.46 HNG-X Counter Business Application Support Guide[249] documents Help Service Desk calls that might result in a stock unit needing to be unlocked on a counter which can be performed by global users with Admin role:

> *"In such situations the clerk must call the Horizon System Desk and request the stock unit to be unlocked. This call is passed on to System Support Centre (SSC) who operates a manual process to unlock the stock unit. To ensure proper accountability this manual process has a high administrative overhead which results in significant work for SSC staff and a long delay for the clerk before the stock unit is unlocked. This function unlocks the locked stock unit in a quick, secure and audited way."*

9.47 The document further sets out:

> *"During the logon process, the user will be forcibly logged off if some unexpected error occurs (during recovery or post logon checks (e.g. change password). If this happens repeatedly, in extreme cases and as a short-term measure purely as a workaround, then the recovery and/or post-logon checks can be bypassed. It must be stressed that this is only to be used for situations where a very fast workaround is required in live. To bypass recovery at logon, use the following application.properties override:logon.recoveryEnabled=false To bypass post-logon checks, use the following application.properties override:logon.postLogonChecksEnabled=true Note that in both cases, when these flags are used, once logon is eventually completed, the user may need to click on the back office/front office button twice in order to*
> *"reset" the counter to a good state."*

9.48 Resetting the counter and bypassing recovery jobs could impact branch accounts in that items awaiting recovery might be lost. When someone from NBSC investigates this in the event of a discrepancy, they would probably not be aware of the action carried out to bypass recovery.

[97581900782d355b4965045331797cea]

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Therefore, their understanding and belief in respect of what should happen in normal recovery procedure will be at odds with actuality. In this instance it could be that the Subpostmaster bears the effects of this (unknown to Post Office) activity.

Supporting Evidence of remote access and implemented fixes affecting transaction data

9.49 KEL SeemungalG519Q[250] records an instance where transaction amendments carried out using the above TIP repair tool at 9.13 are causing exceptions within the BRDB.

9.50 KEL MHarvey2255P[251] records the manual addition of corrective balancing transactions inserted by SSC affecting the TPS system.

9.51 There are potentially more KELs and PEAKs that record the effects of performing corrective transactions which have not been identified at the time of this report.

Permission Controls and Data Auditing

9.52 Typically, in an architecture such as Horizon, there are permission controls set out by roles and privileges that accommodate a support service's ability to manage the estate.

9.53 Administrator capabilities will allow for the management and maintenance of the system. Database administrators will have escalated privileges to allow them to implement changes within the database systems and delegate roles and privileges to others. For example, to set permission controls for 'managers' of a branch, elevated to that of a 'user'.

9.54 Typically, documented procedures will be in place to set out what each defined role can perform within a system. Audit logging is common practice aside from the electronic logging that will occur in a system.

[250] SeemungalG519Q.html, *HNG-X KEL SeemungalG519Q*, 15 January 2010 (last updated 28 April 2014) [POL0039787] [ba2c5c8717aeb77c9a65452e29ec57ba]
[251] MHarvey2255P.html, *HORIZON KEL MHarvey2255P*, 02 September 2005 (last updated 31 May 2006) [POL0035233] [ebd26444c25a88aa178de7cd4be58d27]

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Administrator actions will typically be overseen by other methods of audit.

9.55 For example, the common 'four eyes' principle ensures that an action to be performed is approved and observed by more than one individual where the action to be performed can have a significant effect (as administrator capabilities typically do).

9.56 As there are a number of tools and means by which Fujitsu can perform alterations within the Horizon system (since supporting the system was their primary role) the findings below regarding the auditability of permission controls is limited to those which relate to transaction data amendments which had the ability to affect branch accounts (in answer to Issue 11).

Balancing / Corrective Transactions

9.57 Reconciliation Service: Service Description[252] records the following:

> *"If the Reconciliation Service identifies that Transaction data held on the 'central database' located at the Data Centre is found to be inconsistent when compared to the records of the Transaction that was completed at the Branch, e.g. a receipt, a Transaction log or a Branch accounting discrepancy, the Reconciliation Service shall obtain authorisation from Post Office prior to the insertion of corrective Transactions."*

9.58 It is understood that the request for authorisation as referred to above may be that documented within the Customer Service Operational Change Procedure.[253] The document sets out the process requirements in respect of operational changes where changes are made to the live environment.

Operational Change Proposal

[252] SVMSDMSD0015_4.doc, *Reconciliation Service: Service Description*, 03 December 2013 [POL-0134458] [49b8029c58cb2f714b2ba7e034d6f280]
[253] CSPRD019_1.doc, *Customer Service Operational Change Procedure*, 18 March 2004 [POL-0074909] [439e3230106a96792bf2dd9831729392]

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9.59 An OCP is raised in order to make a change to the live system. The process is administered by Post Office Account Operations and is available to all users for the administration, authorisation and auditing of changes made to the live operational service.

Operational Correction Request

9.60 The OCR process involves the correction of customer data on the live system and because user data is involved, requires different approvals and auditing. The document further states:

> *"Only the SSC has the authority to make changes to the data on the system, and therefore only SSC staff can action an OCR.*
>
> *In most cases, an OCR does not involve the financial integrity of the system. Under these circumstances one of the SSC Manager, the Support Services Manager or the Customer Service Duty Manager can approve an OCR. If the data to be changed has a financial impact on Post Office, then approval must also be given by a senior Post Office Manager.*
>
> *When an OCR has been approved, and has been actioned, it is necessary for two users of the OCP system to confirm that the work has been done – an actionee and a witness. The actionee will always be an SSC staff member, the witness can either be an SSC staff member or a development staff member."*

9.61 Since the definition of what *"involves the financial integrity of the system"* is not documented, it is not clear whether those OCRs that could then be approved without Post Office's authorisation were appropriately decided. Ultimately, Fujitsu could approve and action the OCR independently.

9.62 With regards to Issue 12 and how often facilities were used in relation to accessing/modifying transaction data a Request for Information issued to Post Office provided the response:

> *"…there are in excess of 36,000 MSCs and OCPs combined; and.*

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• OCRs would not be used for any such change (OCRs were used minor support changes that did not required the full approval process that was needed for OCPs)..."

9.63 The above is inconsistent with the operational change document at 9.60 which maintains that they would apply for Live data changes.

Audit Servers

9.64 The audit servers provide an audit trail of all information on the Horizon Online system. In order to ensure that this audit trail is irrefutable the teams which have the ability to change data (i.e. SSC) must not also have the ability to change the audit trail. For this reason, Audit server 3rd line support rests with the Audit development team and not the SSC. This is known as 'separation of duties' and is a type of control.

Process Variations

9.65 The Ernst & Young review of Post Office's systems of internal control conducted in March 2011[254] observes in relation to Horizon (back end) user administration:

"During our testing of the appropriateness of users with access to the Horizon back end environment we noted one user whose access was no longer required due to a change in job responsibilities. When users have access to environments which are not appropriate for their job function there is the risk that users may inappropriately or accidentally use the access leading to loss of application or data integrity."

9.66 As previously opined, where process is not followed, this enhances the likelihood for the possibility of undetected error.

9.67 Further, as noted in the Ernst & Young document[255] there were weak user account management controls and the granting and monitoring of user access was highlighted as an area of concern:

[254] POL Management Letter FINAL.docx, *Management letter for the year ended 27 March 2011*, (Section 2. Prior Year Comments-Update – Item 15) August 2011 [POL-0219218] [9d7862698d2a0f6af2a3c55590763bb7]
[255] POL Management Letter FINAL.docX, *Post Office Limited – Management letter for the year ended 27 March 2011,* [POL-0219218] [9d7862698d2a0f6af2a3c55590763bb7]

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"Unrestricted access to privileged IT functions increases the risk of unauthorised/inappropriate access which may lead to the processing of unauthorised or erroneous transactions."

Opinion Summary

9.68 A number of technical documents provided by Fujitsu identify that the Horizon estate was enabled to be managed remotely.

9.69 This is typically expected in an estate such as Horizon to enable Fujitsu to provide support services without physically having to send an engineer out to each and every branch at the notification of any issue. Software roll-outs and updates to operating system components are typically largely distributed this way.

9.70 Regarding Issue 7, the documents show that Fujitsu could and did remotely access the transaction data recorded by Horizon. Several technical tools exist with the specific purpose of allowing Fujitsu to carry out modifications and corrective fixes to transaction data. In addition, a number of external audit reports commissioned by Post Office show that this access was often not done without the appropriate control mechanisms in place.

9.71 In respect of Issue 10 documents show that a wide range of users at Fujitsu did and do have the ability and facilities to access and modify transaction data. Fujitsu staff were able to implement changes that had the potential to affect transaction data both without the knowledge or consent of the Subpostmaster and/or Post Office. In addition, a number of external audits commissioned by Post Office report that the appropriate control mechanisms to prevent mistakes being made were not followed.

9.72 Regarding Issue 11, business process rules should apply in relation to accessing and modifying transaction data. It is reported that a documented audit log of each and every occasion of live data access exists, however, this has not been made available by POL.

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9.73 Issue 12 is subject to a Request for Information currently disputed by Post Office as to the relevancy of the request. Whilst Post Office states that there are in excess of 36,000 documents regarding how often the access was granted (outside of actions not needing express authorisation that could also be carried out to fix data), these have not been made available for review.

9.74 Regarding Issue 13 it is understood that the implications of Fujitsu carrying out corrective fixes to data within the Horizon system could have the potential to affect the reliability of Branches' accounting positions.

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10. Expert Declaration

I JASON COYNE DECLARE THAT:

10.1 I understand that my duty in providing written reports and giving evidence is to help the Court, and that this duty overrides any obligation to the party by whom I am engaged or the person who has paid or is liable to pay me. I confirm that I have complied and will continue to comply with my duty.

10.2 I confirm that I have not entered into any arrangement where the amount or payment of my fees is in any way dependent on the outcome of the case.

10.3 I know of no conflict of interest of any kind, other than any which I have disclosed in my report.

10.4 I do not consider that any interest which I have disclosed affects my suitability as an expert witness on any issues on which I have given evidence.

10.5 I will advise the party by whom I am instructed if, between the date of my report and the trial, there is any change in circumstances which affect my answers to points 10.3 and 10.4 above.

10.6 I have shown the sources of all information I have used.

10.7 I have exercised reasonable care and skill in order to be accurate and complete in preparing this report.

10.8 I have endeavoured to include in my report those matters, of which I have knowledge or of which I have been made aware, that might adversely affect the validity of my opinion. I have clearly stated any qualifications to my opinion.

10.9 I have not, without forming an independent view, included or excluded anything which has been suggested to me by others, including my instructing lawyers.

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10.10 I will notify those instructing me immediately and confirm in writing if, for any reason, my existing report requires any correction or qualification.

10.11 I understand that:

a. my report will form the evidence to be given under oath or affirmation;

b. questions may be put to me in writing for the purposes of clarifying my report and that my answers shall be treated as part of my report and covered by my statement of truth;

c. the court may at any stage direct a discussion to take place between experts for the purpose of identifying and discussing the expert issues in the proceedings, where possible reaching an agreed opinion on those issues and identifying what action, if any, may be taken to resolve any of the outstanding issues between the parties;

d. the court may direct that following a discussion between the experts that a statement should be prepared showing those issues which are agreed, and those issues which are not agreed, together with a summary of the reasons for disagreeing;

e. I may be required to attend court to be cross-examined on my report by a cross-examiner assisted by an expert;

f. I am likely to be the subject of public adverse criticism by the judge if the Court concludes that I have not taken reasonable care in trying to meet the standards set out above.

10.12 I have read Part 35 of the Civil Procedure Rules, the accompanying practice direction and the Guidance for the instruction of experts in civil claims and I have complied with their requirements.

10.13 I am aware of the practice direction on pre-action conduct. I have acted in accordance with the Code of Practice for Experts.

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Statement of Truth

10.14 I confirm that I have made clear which facts and matters referred to in this report are within my own knowledge and which are not. Those that are within my own knowledge I confirm to be true. The opinions I have expressed represent my true and complete professional opinions on the matters to which they refer.

Signed: GRO

Jason Coyne

Partner

Dated: 16 October 2018

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11. Appendix A

PEAKs of initial interest

11.1 Summaries and key excerpts from a select number of PEAKs which could have a financial impact upon branches (these are also narrated within the main body of the report).

Errors with Financial Impact

PC0027887 (1999)[256]

11.2 Summary: FAD011523 - receipts and payments misbalance

11.3 Date raised in PEAK: 21 July 1999

11.4 Discrepancy value: £1,082,540.28

11.5 Days open: 407 days

Key Excerpts

Date: **21-Jul-1999** 15:25:00 User: **_Customer Call_** *"for fad code: 011523, on week 9 receipts and payments misbalnce of £1337.05, week 10 misbalance of £24000, week 11 misbalance of £12000, week 12 misbalance of £1051111.48 and week 13 misbalance of £17426.05, she has a difference on week 11 of balance due to post office and balance brought fwd on week 12 of £1082544.32 overall these weeks net out a difference of £ 27343.84 . she needs business support(reconciliation) to look into this"*
Date: **27-Jul-1999 10:09:00** User: **Deleted User (Mike Croshaw Sep/00)** *"CAP12 Balance brought forward was multiplied twice due the known software error. The inital balance brought forward for this CAP was £1196622.72. This was multiplied twice to give a total BBF of £2279189.04. The discrepancy was*

[256] PC0027887.html, *PEAK PC0027887*, 21 July 1999 [POL-0221773] [93af66e221ecfde6fcaad8a5ac14eca4]

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therefore £1082540.28. This was due a known software error which has no been resolved."
Date: **03-Aug-1999 13:41:00** User: **Barbara Longley** "*The Call record has been assigned to MSU Team Member: Nicole Meredith*"
Date: **17-Aug-1999 14:32:00** User: **Nicole Meredith** "*A RED report was issued for this incident and I am awaiting confirmation for this call to be closed."*
Date: **24-Aug-1999 14:15:00** User: **Nicole Meredith** "*Julie Dart (POCL TP) is unwilling to close this call. She does not believe that the Receipts and Payments misbalance was caused by the B/F figure doubling up. Please investigate why this misbalance occurred in CAPs 9,10,11,12 and 13 and provide evidence if possible."*
Date**: 25-Aug-1999 09:51:00** User: **Deleted User (Mike Croshaw Sep/00)** "*Evidence for these dates has now been archived. Will update call further when archived evidence has been retrieved*"
Date: **02-Sep-1999 14:58:00** User: **Deleted User (Mike Croshaw Sep/00)** "*Archived message store is now available - further investigation will be carried out on Tuesday."*
Date: **08-Sep-1999 12:11:00** User: **Deleted User (Mike Croshaw Sep/00)** "*The discrepancies for CAP 10 and CAP 11 are related to the transfer incident covered by two previous calls, E-9906020405 & E-9906140099."*

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Date: **15-Sep-1999 08:51:00** User: **Deleted User (Mike Croshaw Sep/00)** *"Jan Holmes is currently working on extracting the archive data for CAP13 and CAP9, which are the two CAPS we have outstanding queries about."*
Date: **21-Sep-1999 08:35:00** User: **Barbara Longley** *"In the absence of Mike, can another team member please take this call - I believe that there is a disc on his desk which is connected with this call. The call summary has been changed from:-FAD011523 - receipts and payments misbalance The call summary is now:-FAD011523 - receipts and payments misbalance The Call record has been transferred to the Team: EDSC"*
Date:**01-Oct-1999 15:03:00** User: **Rakesh Patel** *"Furthur evidence from Jan has not arrived.Passing back to Mike for continuation."*
Date: **04-Oct-1999 14:14:00** User: **Deleted User (Mike Croshaw Sep/00)** *"New evidence added - Files sent by Jan Holmes to SSC…I have added the files sent by Jan Holmes as evidence to this call. Further evidence will probably be required from the archive server. Currently the CAP9 and CAP13 discrepancies are still outstanding on this call. I have asked Les Ong/Brian* *Orzel to take a look at the call and if possible provide guidance."*
Date: **13-Oct-1999 10:53:00** User: **Deleted User (Mike Croshaw Sep/00)** *"evidence deleted - CAP13 New evidence added - Dump of message store taken on 24/08/99 – includes"*

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Date: **13-Oct-1999 11:00:00** User: **Deleted User (Mike Croshaw Sep/00)**

"I spoken to Les Ong re. this call, he has informed me that Steve Warwick is investigating it."

Date: **13-Oct-1999 16:49:00** User: **Steve Warwick**

"The evidence supplied in the Excel files covers 26th May to 30th May. CAP 9 dates were from 20th May to 26th May, therefore I am unable to determine the CAP 9 cause of the £1337.05 imbalance from the evidence presented.

I am also unable to analyse the CAP 12 and CAP 13 (10.6.99 to 23.6.99) imbalances because the data required is not contained in either the spreadsheets or the message store extracts provided. (The only data for this period in the message store extract represents either persistent objects which were still current at the time of the extract or messages which have an expiry period > 35 days).

I can concur with Mike Crowshaw's explanation of the imbalances in CAPs 10 and 11. These were due to a stock transfer for £12,000 which was not settled correctly due to the presence of a corrupt EPOSSSettlement.dll file on the PC involved. The result of this was that the transfer out could not be accepted by the receiving stock unit, leaving a Cash Account imbalance in

CAP 10 of twice the value. The effect of this error in CAP 10 was to leave the overall balance due to POL £12,000 short causing the BBF for CAP 11 to be short by this value and hence the £12,000 imbalance in CAP 11."

Date: **12-Jan-2000 09:54:00** User: **Lionel Higman**

"CSR is no longer a valid target release. Moving target forward to earliest valid value.Target Release updated to CSR-CI2_2R"

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Date: **05-Jul-2000 16:01:00** User: **Deleted User (Anna Croft Sep/00)** *"HSH are chasing an update on this call call still with Steve Warwick -QFP"*
Date: **06-Jul-2000 11:03:00** User: **Lionel Higman**
"This PinICL has been assigned a CS categorisation of C (fix for first maintenance release). Target Release set to M1 to reflect the categorisation. Target Release updated to M1"
Date: **31-Aug-2000 10:46:00** User: **Gerald Barnes** *"I have now taken over analysing this problem from Steve Warwick who requested additional information on 13/10/1999 17:49:21. I have looked at the information and I am not convinced it can possibly be complete.* *For example he said he wanted information from 20th May until 26th May. I opened the spreadsheet mc20may.xls and observed it only had 6 counter 32 transactions in - is this correct?* *In any case my team is not used to dealing with data in this form (spreadsheets). We have developed techniques to look at problems using a full message store plus audit and event logs from the failing counter. Even if all the relevant spreadsheets could be obtained I do not think it would be worthwhile me getting to grips with this new method of analysing problems.* *I see this is a very old problem (21/07/1999) and there have been many software updates since then. May I suggest we discontinue investigation of this particular problem but that if a similar problem occurs again you send full message store plus audit and event logs from the failing counter."*
Date: **31-Aug-2000 13:17:00** User: **Deleted User (Mike Croshaw Sep/00)** *"Closing call on basis of insufficient evidence. As this is such an old call I have not contacted the call originator. I suggest that this call remains closed!"*

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PC0063227 (2001)[257]

11.6 Summary: APS and TIP: unequal harvesting.

11.7 Date raised in PEAK: 28 February 2001

11.8 Discrepancy value: £11,708.08

11.9 Time open: 9 Days

Key Excerpts

Date:**28-Feb-2001 10:34:00** User: **_Customer Call_**
"Could you raise this call for me. APS, PATH039, Priority B The APS Daily Account Balancing Report (2133) for processing date 27/02/01shows 401 transactions that were harvested by APS but not by TPS. Please send to EDSC for investigation."
Date:**28-Feb-2001 12:14:00** User: **Garrett Simpson**
"We have now found out, the hard way, that there is a bug in the new version of Riposte installed for M1. The effect of this is to cause it to run very slowly. TIP harvester runs first and has a finish time of 2030. After that the APS harvester starts. The slow running meant that when the TIP harvester was stopped there were still a lot of offices for it to harvest. By the time the APS harvester was stopped more offices had succeeded in reporting their EOD so the APS harvester had more offices to harvest than the TIP harvester. The correspondence servers have now been regressed to the previous version of riposte, so this problem should not recur."
Date:**01-Mar-2001 15:30:00** User: **Angela Shaw**
"The APS daily account balancing report (2133) processing date 28/2/01 shows that the 401 txns for a value of £11708.08 have now been returned to TIP and have been collected by the TIP harvester. Can you please advise what is being done to fix the problem in the longer term? Is there a fix / work package? Which team is progressing the fix? Thanks"
Date:**01-Mar-2001 17:08:00** User: **Garrett Simpson**

[257] PC0063227.html, *Peak PC0063227*, 28 February 2018, [POL-0237798] [8c84cd6299903d0d3bbe0e05de44b924]

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"The bug in Riposte has been identified. Escher have sent a fixed version which is under test."
Date:**09-Mar-2001 10:21:00** User: **Michael King** "These transactions have now been harvested and this is being fixed under PC0063158. Please close call."

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PC0063723 (2001)[258]

11.10 Summary: FAD213422 – Spurious cash figure on trial balance

11.11 Date raised in PEAK: 10 March 2001

11.12 Discrepancy value: £428.29

11.13 Time open: 5 days

Key excerpts:

Date: **10-Mar-2001 09:01:00** User: **_Customer Call_** "*called by michelle at nbsc & asked to call pm regarding a discrepancy that had been made good but resulted in a spurious cash figure on trial balance*" "*pm had original balance £30358.35 & a shortage of £428.29pm declared cash to £3078.86 his new balance was £428.29over £428.29 under net discrepancy zero, but his cash figure had gone up £856.58 to £31643.22 and a message saying continuing could result in an unbalanced stock. I took the pm back into the cash declaration & it was still the same figure £30786.64, I printed out the trial balance again this time it was over £428.29 under £856.58 net discrepancy £- 428.29. cash figure £30358.35. I went back into cash declaration again & declared cash was still at £30786.64, I printed out another trial balance this time it was over£428.29 under £428.29 nett zero & the cash figure was ok*" "*Info provided for update of KEL DRowe1625K as this PM seems to have got himself a workaround which may work in the future.*"
Date: **15-Mar-2001 11:54:00** User: **Sudip Sur** "I have updated KEL DRowe1625K as requested. Please note that this is a known problem and development are working on this and a fix will be released when available.

[258] PC0063723.html, *Peak PC0063723*, 10 March 2001, [POL-0238257] [1efaafc05039eea7a5e5e09d1d50226c]

FUJ00082162

PC0098844 (2004)[259]

11.14 Summary: FAD011642 - Fault with bureau & decimal point

11.15 Date raised in PEAK: 6 February 2004

11.16 Discrepancy value: N/A

11.17 Days open: 193 days

Key Excerpts

Date: **06-Feb-2004 16:36:52** User: **_Customer Call_** CALL PC0098844 opened
Date: **06-Feb-2004 16:36:58** User: **_Customer Call_** "*pm has problems regarding a fault with there bureau, something to do with a decimal point* *Contacted: paul buttler who help with the implimentation of the bureaude change at the p.o advises that the problem which is arising at the p.o is due to a decimal point missing on the horizon system on the 'euro line' which is causing a decrepency.* *…* *pm declares euros, but does not show on the balance snap shot. pm does transaction log @ 14.34 on gateway which shows all the euros she has declared but it does not show up as the sterling equivellent. eg. DDP euro 5786500 = sterling 0.00 NB. this problem is only showing for euro's. All other currency's are showing ok in the system* *When the pm is now trying to reverse the transaction the figure is doubling.* *Can ssc please investigate as a matter of urgency why the bureau de change is not updating on the system for euro's currency on the system.*"

[259] PC0098844.html, *Peak PC0098844*, 6 February 2004 [POL-0270879] [050c1d940ddd970bf7ed304afc494faf]

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Date: **06-Feb-2004 16:41:54** User: **Barbara Longley** *"Prescan: Assigning call to Martin Harvey in EDSC who has been working on call already. Raising call to 'A' priority to reflect urgency."*
Date: **06-Feb-2004 18:18:56** User: **Martin Harvey** *"The event log shows several error messages indicating that the DBD discrepency value is too large. It is believed that the problem is with the balance snapshot only The PM has been advised to not roll over but to continue transacting normally. Messagestore and event logs to follow."*
Date: **09-Feb-2004 15:41:01** User: **Martin Harvey** *"Just to clarify, in addition to a software fix for this problem we also need dev to advise on the remedial action necessary to unpick the actions taken by the* *PM and to enable the office to be balanced on the 11th Feb"*
Date: **10-Feb-2004 09:01:39** User: **Martin Harvey** *"The PM has done a trial balance on Stock Unit FC as requested. This shows a value of £50530.57 as the sterling equivilent of Euro's, which is about right apparently. Also there is Receipts/Payment mismatch of £79321.46, which is double the revaluation amount of £39660.73. Response code to call type L as* *Category 4"*

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Date: **10-Feb-2004 11:46:55** User: **Martin McConnell**

"*The receipts payments mismatch is a duplicate of 98480 currently with RMF. In other words users should NOT be allowed to reverse system generated revaluations thus. The initial problem with the large amounts I believe the system has coped OK and has alerted a red event to say so. Perhaps the only thing the system should hve done based on the current spot rate as time of declaration would be to refuse to allow such a number to be entered because it would blow a system limit. This is potentially flawed should a new spot rate*

arrive after a declaration but it is probably a more user friendly thing to do.

Routing to management for their onward consideration."

Date: **10-Feb-2004 13:13:56** User: **Mark Wright**

"*I've applied the fix that Martin provided, and that has cleared the receipts and payments mismatch, however the PM is still reporting a shortage of£39660.73 Martin is now looking into this and will advise."*

Date: **10-Feb-2004 16:42:19** User: **Martin McConnell**

"*The clerks/PM@@s should be alerted to the fact that they should NOT under any circumstances be allowed to reverse (ER) a system generated revaluation with regard to BDC. Hopefully we@@ll be able to punt out a fix for PC0098480 which has led us down this path in S60(?) which will prevent the likes of this problem spiralling out of control."*

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Date: **12-Feb-2004 11:46:13** User: **Matt Arris**

"*In summary This PinICL has exposed two potential problems. 1) Clerks can reverse an auto-generated Bureau revaluation. This is a duplicate of 98480.*

2) Clerks declare foreign currency daily.

The counter software checks to see if the figure declared matches the system generated figure. If the declared figure does not match the system figure the outlet has ?lost? some currency and there will be a discrepancy. If this discrepancy is greater than 1 million pounds an error is produced whereby the sterling equivalent is set to zero, but the declared foreign currency figure is retained. When entering the daily foreign currency declaration there may be the odd small discrepancy, but there will not be one of 1 million pounds worth unless there was a robbery ? but a million pounds of a particular foreign currency in stock is too high anyway.

The clerk produced this problem because two many zeros were added to the generated figure would have been zero for every currency. Under normal operation a discrepancy would make the clerk double check the entered figure

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or explain the difference in stock. To prevent this second problem from arising by changing code we would have to check each declared foreign currency when entered to decide if the sterling equivalent of any discrepancy would exceed 1 million pounds. This would require a sizeable rework with associated changes to dialogues, etc.

Development would rather not have to make this change. I think this second problem can be covered by a KEL with no code change made. Small discrepancies will occur and will need checking and explaining. Post migration, large discrepancies should not happen. Discrepancies of more than a million pounds worth should never happen.

If we stop the ability of reversing an auto generated Bureau revaluation (98480) no further damage can be done by making incorrect declarations. By just making a correct declaration and performing a trial balance (with no commit) the error will be resolved. It may be worth passing this PinICL to John Pope in Requirements for him to find out if the customer is willing to pay for a code fix for item 2) or whether PO is prepared to accept that item 2) is unlikely to happen and there is an easy way to put things right if it does happen (re-declare and perform a trial balance). declaration. £30,000 worth of Euros was turned into £3,000,000.

Bureau sites were being migrated from the existing MoneyChanger system to Horizon. The instructions were to declare all MoneyChanger stock on the new Horizon Bureau system. Effectively all transactions were discrepancies as the system."

Date: **13-Feb-2004 10:07:56** User: **Martin Harvey**

"*OCR MWright420K was raised to cover the correctice actions. Kels AChambers5533Q and GMaxwell3841K cover both problems. As recommended please pass call to John Pope in Requirements for him to find out if the customer is willing to pay for a code fix*"

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Date: **04-May-2004 10:34:39** User: **_Customer Call_**

"Caller states that the rates on the rate board are not being updated. 04/05/04 10:33 uk951563 HSH2 Information: PM is sure she has not logged, or is not aware there is a call logged for this fault. This call is a PATH call, therefore the PM may not be aware. Also, there has been no update since March 23rd. 04/05/04 10:34 uk951563 HSH2 Information: Raising new call for FAD FAD, and to reflect callers new complaint."

Date: **21-Jun-2004 15:28:39** User: **Lionel Higman**

"The call Target Release has been changed from:- BI_3S50R-Provisional The call Target Release is now:- BI_3S70R-Provisional S50R is no longer a possible target release. S60R is already fully subscribed. Targeting at next available potential R release - S70R."

Date: **14-Jul-2004 16:20:08** User: **Lionel Higman**

"The call TargetRelease has been changed from:- BI_3S70R-Provisional The call TargetRelease is now:-

BI_3S75R-Provisional I am told the currently targeted release for this call (70R) exists only in name - retargeting at S75R-Provisional."

Date: **29-Jul-2004 17:09:23** User: **David Cooke**

"In the absence of John Pope I have reviewed this entry and agree with the assertion that this can be handled via KEL with no code change. The circumstances were unusual and should not occur in normal live operation. Unless the help desk advises we have had a large number of calls relating to the KELs I suggest we close this call."

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Date: **17-Aug-2004 09:14:41** User: **Barbara Longley**

"Prescan: As Martin Harvey is out of the office this week, I am reassigning call to Anne Chambers who is familiar with this problem."

Date: **17-Aug-2004 10:37:23** User: **Anne Chambers**

"Call had been passed to John Pope to see if there was a POL requirement for change here - after some months the following response was received from David Cooke: In the absence of John Pope I have reviewed this entry and agree with the assertion that this can be handled via KEL with no code change. The circumstances were unusual and should not occur in normal live operation. Unless the help desk advises we have had a large number of calls relating to the KELs I suggest we close this call. However in the interim, this problem has been seen on a couple of other occasions and has caused significant accounting problems. PC0103606 is with development, fix scheduled for S80. This call can be closed (please do not contact original outlet)."

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PC0203131 (2010)[260]

11.18 Summary: FAD203306 office snapshot is showing incorrect volume

11.19 Date raised in PEAK: 18 August 2010

11.20 Discrepancy value: N/A

11.21 Days open: 24 Days

Key Excerpts

Date: **18-Aug-2010 11:01:23** User: **_Customer Call_** "*pm states office snapshot is showing incorrect volume*" … "*pm states volume for lottery was £284 but value on the office snapshot is £604 Rem in session ID: 1-362075 - items in question are the first two from this session ID*" … "*The volume of £1 lottery tickets was set at £284 but the value on the snapshot under receipts table is £604 Smiley Desktop could not find any particular issues No relevant SSC KELs could be found Counter can be pinged.*" … "*PEAK, can you investigate discrepancy between volume and value in office snapshot for £1 Lottery tickets?*"
Date: **21-Aug-2010 09:38:49** User: **Sudip Sur** "*I have looked at the tally roll printout of the Office snapshot that was carried out on 13/8/10 @15:35. The print out showing the volume of Instants £1 =*

[260] PC0203131.html, *Peak PC0203131*, 18 August 2010 [POL-0372925] [6ea70fc9c6b34cbcd61b2a7b2ddb2628]

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284 and the Value = 604.00. Clearly this is wrong and the system is failing to calculate correctly. *I have done a query on the database for session data for product:56 during 1st Aug and 20th Aug and found a txn that was done on 4th Aug @7:48:57 (Mode:SW) for quantity = -320. This may have contributed to the incorrect value of 604.00."*
Date: **23-Aug-2010 08:56:07** User: **Gareth Jenkins** "*I have tried this out on Horizon and I accept that on Horizon the Volume relating to a TC is NOT included in the Receipts and Payments.* *I believe that this is a bug on Horizon and that it should be included. We had a similar issue with Discrepancies on the Pre and Post Migration report and this was accepted as being due to a bug on Horizon rather than on HNG-X.* *I believe that this PEAK is another symptom of the same issue. I think that this should be closed as "Advice after investigation" (since "No fault" fives SSC a Black Mark!)."*
Date: **11-Sep-2010 09:43:54** User: **Sudip Sur** "*Development have investigated the problem and believe that the feature has been carried forward from old Horizon and not a new problem in HNG X."*

PC0203676 (2010)[261]

11.22 Summary: Branch 054106 (HNGx) - NB102 Section 5 LINK - State 4

11.23 Date raised in PEAK: 31 August 2010

11.24 Discrepancy value: £71

11.25 Days open: 1 Day

[261] PC0203676.html, *PEAK PC0203676*, 31 August 2010 [POL-0373467] [9c65a8e1e33e636bc6ae372aefed3690]

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Key Excerpts

Date: **31-Aug-2010 10:33:40** User: **Jay Crofton** *"Branch 054106 (HNGx) - NB102 Section 5 LINK - State 4 Call Type: L Call Priority: A"* *"NB102 Section 5 report for Client: LINK produced on 30/08/2010. Branch shows one new exception with Txn Id: 00-54106-2-3633070-1 Receipt date 27/08/2010, Amount: -£71.00* *This branch also appears on the Failed Recovery Report ? why? KEL acha959T or KEL dsed2640M may be relevant. Relevant reports attached. Sending to SSC for investigation.* ***PLEASE include further txn attempts with the same PAN immediately after this txn if applicable as this is useful for Post Office Ltd for settlement issues**"*
Date: **31-Aug-2010 15:51:58** User: **Clive Turrell** *"The customer requested a withdrawal which was authorised by the FI and a receipt was successfully printed at the counter so it is very likely that cash was handed over. However the T1 recovery request timed out at the counter and was abandoned. No subsequent transactions were attempted on the same PAN. In these circumstances the following applies from KEL acha959T*
"If the receipts were printed successfully, and no subsequent transaction was done for the same PAN at the branch (check on TESQA) it is likely that the transaction was completed. Customer's account will be correct but the branch will have a shortage (for a withdrawal) or surplus (for a deposit) because the session hasn't been recorded.""
Date: **31-Aug-2010 16:08:24** User: **Clive Turrell** *"The Call record has been transferred to the team: MSU-Indt Mgt"*

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Date: **31-Aug-2010 16:34:36** User: **Andrew Nash**

"*[Start of Response] Closing call. [End of Response] Response code to call type L as Category 67 -- Final -- Solicited Known Error Routing to Call Logger following Final Progress update. Defect cause updated to 42 -- Gen - Outside*
Program Control"

PC0263451 (2017[262])

11.26 Summary: Branch 66013 - Failed Recovery Report - 19/10/2017

11.27 Date raised in PEAK: 19 October 2017

11.28 Discrepancy value: £20

11.29 Days open: 1

Key Excerpts

Date:**19-Oct-2017 08:25:20** User: **Dharmesh Mistry**

"Branch shows one failed recovery transaction with Txn Id: 00-66013 15621320-1 for Receipt Date: 16/10/2017.

This exception has not appeared on any of the reports and following a search on the DRS did not bring back any results. Raising a call to investigate why this has appeared as an exception, the root cause and the potential business impact for POL. Relevant reports attached. KEL cardc464Q and KEL acha2511S (seng2048K for DCS) may be relevant. For charging purposes, please could SSC explain whether or not this issue is Fujitsu related (at fault) i.e. hardware or not? Relevant reports attached."

[262] PC0263451.html, *Peak PC0263451*, 19 October 2017, [POL-0430967] [981b785aa6f78e75a5f19c8a2c70aff5]

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Date: **19-Oct-2017 09:39:42** User: **Sunil Nellikkentavita**

"The £20 cash withdrawal transaction was authorised by the FI and an AUTHORISED receipt was produced on the counter. However, when the user attempted to settle the transaction it failed due to the comms issue at the time so disconnected session receipts were produced and the user was logged off. The user managed to log back in but recovery also failed because of same comms issue. As an AUTHORISED receipt was produced the user should have handed money over to the customer but we cannot be certain that they actually did so. Assuming money was handed over, the customer account will be correct but the branch will

have a shortage given that the transaction hasn't been recorded on the system. This will need to be manually reconciled"

Date: **19-Oct-2017 09:51:25** User: **Sunil Nellikkentavita**

"Failed recovery session cleared from BRDB under MSC Task 043T0095737.MSC updated with following details: PC0263451 - Failed recovery tx no:00-66013-1-5621320-1 cleared from BRDB. Actioned by Sunil and witnessed by Dave Seddon."

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PC0266575 (2018)[263]

11.30 Summary: Branch 116940 - NB102 Section 5 A&L ? State 4

11.31 Date raised in PEAK: 26 January 2018

11.32 Discrepancy value: £125.00

11.33 Days open: 6 days

Key excerpts:

Date:**26-Jan-2018 08:52:35** User: **Dharmesh Mistry** "*NB102 Section 5 report for Client: A&L produced on 26/01/2018. Branch shows one exception with Txn Id: 00-116940-1-5311-1 Receipt Date: 24/01/2018, Amount: £125.00 KEL acha959T may be relevant. Relevant report attached. Sending to SSC for investigation. For charging purposes, please could SSC explain whether or not this issue is Fujitsu related (at fault) i.e. hardware or not?*"
Date:**31-Jan-2018 11:11:47** User: **Venkata Subbarao Konakalla** "*The cash withdrawal transaction was authorised by the FI and an AUTHORISED receipt was produced on the counter. money should have changed hands. However, when the user attempted to settle the transaction it failed due to comms issues. The user logged back today after one week and the recovery also failed. The customer's account will be correct but the branch will have a shortage because the session hasn't been recorded. This requires manual reconciliation. Please raise an MSC to clear the failed recovery transaction.*"
Date:**09-Feb-2018 09:45:06** User: **Dharmesh Mistry** "*Closing peak as MSC completed and Failed recovery cleared*"

[263] PC0266575.html, *PEAK PC0266575*, 26 January 2018, [POL-0433904] [8d02a629313fa13f86f853d49e55dcc7]

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PC0273046 (2018)[264]

11.34 Summary: Branch 051106 - NB102 Section 5 LINK - State 4 and Failed Recovery

11.35 Date raised in PEAK: 15 August 2018

11.36 Discrepancy value: £25

11.37 Days open: 1

Key excerpts:

Date:**15-Aug-2018 08:15:59** User: **Andy Dunks** "*PEAK raised for the investigation of transaction(s) in a state other than Final as showing in daily Reconciliation reports. To comply with SLA, PEAK will be open for a between 8 hours and 5 days maximum whilst transaction issue is investigated, reported and mitigating actions completed and closed down.*" … "*This branch also appears on the Failed Recovery Report. Could SSC please investigate why? KEL acha959T (surs136M for DCS) may be relevant.*"
Date:**15-Aug-2018 11:30:17** User: **RCAClient Live** PEAK [PC0273046] Branch ID [051106] Node ID [02] SSN [lprpssn003] User [snell02] Attempting command execution: get /cygdrive/c/ProgramData/Fujitsu/CounterBusinessApplication/log/PostOfficeCounter.log.2018-08-13.zip evidence/051106/02_PostOfficeCounter.log.2018-08-13.zip
Date:**15-Aug-2018 11:30:36** User: **RCAClient Live** PEAK [PC0273046] Branch ID [051106] Node ID [02] SSN [lprpssn003] User [snell02] Command execution completed successfully: get /cygdrive/c/ProgramData/Fujitsu/CounterBusinessApplication/log/PostOfficeCounter.log.2018-08-13.zip evidence/051106/02_PostOfficeCounter.log.2018-08-13.zip

[264] PC0273046.html, *PEAK PC0273046*, 15 August 2018, [POL-0439981] [c4330f4fcc4ea9f37368e4c692730828]

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Date:**15-Aug-2018 11:45:35** User: **Sunil Nellikkentavita**

"During the 25 RBS Grp Cash Withdrawal, the banking transaction had fully completed, including the receipt print but disconnected session at settlement (Comms issue).
Recovery also failed because of same comms issue.

As per KEL, transactionState=1 the banking transaction had fully completed, including the receipt print, and money should have changed hands. If recovery had succeeded, it would have automatically completed the session. So you can assume that the transaction was completed successfully. The customer's account will be correct but the branch will have a shortage for 25 withdrawal because the session hasn't been recorded."

Date:**15-Aug-2018 11:49:50** User: **Sunil Nellikkentavita**

"Cleared failed recovery transaction from BRDB under MSC Task 043T0098231. Actioned by me and witnessed by Venkat."

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12. Appendix B

Horizon Architecture Diagrams

Figure 1 Horizon Data Flows Overview

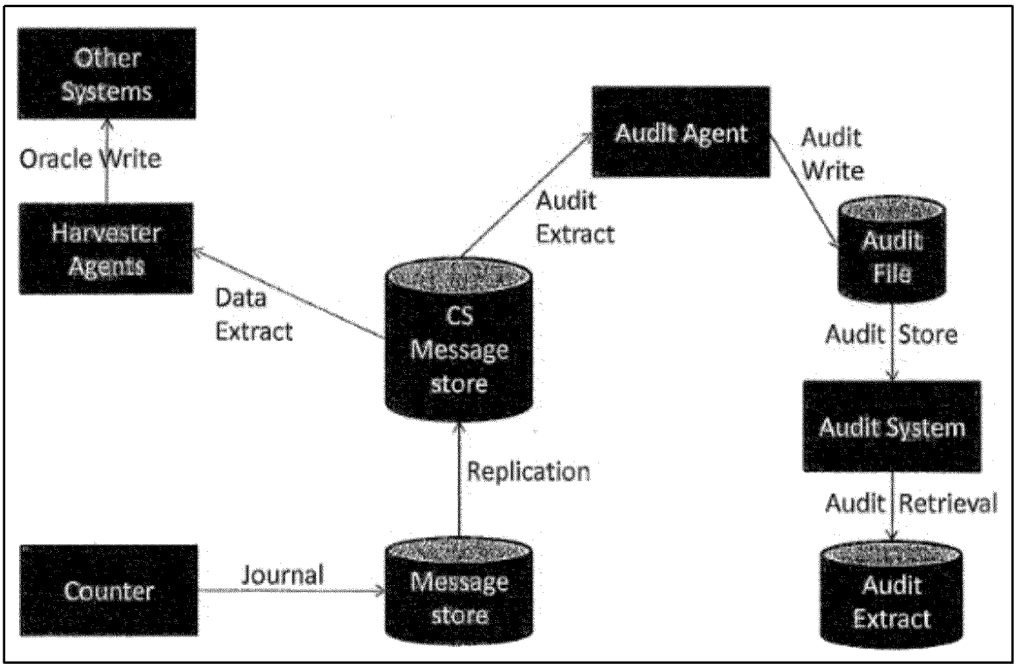

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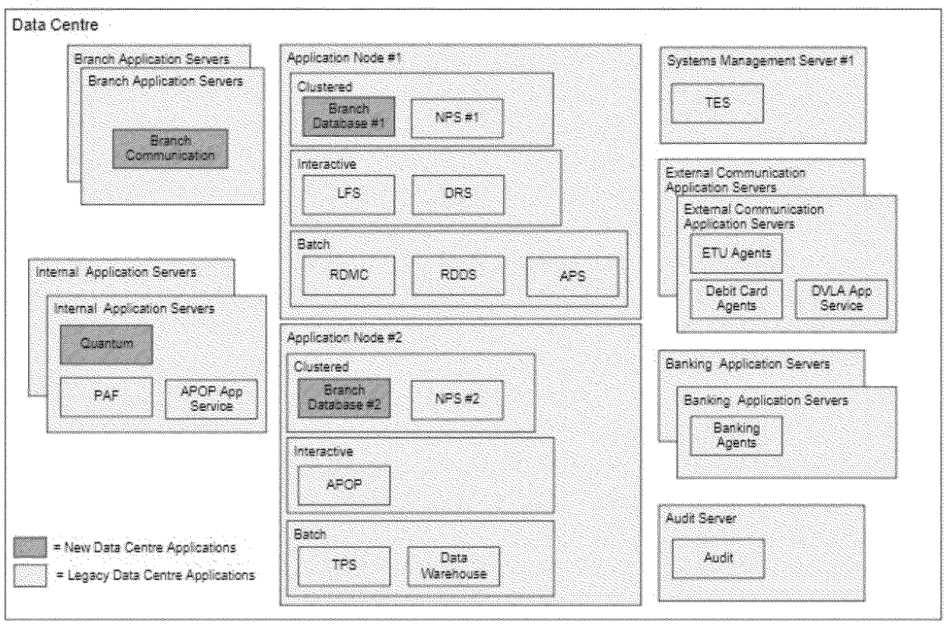
Figure 2 Data Centre Applications Overview[265]



[265] RMARC002_0.1.doc, *Horizon Next Generation - Plan X (HNG-X)*, 21 September 2005 [POL-0084540] [754315a4037a6ea4c1ec7ee070b7d170]

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Figure 3 Horizon / Horizon Online migration overview[266]

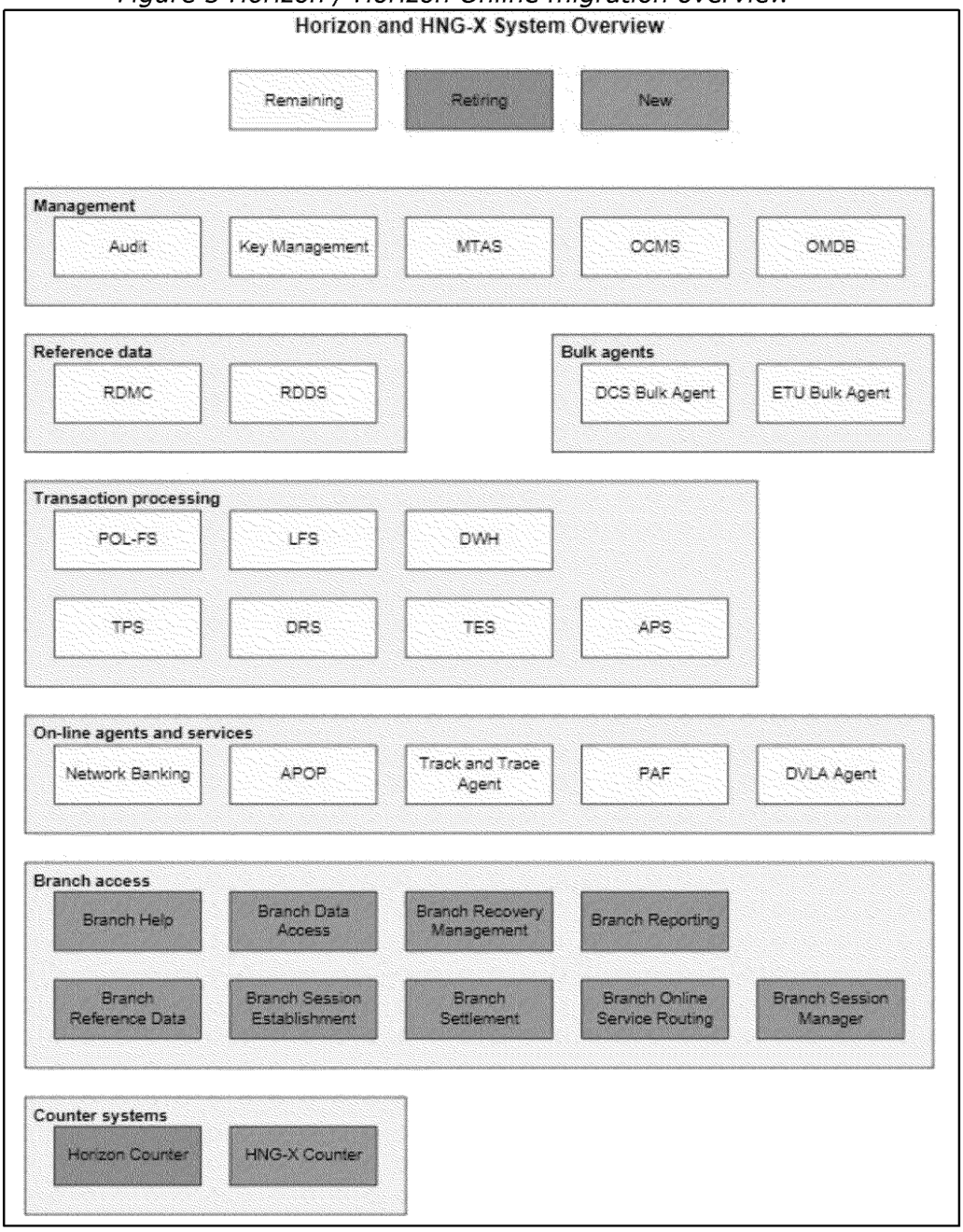

Figure 4 Horizon Online Message Flows overview[267]

[266] ARCAPPARC0002_0.2.doc, *HNG-X Integration Architecture*, 08 November 2006 [POL-0087918] [daec0de8a5eee25b5c9d06730c338dd0]
[267] Witness Statement of Gareth Jenkins.pdf, *Witness Statement of Gareth Jenkins*, 05 October 2012 [C0003632] [b544230cf07249c189cf664fcba6d899]

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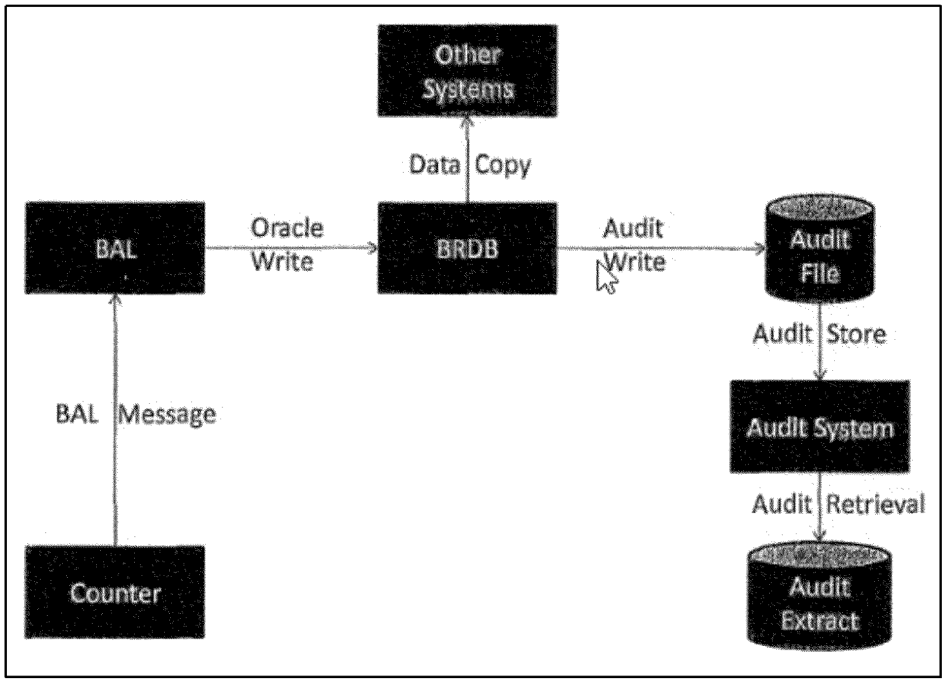

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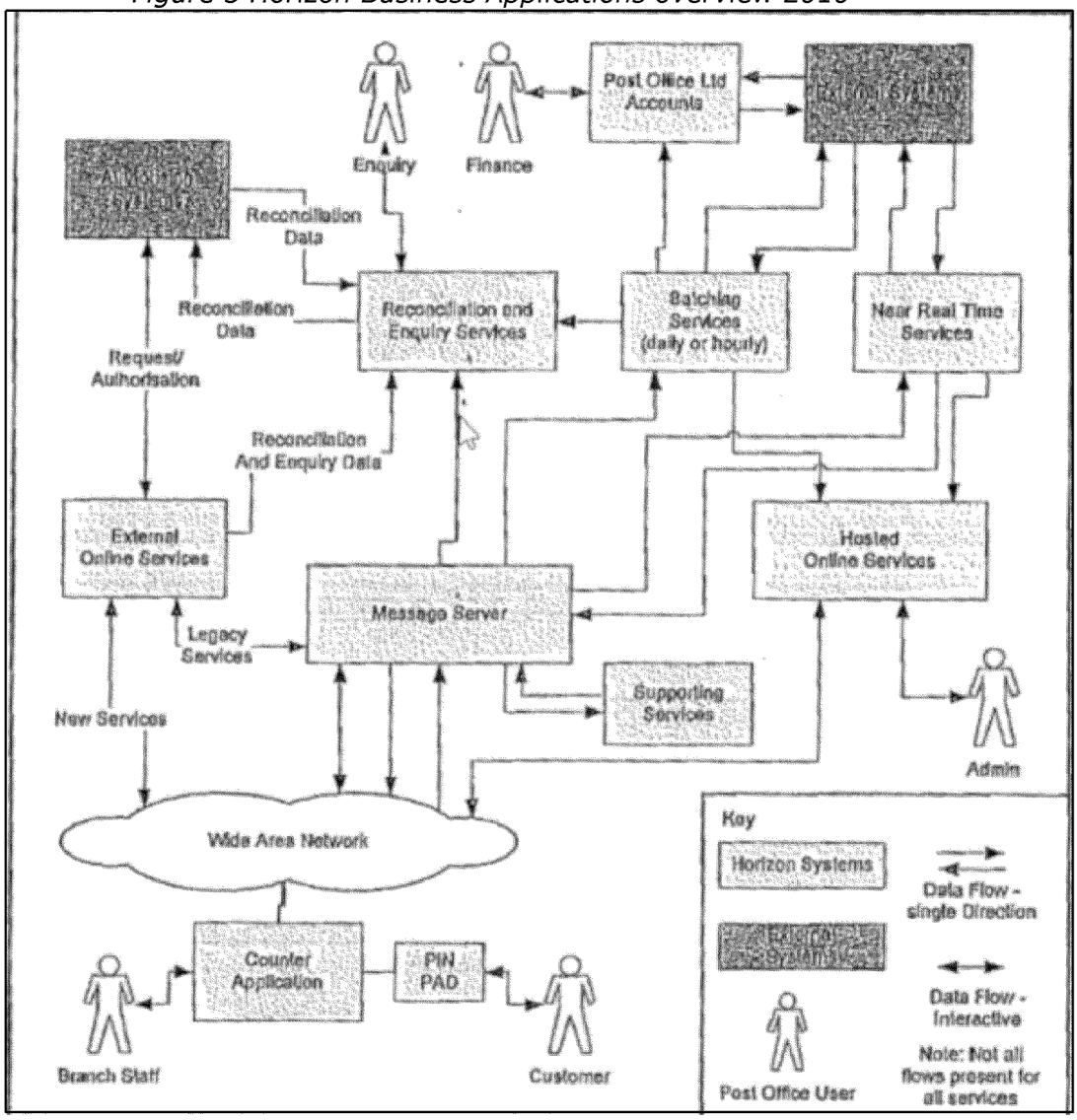
Figure 5 Horizon Business Applications overview 2010[268]



[268] POL-0003093.pdf, *Horizon Architecture Diagrams*, 8 March 2010 [POL-0003093] [00195d1cbb0017bd34e7c68b7930c1cf]

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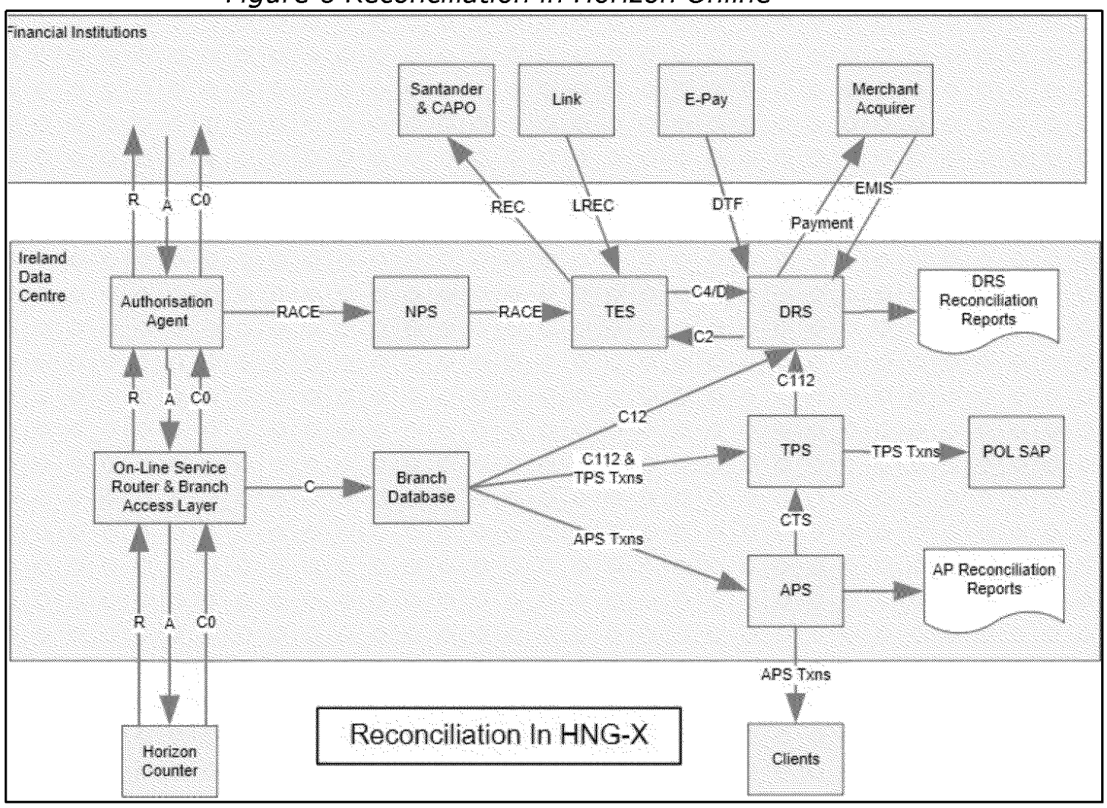
Figure 6 Reconciliation in Horizon Online[269]



[269] SVMSDMPRO0012_3.doc, *Reconciliation and Incident Management Joint Working Document*, 30 April 2012 [POL-0125134] [ad897ac9ff5edb2de37bfb8c4e9dc362]

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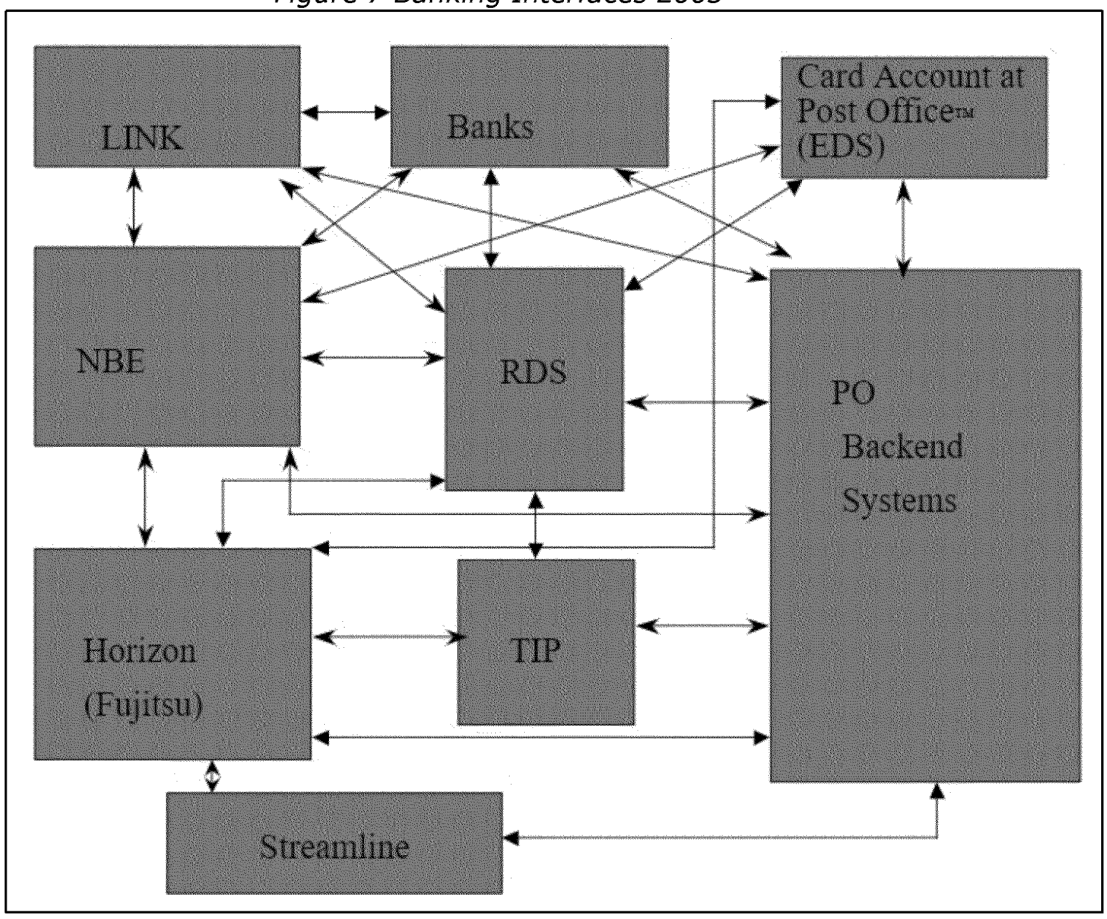
Figure 7 Banking Interfaces 2003[270]



[270] CSOLA045_1.1.doc, *Operational Level Change and Release Management Interface agreement Between Post Office Ltd and Fujitsu Services*, 24 April 2003 [POL-0069985] [334ef7724ebe8012129c96f62b41ad15]

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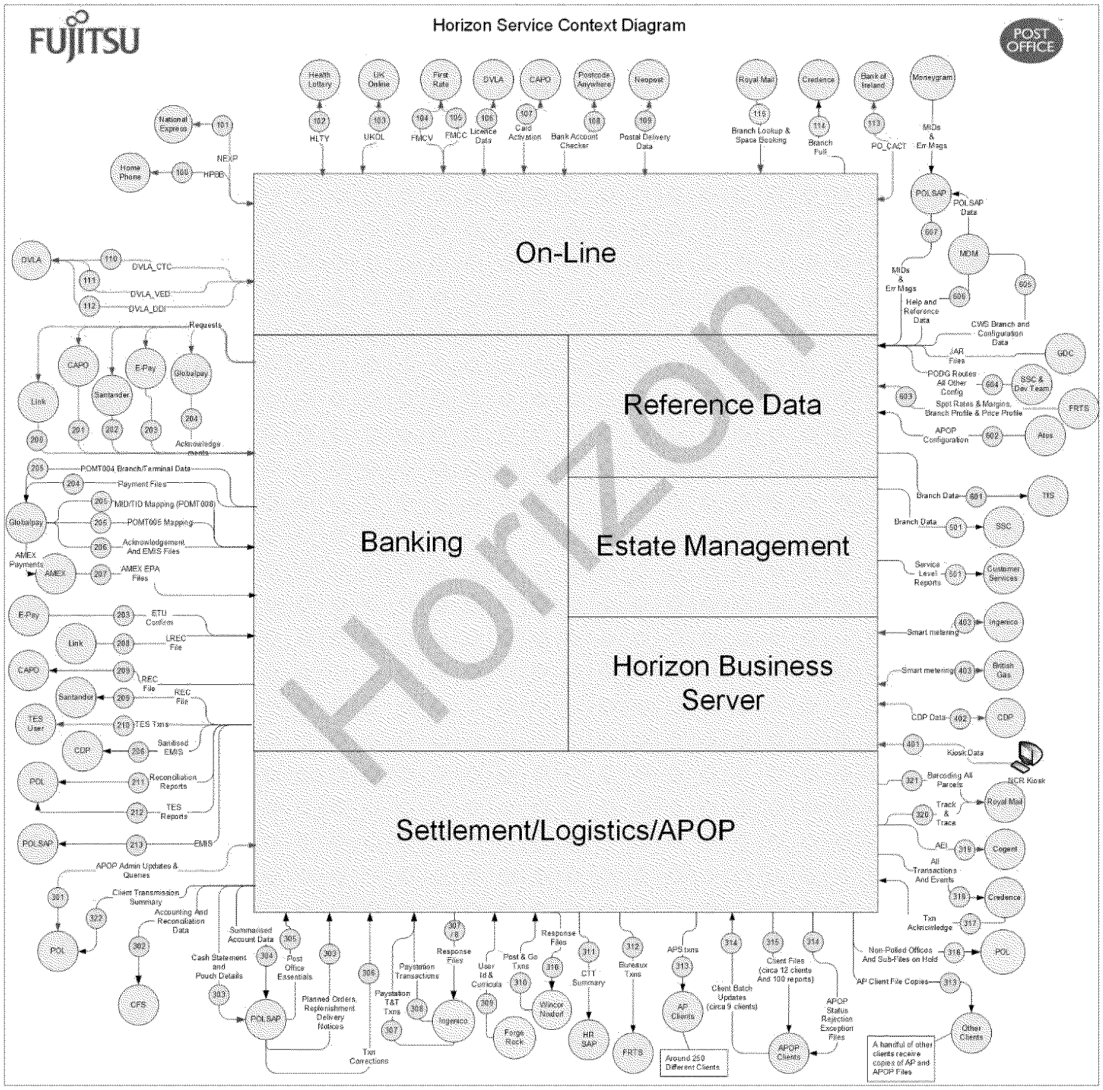
Figure 8 External Clients / Systems



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13. C

2012 – 2013 TC's

Row Labels	Count of Type	Count of Reference	Sum of £ Value
(blank)			
Unpaid Cheques	538	238	249515.5
Suspense	4671	4667	-371763.46
Stock - Non Rem	235	234	5824.93
Santander - Online Banking	1458	1452	-11297609.87
Santander - Manual Withdrawal	602	602	191847.23
Santander - Manual Deposit	5905	5905	-896625.78
Santander - Green Giro	887	886	12091.87
Santander - Co-Op Business Encashments	1321	1321	42285.91
Pre-Order	127	126	-735.28
Postal Orders	1046	1046	15639.96
Personal Banking	327	323	19938
Paystation	53	52	2778
Other (Branch)	88	86	7878.21
Online Banking	705	704	-1871845.18
NS&I	826	826	-340783.35
Government Services	1044	1039	-121795.24
First Rate	124	122	46352.47
DVLA	3744	3743	-223352.65
Drop & Go	514	514	27721.21
DebitCards	140	139	771759.83
Cheques To IPSL	4722	4675	1585269.95
Cash Rems From Branch	25649	25649	6120594.63
Camelot	22567	22567	-448789.34
Bureau	3939	3939	432165.75
Automated Payments	2040	2040	-3351011.34
ATM	945	945	947230
Grand Total	**84217**	**83840**	**-8445418.04**

14. D

Log of helpdesk calls regarding Transaction Corrections W/E 15 June 2014

	W/E 15/06/ 2014		
		Data	
Activity	Sub Activity	Count of Sub Category	Count of Resolving Group
⊖ Transaction Corrections	Dispute	23	23
	General Information	84	84
	Missing Evidence	3	3
	Possible Solutions	13	13
	Printing Corrections	7	7
	Resolving Branch Discrepancies	7	7
	Transaction Correction Dispute	8	8
Transaction Corrections Total		145	145

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Appendix

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Appendix 15. E

Horizon Reports

TPS Reports

15.1 TPS Reports were set out in the "TPS Report Set" which was designed to enable the reconciliation of transactions that were carried out in branches using the branch infrastructure. It was sent to the POLSAP system and the POLMISs (Credence), and was made up of the following reports:

15.2 TPSC250: Host Detected Transaction Control Errors - Daily report which shows detail for any Post Office branch where the control totals for the transactions output by the Host to POLSAP and Credence do not match the Daily Transaction Totals calculated by the counters.

15.3 TPSC254: Harvester Exceptions - Daily Report which shows a list of exceptions detected by the BRDB copy process when failing to process one or more messages.

15.4 TPSC257: POLSAP Incomplete Summaries Report - Daily report which identifies all Post Office branches in which the net total transactions (debits/credits) does not equal 0.

15.5 The TPS Report Set contained information which would allow Post Office to identify the errors or inconsistencies set out above, which could include shortfalls. However, the investigation of the cause and resolution of TPS exceptions and errors was not dealt with within the TPS Report Set. Resolution was dealt with through "Business Incidents" and the underlying cause was investigated via "System Incidents", both of which are part of the Business Incident Management (BIM) procedure. This is considered in more detail below.

15.6 There are 2 additional points to note in relation to the TPS Report Set

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Appendix

15.7 There was no formal reconciliation process between the POLSAP system and the Credence transaction stream, so Credence could not be used to

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verify financial integrity. POLSAP system transaction information should have been used for this purpose.

15.8 The TPS Report set was not intended to be shared with Post Office, but it was available upon request.

APS Reports

15.9 APS reports were set out in the APS Report Set which was designed to ensure APS Transactions completed in Branches are reconciled with the Transaction stream received by the POLSAP System to enable settlement to be made with Clients. The APS Report set was made up of the following reports

15.10 APSS2133: APS Daily Account Balancing Report - The objective of this report is to confirm that the APS transaction account balances for the processing day.

15.11 APSS2133b: APS Client Summary Report - Objective is to provide a summary of the transactions which have been delivered by APS during the processing day. The summary is produced by the clearing agent (i.e. the organisation to which Fujitsu Services deliver the transactions). For each clearing agent, a breakdown is provided by Client account for each transaction date. Transactions delivered to Manual are processed manually and consequently are not reported here.

15.12 APSS2133c: APS Delayed Transactions Report - Objective is to provide details of all transactions which have not been delivered by Fujitsu Services because they have been delayed/quarantined within the APS Host system. Initial Customer Support resolution will cause the transactions to be returned for normal processing or sent to manual for manual processing. TPS quarantined APS transactions will show up as a discrepancy on the APS Daily Account Balancing Report.

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15.13 APSS2136: Daily TPS / APS Transaction Reconciliation Summary Report - Normally, APS transactions flow through the TPS Host to POLSAP and through the APS Host system within the same working day. However,

the rules associated with the processing of APS transactions within the TPS Host and the APS Host systems are different. Consequently, transactions may be placed in exception status by APS but be accepted as valid by TPS. This reconciliation point is at the end of the processing day. It reconciles the APS transactions at Branches and APS transactions delivered by TPS to POLSAP. It maintains a record of which transactions have passed through the TPS side and which transactions have passed through the APS side and on a daily basis it reports transactions which have been processed by one side and not the other.

15.14 APSS2136b: Daily TPS / APS Transaction Reconciliation Client Account Exception Report - Objective is to identify Client account exceptions when comparing the actual number and value of transactions that were processed by TPS (TIP) and APS (Client) for the last 30 days.

15.15 APSS2136c: Daily TPS / APS Transaction Reconciliation Detail Exception Report - The objective is to report all transactions for the last 30 days which are different in POLSAP to Client delivery. Differences may occur either as a result of some error condition, or in the case of unmatched TPS/POLSAP transactions, as a result of business processing rules being different from those of APS/Client transactions.

15.16 APSS2139: Daily APS Office Harvesting Report - The APS Harvester Reconciliation was used to ensure all Horizon Branches had been harvested. As Horizon Online does not rely on harvesting of transaction this report is no longer relevant.

15.17 APSS2140: APS Harvester Transaction Totals Summary - Objective is to provide Branch totals and harvested totals by transaction date for each of the last 30 transaction days for the APS Harvester.

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15.18 APSS2140b: APS Harvester Transaction by Office - Objective is to provide details by Branch code of any discrepancies that exists in the overall totals shown in the APS Harvester Transaction Totals Summary.

15.19 APS2134: APS Validation Status Report - Objective is to identify the success or failure of the APS Validation process. This compares the volume of normal transactions and the value of all transactions between each Client Transmission file and the corresponding fields in the CTS sub-file.

15.20 Rejected Sub-Files Report - The Times Rejected column will indicate how many times that the sub-file has been rejected and will indicate whether there is an ongoing problem with poor quality data in corrected files. If the quality of the data in the external transaction file is good then we would not expect any output from the report.

15.21 Similar to the TPS Report Set, the APS Report Set would allow Post Office to identify the errors or inconsistencies set out above, which could include shortfalls. However, the investigation of the cause and resolution of APS exceptions and errors was not dealt with within the APS Report Set. Resolution was dealt with through the BIM procedure which is set out in more detail below.

Banking & Related Services Reconciliation (DRS Report Set)

15.22 The Banking & Related Services Report Set was designed to enable Santander, CAPO, LINK, Global Payments Inc., and Epay transactions completed in the Branches to be reconciled in order to allow settlement to be made with Clients, or direct settlement to specific Clients and/or Banks. It was made up of the following reports:

15.23 NB000: DRS Summary - This report summarises all reconciliation reports produced by the DRS. It also summarises all reports that were not produced by the DRS because there was no data to report.

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15.24 NB101: Network Banking Settlement Statement - This report identifies 'C4' transactions received against each 'C4 Settlement Date' as reported to the DRS for the most recent processing date. The report will be used by Post Office Ltd. as a basis for settlement of Network Banking transactions with the Financial Institutions (FIs).

15.25 NB102: Exception Summary - This report identifies all incomplete or exception states, and is divided into 12 sections:

a. Section 1: All Uncleared Confirmed, Unconfirmed & POLSAP exceptions

b. Section 2: Uncleared Exceptioned Client Transactions

c. Section 3: Uncleared Corruptions

d. Section 4: Uncleared Timing Differences

e. Section 5: Uncleared Confirmed, Unconfirmed & POLSAP exceptions >24 hours

f. Section 6: Uncleared Future Dated Transactions by Client

g. Section 7: All Cleared Confirmed, Unconfirmed & POLSAP exceptions

h. Section 8: Cleared Exceptioned Client Transactions

i. Section 9: Cleared Corruptions

j. Section 10: Cleared Timing Differences

k. Section 11: Cleared Confirmed, Unconfirmed & POLSAP exceptions

>24 hours

l. Section 12: Cleared Future Dated Transactions by Client.

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Reconciliation and Incident Management

15.26 The BIM system was designed to report progress on the resolution of Business Incidents to allow Post Office to complete reconciliation or settlement with its internal systems, clients and banks.

15.27 A "Business Incident" is defined as the symptom of an underlying cause – e.g. the effect of the system fault on the resulting reconciliation or settlement information sent to Post Office. A Business Incident can relate to any of the exceptions from the various reports above or one or more of the reconciliation or settlement Errors discovered by Post Office.

15.28 Post Office have reported the following numbers of BIs raised each year:

01/07/2017 - 30/06/2018: 2096 BIMS
01/07/2016 - 30/06/2017: 1208 BIMS
01/07/2015 - 30/06/2016: 1773 BIMS
01/07/2014 - 30/06/2015: 1020 BIMS
01/07/2013 - 30/06/2014: 1130 BIMS
01/07/2012 - 30/06/2013: 875 BIMS
01/07/2011 - 30/06/2012: 1013 BIMS
01/07/2010 - 30/06/2011: 1413 BIMS
01/07/2009 - 30/06/2010: 3201 BIMS
01/01/2009 - 30/06/2009: 335 BIMS

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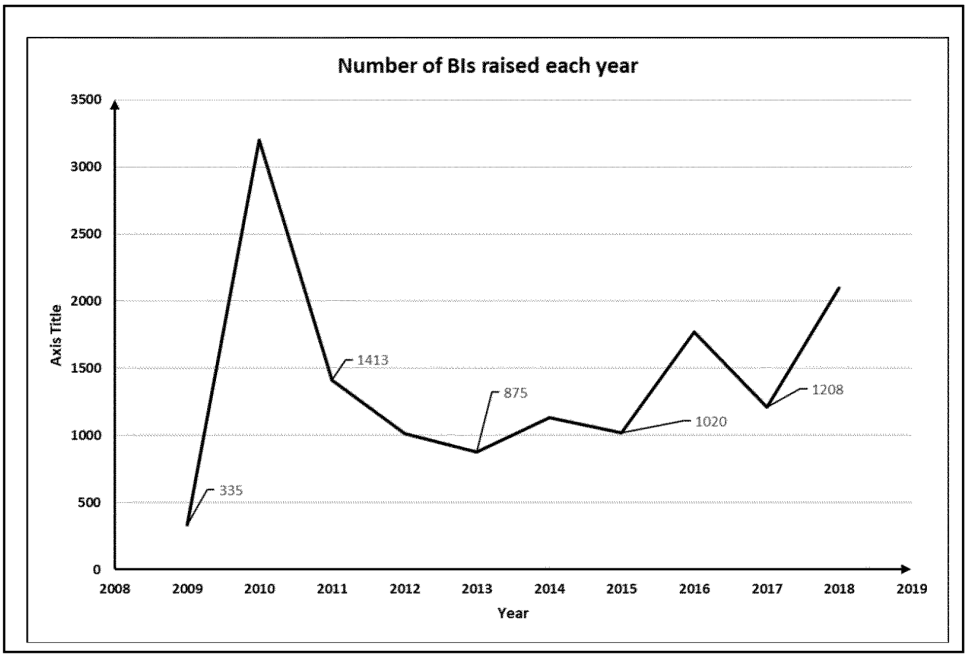

15.29 From the above BIM's the following where identified:

While POL-0032901.pdf relates to Horizon this report is still run in HNG-X and the numbers below are from the records Fujitsu now hold:
01/07/2017 - 30/06/2018: 162 APS Reconciliation Error BIMS
01/07/2016 - 30/06/2017: 125 APS Reconciliation Error BIMS
01/07/2015 - 30/06/2016: 104 APS Reconciliation Error BIMS
01/07/2014 - 30/06/2015: 39 APS Reconciliation Error BIMS
01/07/2013 - 30/06/2014: 37 APS Reconciliation Error BIMS
01/07/2012 - 30/06/2013: 42 APS Reconciliation Error BIMS
01/07/2011 - 30/06/2012: 33 APS Reconciliation Error BIMS
01/07/2010 - 30/06/2011: 69 APS Reconciliation Error BIMS
01/07/2009 - 30/06/2010: 76 APS Reconciliation Error BIMS
01/01/2009 - 30/06/2009: 15 APS Reconciliation Error BIMS.

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15.30 A "System Incident" is defined as the underlying cause of a Business Incident and is created to track the root cause of the same.

15.31 Depending on the impact, nature and scope of the Business Incident the POA Problem Management Procedure may be invoked. However, if the nature of the Business Incident is agreed to be low priority or a one-off, the BIM reconciliation procedure would suffice. The choice of procedure is determined by discussion and agreement between Post Office and the Reconciliation Service for specific Business Incidents as they occur.

15.32 BIM Reports are issued for each Business Incident generated. BIM reports are designed to notify Post Office Finance of the detail required to assist in the reconciliation or settlement process within Post Office. BIM Reports communicate information concerning the resolution of the symptom of an underlying cause, not the cause itself. This information would be supplied via the Problem Management route, if escalated to that level

<u>The Problem Management Procedure</u>

15.33 The aim of Problem Management is to investigate, eliminate or prevent causes of Incidents and known errors regarding Post Office Account and Post Office Limited Infrastructure / Information System and to prevent the recurrence of Incidents related to these errors. A "Problem" in this

respect is defined as the unknown underlying root cause of one or more incidents.[271]

15.34 The Problem Management Process covers both reactive and proactive functions of Problem Management.

15.35 Whilst there are several responsibilities detailed within the process document, no mention of advisory to Subpostmasters whereby an

[271] SVMSDMPRO0025_5.doc, *Post Office Account Customer Service Problem Management Procedure*, 12 July 2016 [POL-0146787] [fe6a96a3615a63e094682c7efaa33090]

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incident may affect branch accounts is detailed. It could be that this was incorporated within the "investigative" phase, but I would expect some low-level detail to be provided as to what to do in the event that a problem that has the potential to reoccur, might impact, and how to handle such.

15.36 As highlighted in the same process document, effective Problem Management is dependent upon the effective use of the process by Fujitsu, Atos, POL and third parties. We have not yet established that it was the case.

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16. Appendix F

Closed Problem Records

Issue ID	Description of Problem	Number of Users Affected
3	Horizon Overnight Release	10% to 40% of users affected
15	Negative Stock Figure on Branch Account	10% to 40% of users affected
12	HNGx Generic Connectivity issue	More than 70% of users affected
25	End of Icon removal	Single User
14	Receipts & Payment Mismatch	10% to 40% of users affected
19	First Rate Reconcilliation issue	10% to 40% of users affected
24	Cash declarations discrepancies	10% to 40% of users affected
30	HOL Online Disc POLFS	10% to 40% of users affected
32	Branches able to settle centrally >£150	40% to 70% of users affected
37	Transaction harvesting issue	10% to 40% of users affected
52	Streamline payment file issues	10% to 40% of users affected
49	Transaction Correction Failure	Single User
43	ROLLOVER Issue with cancel button	10% to 40% of users affected
67	Harvesting of Branch event data	10% to 40% of users affected
76	Unexplained Fluctuations with the EBT (Electronic Banking Transactions)	40% to 70% of users affected
77	Postal Orders causing printer failures and issues on counters	Less than 10% of users affected
78	Camelot file mapping issue causing discrepancies	More than 70% of users affected
79	Transcash fees are shown incorrectly on the end of day report	10% to 40% of users affected

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80	POLSAP – Files/ data not received following issues in the Fujitsu domain	10% to 40% of users affected
81	Branches receiving "Unable to Contact Data Centre" message when attempting rollover.	10% to 40% of users affected
85	Impact of MDM on live service following recent service incidents	40% to 70% of users affected
86	Some mobile van branches have various connectivity issues	10% to 40% of users affected
88	Higate Near Station - 15 postage labels produced but receipt shows 14 items.	Single User
92	Horizon Methods of Payment Issue	More than 70% of users affected
96	Withdrawn products - Approximately 30 branches have been affected by the withdrawal of Bureau / Savings Stamps / Philatelic products.	Less than 10% of users affected
105	POLSAP - RIS Table shows minus values for Bureau.	10% to 40% of users affected
115	POLSAP Data issue re. Article BSBO000115 Created Incorrectly	More than 70% of users affected
122	POLSAP Determine if there are RIS3 Discrepancies	10% to 40% of users affected
112	POLSAP Analysis of Misbalance on 628100	Single User
135	Counter Printer Issues for singer counter branches	10% to 40% of users affected

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140	Branches haven't rolled over into a new Trading Period for a long time.	10% to 40% of users affected

147	Complex Basket Not Working	10% to 40% of users affected
153	Paystation branch connection problems	Less than 10% of users affected
155	Shopping Basket files are either being delivered later than expected or not being delivered	More than 70% of users affected
154	Transcash values not deleting out, but adding on to total	More than 70% of users affected
158	Short Dump running automated POe settlement	Single User
159	Reconciliation identified (via TPSC257 report) that POLFS records were not being created from BRDB	
160	POLSAP - POE Weekly Reports Issue	Single User
162	Duplicate Data	Single User
165	Corrective actions process for future branch escalations	Less than 10% of users affected
164	POLSAP - Missing data in POLSAP (Paystation)	Less than 10% of users affected
182	Disconnected sessions with foreign cards	Less than 10% of users affected
197	Token ID Mismatch	More than 70% of users affected
199	TFS : 5139830 - Issue with DIRD files being overwritten	Single User
213	New Ingenico High Failure Rate Problem	10% to 40% of users affected

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220	Pinpad High Failure Rate Firmware	10% to 40% of users affected
218	HSBC Merchant Aquirer (HMS) incorrect EMIS file to FJ	Less than 10% of users affected
226	Cash & Stock Screen Order	40% to 70% of users affected
228	Fibre Link	40% to 70% of users affected
229	Counter Slip Buffer	Less than 10% of users affected
235	MAG Card Track 2 Length Errors	Less than 10% of users affected

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17. Appendix G

[See Spreadsheet]

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18. Appendix H

Failure Point Diagrams

18.1 The diagrams below are constructed summarisations of the processing components within Horizon that have been identified as common points in which discrepancies have been recorded.

18.2 The first diagram displays each of the failures examined overlaid on top of each other. This helps to illustrate that the different aspects of Horizon have suffered failures.

18.3 The diagrams that follow take each of the failures individually and attempt display the flow of the transaction (using the dotted coloured lines) to understand where the failure occurred.

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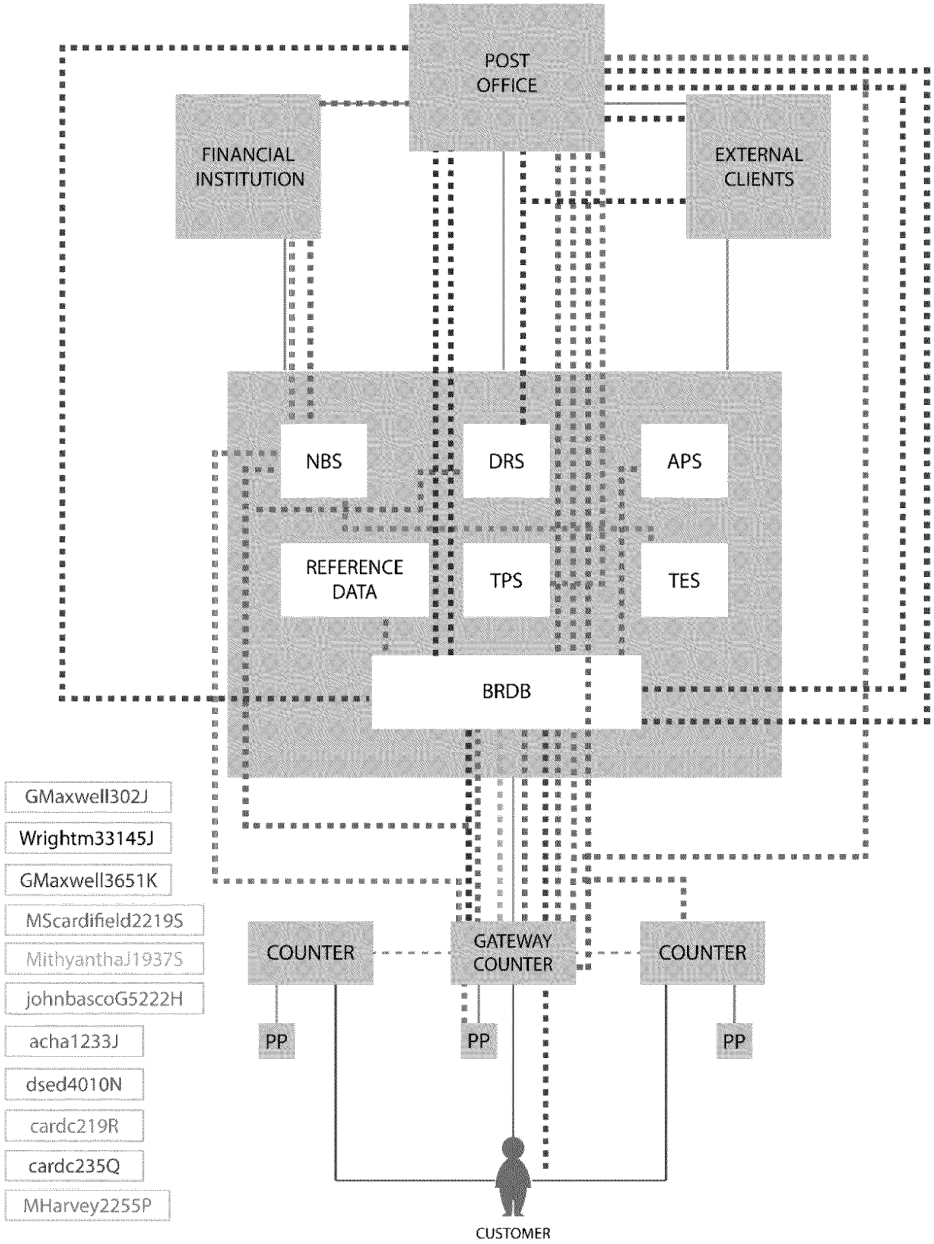

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18.4 KEL cardc219R

KEL Type	Unresolved
Title	NB102 Section 5 CAPO State 4 – transaction cancelled by pinpad but not reversed resulting in state 4
Raised	11/05/2011
Last Updated	31/10/2016
Release System	HNGX
System Product	Counter
Issue: MSU report a transaction State 4 on one of the NWB reports, C4 only. TES shows request and authorisation messages but no confirmation. Post Office Counter log shows transaction being declined by the pinpad: MSG00999: Card Removed Too Early. No c0MessageDetail, hence the transaction does not get reversed.	
Summary: Since a State 4 transaction implication is potential for incorrect settlement with the Financial Institution (FI) and/or incorrect adjustment of End Customer Account, considering the above KEL records that the transaction was not reversed as it should have been it is likely that branch accounts were affected potentially recording a value transaction that should have been reversed and was not.	

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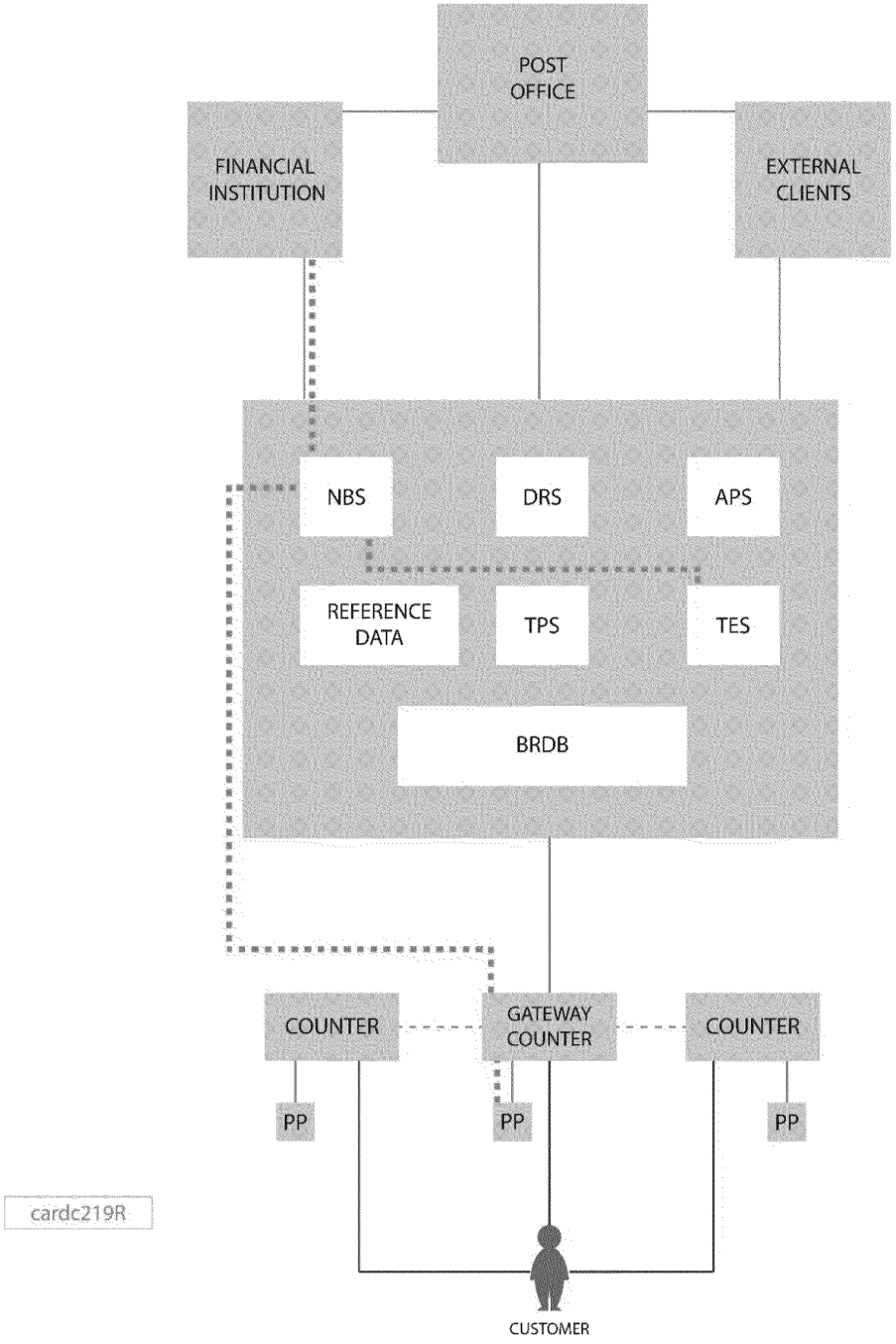

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18.5 KEL Acha1233J

KEL Type	Information
Title	Incorrect cash declarations received by Cash Management – errors relating to cash management
Raised	22/06/2012
Last Updated	22/06/2012
Release System	HNGX
System Product	CounterBusinessapplications
Issue: … it appears that somewhere after leaving Horizon but before getting into the cash management system, an adjustment is being made to add the branch Cash in Pouches overnight figure to what they have actually declared. But rather than using the value for the correct trading day, it is using the value from the previous day. Hence the declarations being used by the Cash Management system do not match the cash actually in the branch. This problem will only affect branches which frequently hold large amounts of cash in pouches overnight - these are likely to be the larger branches. If they are affected by this problem, it is NOT user error and they can't do anything to correct it themselves. Rebecca Portch (Inventory Manager - South, Post Office Ltd - Supply Chain) is aware of the problem - the branch could check with her, via the cash management team, whether this could be the cause of the apparent differences.	

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Summary: Since POLSAP are aware of the issue it is likely that any branch differences could be corrected however, this still evidences an issue in the data integrity in that incorrect values were being erroneously added to branch accounts.

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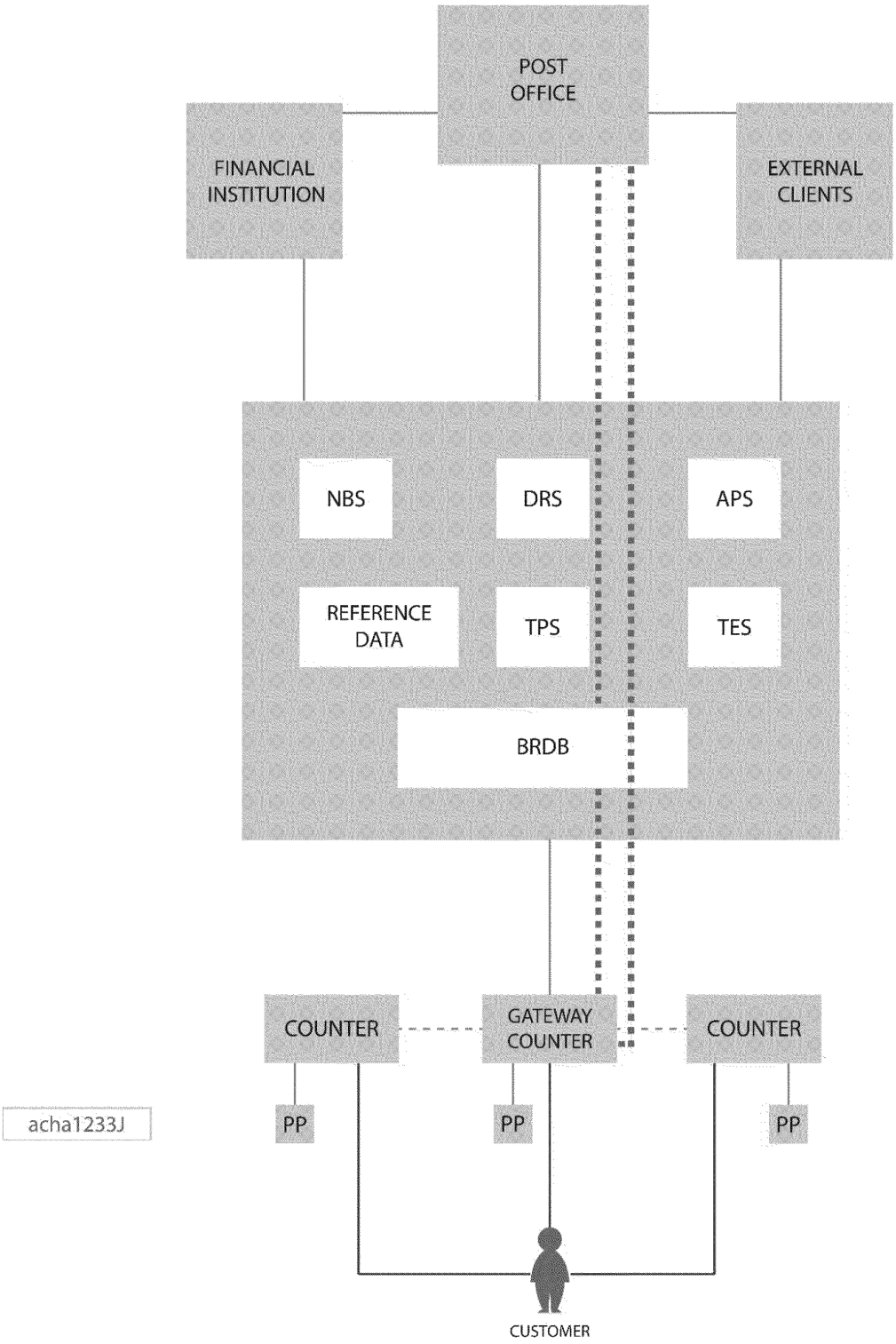

acha1233J

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18.6 KEL Dsed4010N

KEL Type	Unresolved
Title	NB102 Section 5 State 4 – PM pressing cancel on counter moments after the customer has entered their PIN on pinpad
Raised	28/01/2013
Last Updated	20/11/2015
Release System	HNGX
System Product	HNG-X Counter(CNT)

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Issue: The cash withdrawal was initiated and the customer got as far as successfully completing PIN entry on the pinpad. However, within milliseconds of this the PM has pressed Cancel on the counter. This appears to have put the counter and pinpad in a confused state as an authorisation request (R1) was generated despite the counter and pinpad also trying to cancel the transaction. The PM ended up being prompted with a message saying that the transaction had been declined and a CANCELLED receipt was produced for it. Moments after this a successful authorisation response (A3) was then received which caused an 0291 System Error to occur. The PM pressed Continue and was returned to the Front Office home menu from where they continued the transaction session by selling some stamps before settling the basket by Fast Cash. On the branch database the cash withdrawal has been recorded as a zero value and as a CANCELLED receipt was produced the PM should not have handed any money over to the customer so this is ok.

However, a C0 reversal was not generated for the transaction and the DRS hasn't got the C12 or C112. It just has the £142 C4 which means £142 has been taken from the customer account. The recovery table on the branch database showed no recovery outstanding for this transaction.
Summary: This ultimately would require input from Post Office to manually reconcile the issue where there are discrepancies.

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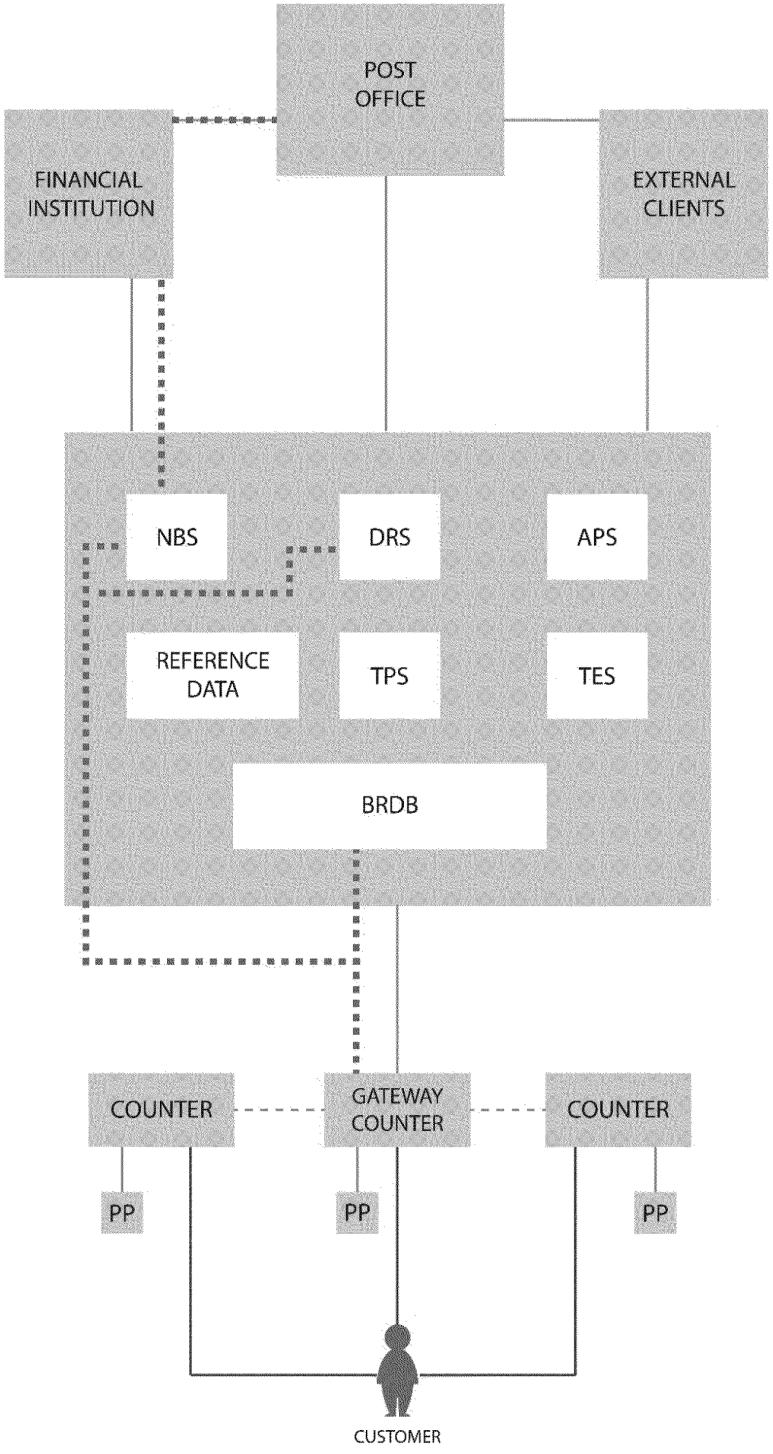

dsed4010N

18.7 KEL johnbascoG5222H

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KEL Type	Information
Title	Counter APS Txn posted against incorrect APS Account
Raised	11/07/217
Last Updated	11/07/2017
Release System	HNGX
System Product	HNG-XCounter(CNT)

Issue: It is been noted that two AP dangerous goods transactions 6 minutes apart on the same counter in two different baskets. Both record the same CuRef (barcode), same AP token, same client code and SVC, but one of them has client account code 3047 (correct) and the other 3046 (incorrect, does not exist in ref data).

On investigation, we find that the issue is either not reproducible or there is no code which seems to cause this issue. On every retry, the client accounting code is always posted correctly to 3047. Additionally, the reference data is verified and there is no client accounting code with 3046.

Occurrences of this issue is rare however it has business impact so, a fix will be provided to prevent this from happening i.e. to add a check and verify if the clientAccountCode exist in ref data and raise a system error if it does not.

Summary: Whilst this does not immediately indicate a branch discrepancy it does highlight issues with reference data occurring in

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the processing systems. KEL MWright1458Q details an instance where reference data could impact branch accounts.

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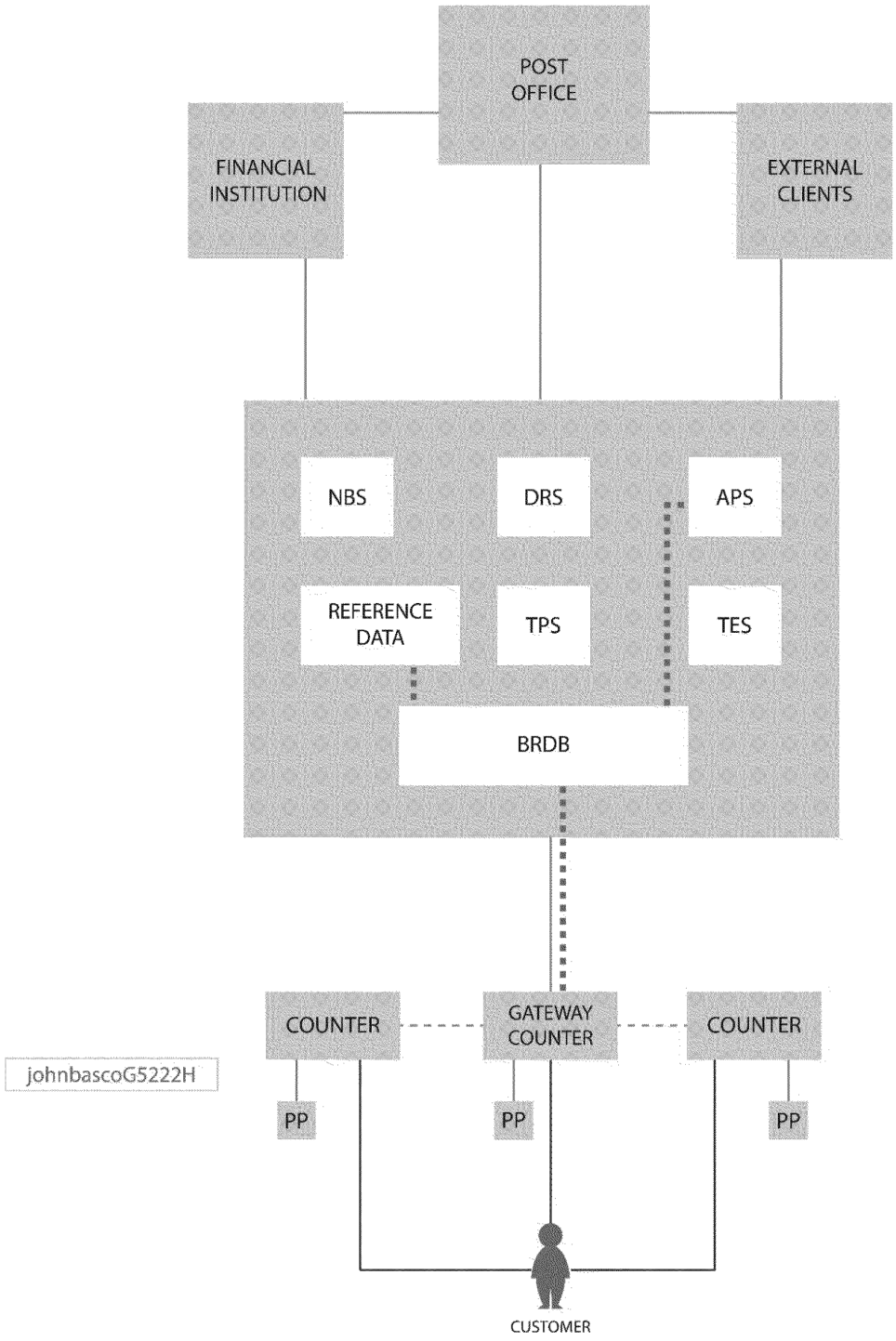

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18.8 MithyanthaJ1937S

KEL Type	Information
Title	Exception raised whilst processing message event – Serious system error:[Duplicate JSN detected – failed to insert journal record]
Raised	06/05/2010
Last Updated	09/08/2016
Release System	HNGX
System Product	BranchAccessLayer
Issue: Duplicate JSN messages will only occur when there is a record with the same JSN number already in the message journal table BRDB_RX_MESSAGE_JOURNAL UPDATE: 04-Nov-2010 - Until this fix is released, it has been agreed that these events will be ignored UPDATE: 16-06-2011- The fix is still with RM (Release Management) so not yet delivered. UPDATE: 09-Aug-2016 - Fix was released but variations of issue are still seen on rare occasions and should be sent to SSC to investigate	
Summary: Although it is not documented as causing a potential branch account discrepancy in this instance, the problem illustrates how retry requests between the counter and the branch database (BRDB) can occur and have over an extended time period.	

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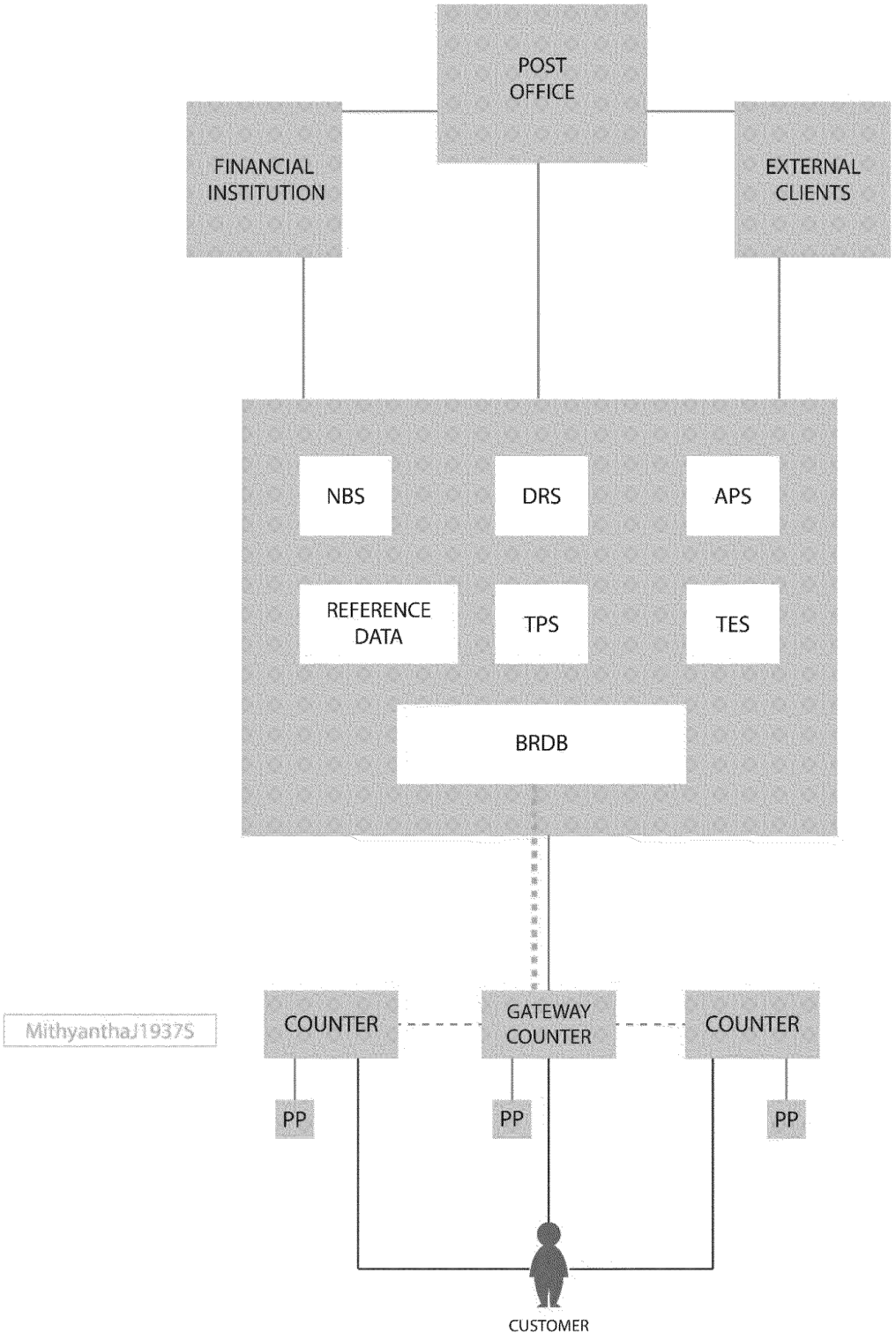

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18.9 Wrightm33145J

KEL Type	Fault_Fixed
Title	Office has Non-Zero Trading Postion (Receipts/Payments mismatch) Office receipts do not match payments. Office has a non-zero trading position.
Raised	23/09/2010
Last Updated	01/04/2016
Release System	HNGX
System Product	CounterBusinessapplications
Issue: The Receipts / Payments mismatch is due to a bug in the code that occurs when Cancel is pressed on MSG31316. The bug incorrectly causes the discrepancy to be cleared, and because there is no balancing transaction (such as a transfer to local suspense) it gives rise to the accounting error. Unfortunately the workaround cannot be done after the problem has occurred at the office! In this case the branch accounts will need to be corrected.	
Summary: Acknowledged issue by Post Office. Correction needed within branch accounts.	

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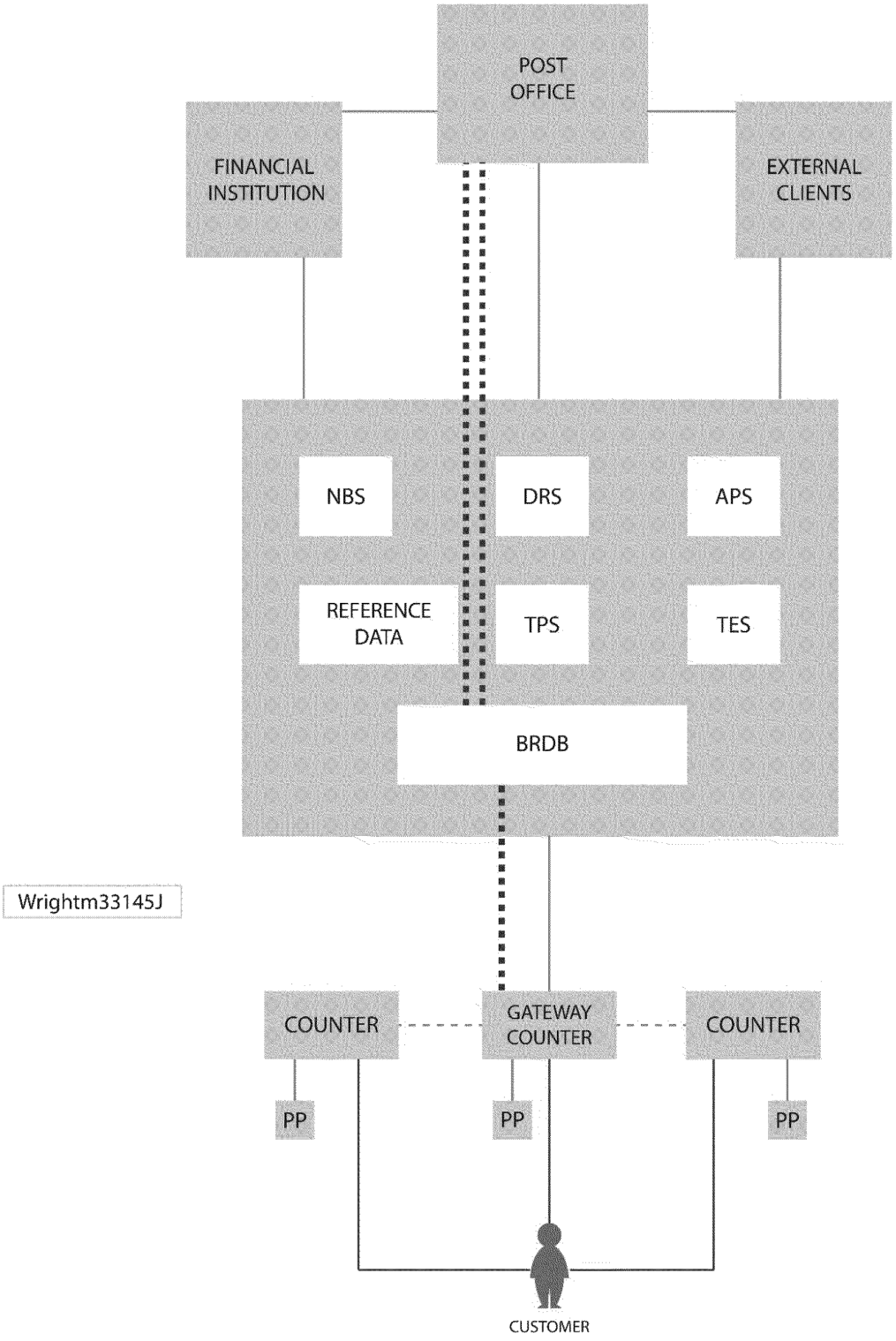

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18.10 GMaxwell302J

KEL Type	Information
Title	Transaction Correction not received at FAD
Raised	04/10/2005
Last Updated	04/10/2005
Release System	S80
System Product	TPS
Issue: POLFS report that transaction corrections sent for a particular office did not arrive at the office.	
Summary: Since Transaction Corrections are issued to clear anomalies in financial values, it is imperative these are applied where necessary. Although this instance identifies the error in the file validation and therefore 'catches' the loss, it still evidences issues in data processing within Post Office processing systems.	

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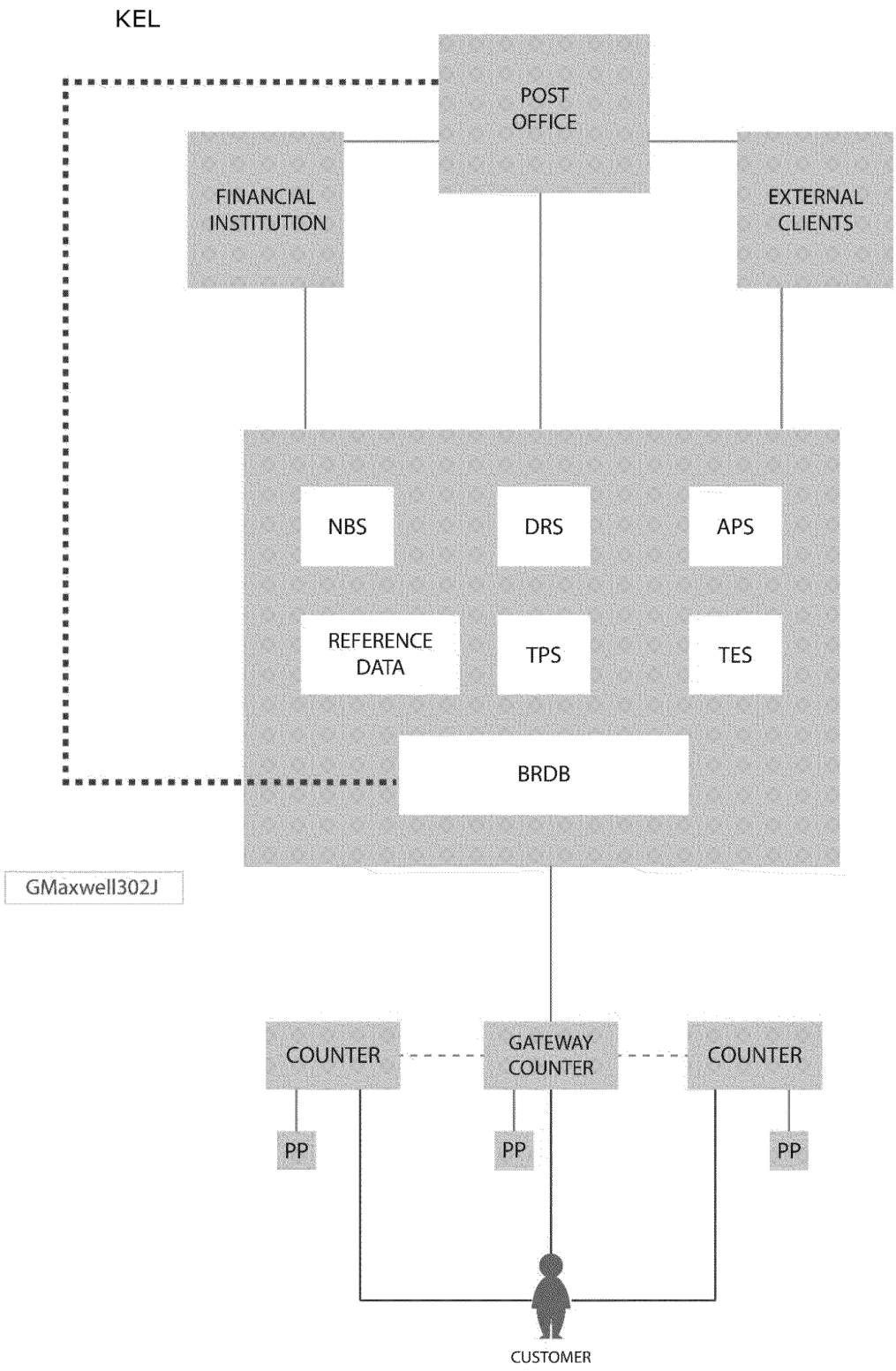

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18.11 MHarvey2255P

KEL Type	Information
Title	TPSC294 operational exception
Raised	02/09/2005
Last Updated	31/05/2006
Release System	S80
System Product	TPS
Issue: This is not a software problem and should only occur when SSC have manually added balancing entries to tps_pol_fs_summaries_incomp following a problem with missing POLFS mappings.	
Summary: This issue relates to manual corrections (balancing entries) applied within database transaction summary files. Since summary files inform Post Office of financial positions, it is entirely possible that this may cause financial discrepancies if manual corrections were to be incorrectly applied.	

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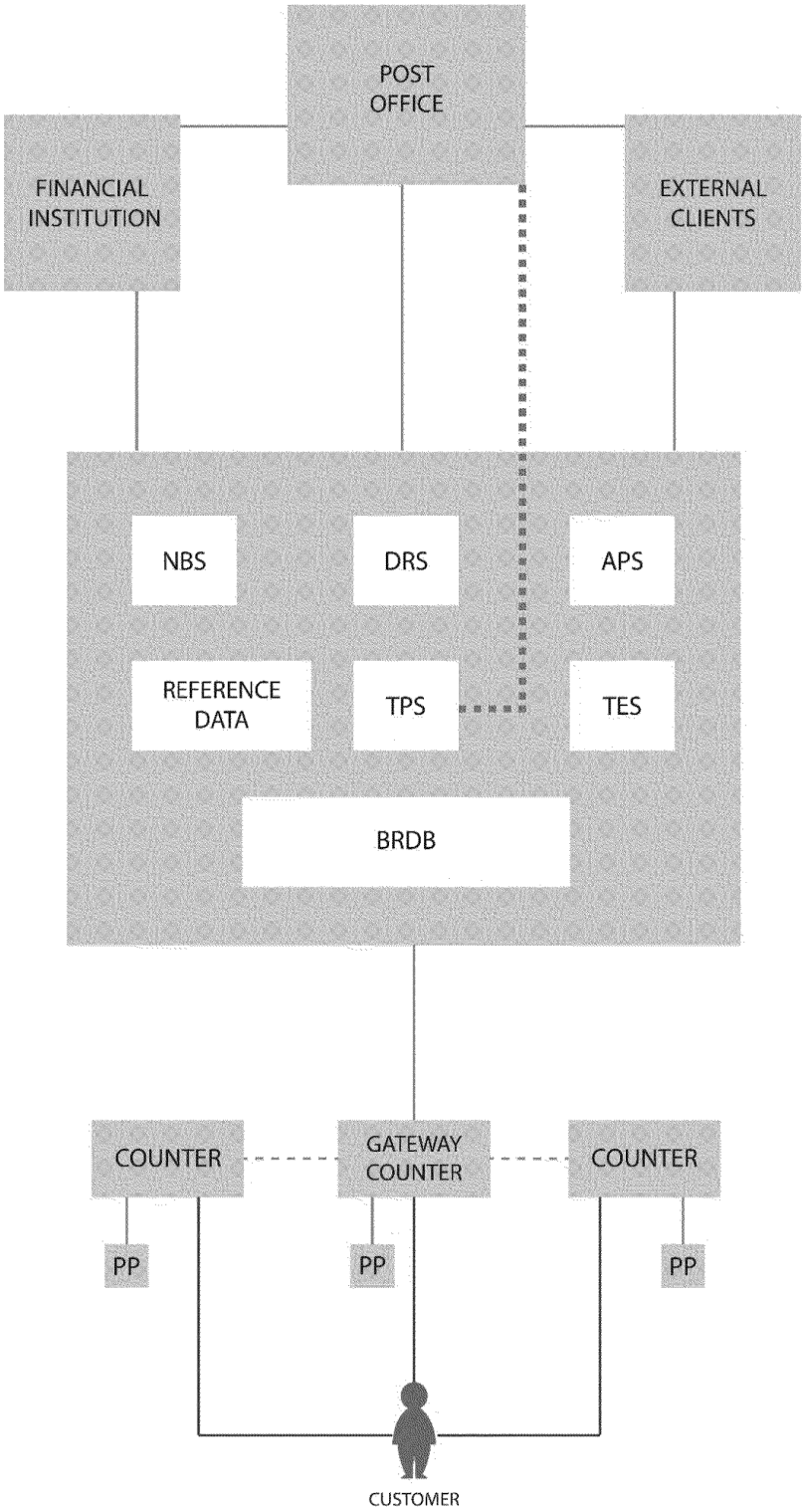

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18.12 GMaxwell3651K

KEL Type	Information
Title	Duplicate transactions sent to Streamline
Raised	22/12/2004
Last Updated	08/05/2006
Release System	S75
System Product	DCS
Issue: Streamline report that they have received a payment file containing a large number of transactions which they had received in a previous run. It looks like a problem with the confirmation agent which has harvested the information twice (most likely due to a previous failure resulting in a failure to write a new checkpoint).	
Summary: This duplication has primary effect with Post Office processing. It is not clear whether it may have in turn caused discrepancy in branch accounts.	

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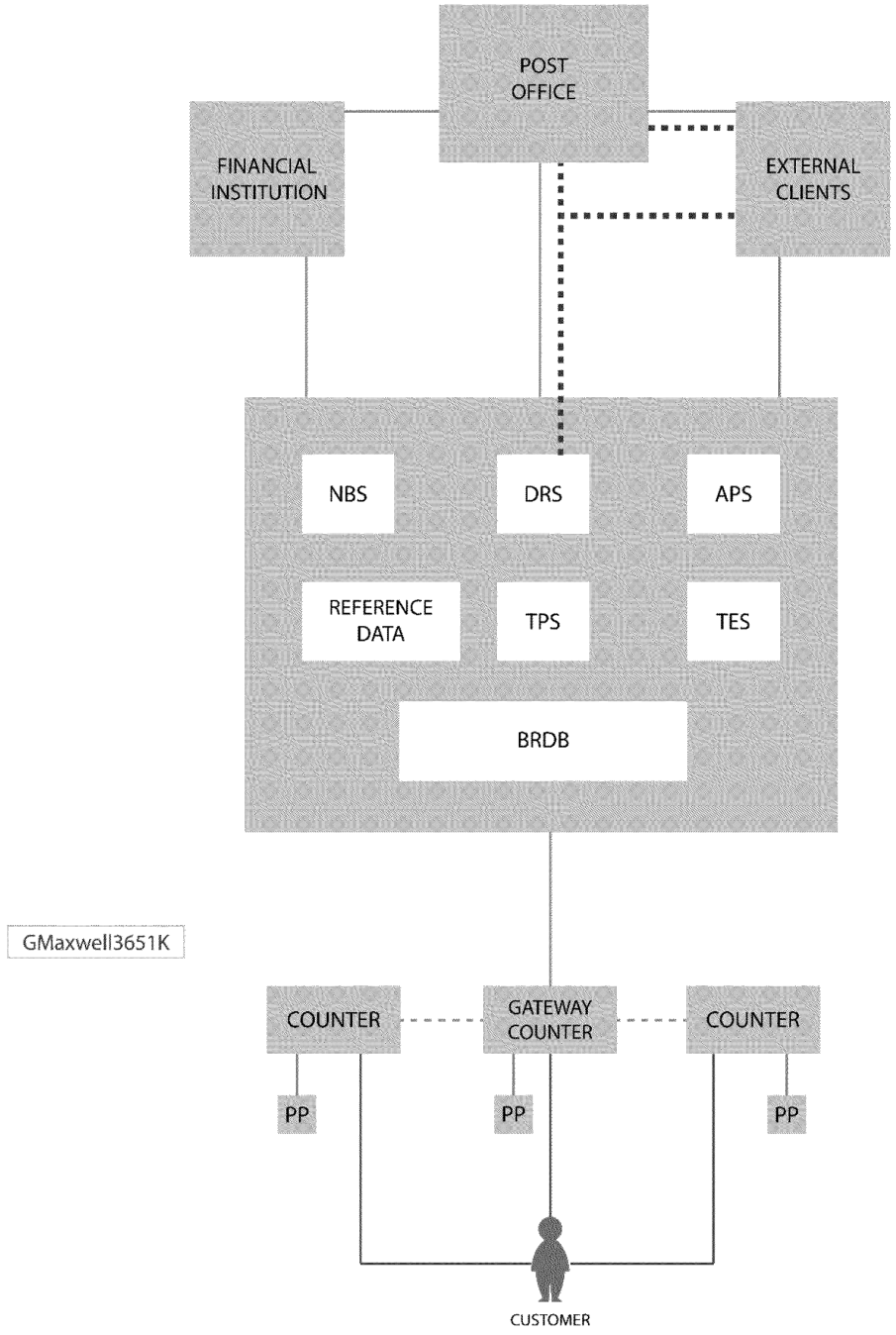

GMaxwell3651K

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18.13 cardc235Q

KEL Type	Information
Title	Drop&Go top up transaction times out but is then marked as successful.
Raised	05/07/2017
Last Updated	05/07/2017
Release System	HNGX
System Product	CounterBusinessapplications
Issue: The clerk initiated a Drop and Go transaction for £100 which failed due to timeouts, but then a success message was displayed. The clerk settled the transaction and the customer handed over £100. The customer checked the balance and stated that the top up had not gone through, so the clerk then performed another Drop&Go transaction which was successful. The customer has paid in £100 but the branch account has been debited by £200. Accenture verified that only the second Drop&Go top up was successful.	
Summary: This issue would require a transaction correction being applied within the branch accounts to remove the discrepancy.	

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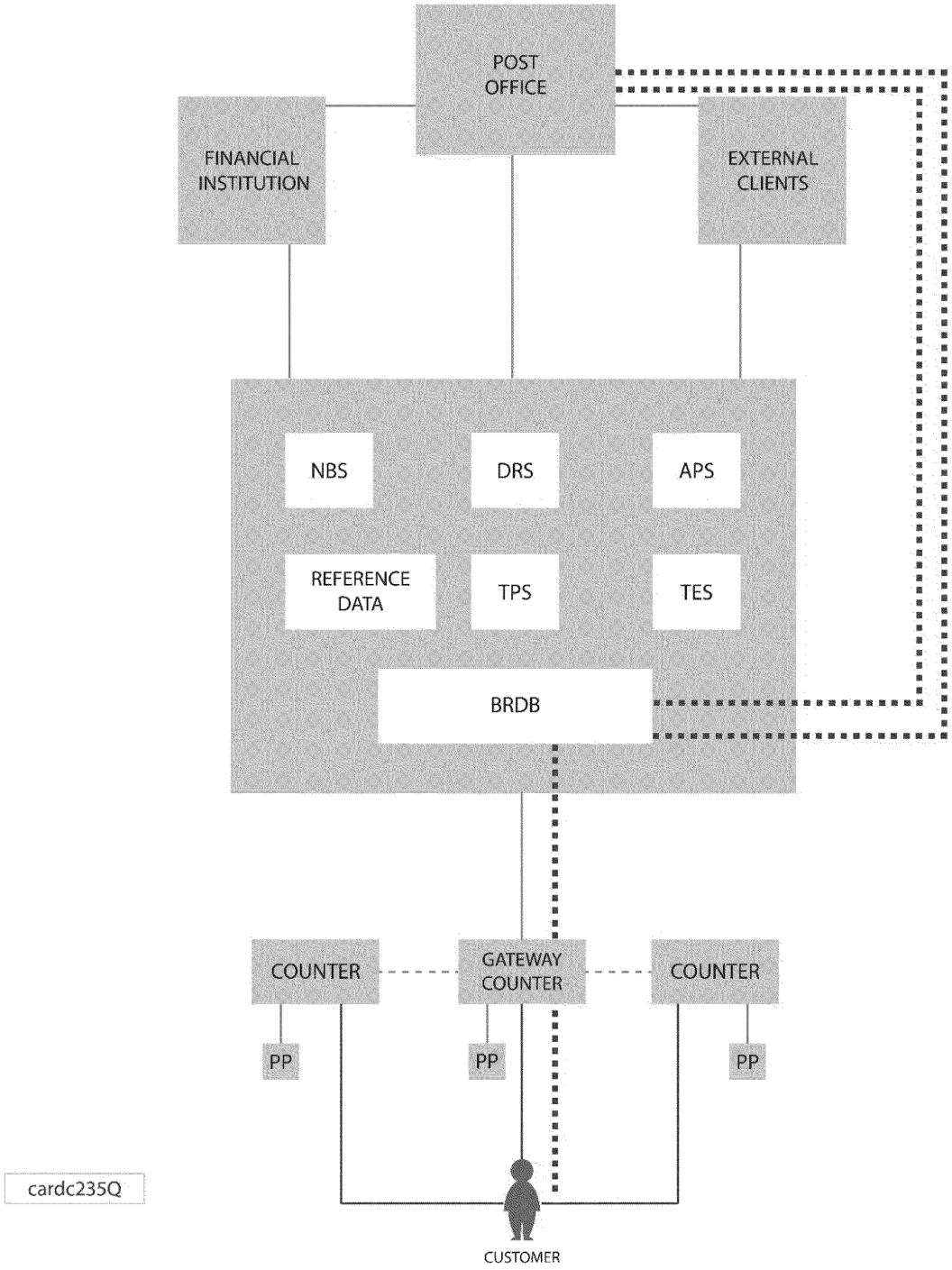

cardc235Q