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CLAIM NUMBERS: HQ16X01238, HQ17X02637 & HQ17X04248

IN THE HIGH COURT OF JUSTICE QUEEN'S BENCH DIVISION

BETWEEN:

ALAN BATES & OTHERS

CLAIMANT

AND

POST OFFICE LIMITED

DEFENDANT

SUPPLEMENTAL EXPERT REPORT OF JASON COYNE

01 FEBRUARY 2019

OCCUPATION:	PARTNER
SPECIALIST FIELD:	IT SYSTEMS
ON THE INSTRUCTIONS OF:	FREETHS LLP
ON BEHALF OF:	ALAN BATES & OTHERS
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1. Executive Summary

1.1 I provide this supplemental report in relation to the agreed Horizon issues which I addressed in my first report dated 16 October 2018. The purpose of this report is to update the Court with my opinions in relation to those issues, having now had the opportunity to consider further documents (in particular further PEAKs, Managed Service Change logs and Privileged user access logs) and further witness evidence, and to respond to the opinions expressed by Dr Worden in his report, dated 7 December 2018,

1.2 I consider that Horizon is less robust than as originally expressed in my first report. My primary reasons for this are as follows:

a. Access to modify the Horizon branch database was not as restricted as it should have been;

b. Whilst said to be governed by a documented policy, the actions were that were actually being undertaken by support staff were unaudited;

c. Post Office do not consult the full audit data before ruling on a discrepancy, instead using third party client reconciliation data or subsections of the audit data from within Credence or HORice;

d. The PEAKs are consistent with many more bugs/errors and defects shown to impact branch accounts than the initial three acknowledged by Post Office;

e. PEAKs show defects have lain undetected in Horizon for extended periods without detection;

f. PEAKs confirm Post Office often only becoming aware of bug/errors and defects when Subpostmasters report problems, suggesting that Post Office detection methods are not as good as initially suggested;

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g. PEAKs confirm that Post Office have suspended active investigations into known discrepancy causing bugs due to Subpostmasters not reporting shortfalls.

1.3 Other important matters which I have identified and considered which impact the robustness of Horizon and other issues before the Court are as follows:

a. Evidence exists which displays that Horizon has suffered from bugs, errors and defects that have impacted branch accounts. These bugs, errors and defects number many more that the three acknowledged by Post Office and some existed for extended periods before they were detected. (Horizon Issues 1,3,4,5)

b. Evidence exists which displayed that Post Office (via its subcontractors) modified transaction data which impacted branch accounts during the course of supporting the Horizon System.

c. Evidence exists which shows that Post Office (via its subcontractors) was aware that wider access that was permitted to the Horizon branch database and that users could and did access the Horizon system databases. The actions from such access was not recorded in the audit logs.

d. Evidence exists which shows that it was often a Subpostmaster who first detected the impact of bugs, errors and defects and reporting their existence to Post Office, rather than Post Office detecting such bugs, errors and defects themselves and preventing such branch impact from occurring.

e. Whilst there are audit logs available to Post Office to assist it in determining the impact of Horizon issues on branch accounts, the complete picture is only available by requesting the full audit logs which are not typically accessible to Post Office but are stored by Fujitsu. Based on my review of the evidence Post Office rarely requested these full audit logs even in the knowledge that they are required for the complete picture.

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1.4 Dr Worden's report focuses on Horizon having 'countermeasures' which he opines make it robust. Dr Worden's countermeasures are simply basic elements of practical system design and in many respects Dr Worden's opinions are based on design aspirations.

1.5 Outside of the bugs, errors and defects acknowledged by Post Office, Dr Worden has not reported on evidence which show how additional bugs, errors and defects in fact arose and impacted branch accounts.

1.6 Dr Worden's consideration of the financial impact of bugs, errors and defects is based on assumptions which are shown to be faulty when technical evidence is considered.

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2. Introduction

2.1 Since my first report I have been provided with the following documents:

a. **Supplemental PEAK disclosure**, received 31 October 2018, comprising 3,886 documents which were responsive to keywords for privilege and as such had to be manually reviewed by Post Office.

b. **Defendants responsive witness statements** dated 15 or 16 November 2018, and exhibits namely:

i. Torstein Olav Godeseth (second statement);

ii. Tracy Jane Wendy Mather;

iii. Angela Margaret Van Den Bogerd (second statement);

iv. Stephen Paul Parker;

v. Paul Ian Michael Smith;

vi. David Malcolm Johnson (second statement);

vii. Andy Dunks; and

c. **Dr Worden's first Expert Report** dated 7 December 2018 and supporting documents. This disclosure included 4 documents describing the Horizon System Architecture, a report prepared by Fujitsu describing the operational services provided to Post Office and a document estimating the value of losses experienced by Claimants in the Group Litigation.

d. **Privileged User Logs and Managed Service Change logs** following a letter from the Defendants dated 21 December 2018.

e. **Second witness statement of Claimants' witness Richard Roll** dated 16 January 2019.

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f. **Additional documents referred to in the Defendant's witness statements** following a request by the Claimants' solicitors for disclosure .

g. **Supplemental KELs disclosure**, received on 17 January 2019 following a request from the Claimants' solicitors, comprising those KELs which had been deleted and not provided in the original KELs disclosure in March 2018. I have also been provided with KELs dated from March 2018 to date.

h. **Operational Change Process documents (OCPs)** were disclosed on the 25 January 2019, but due to the proximity of these to the report deadline these have not been reviewed.

2.2 Very shortly before finalising this report I was provided with a further responsive witness statement from Mr Parker, dated 29 January 2019, responding to the second witness statement of Richard Roll. My attention has been drawn to paragraphs 27 and 32 of that statement in relation to remote access, but I have not otherwise had an opportunity to consider the contents of that statement or its exhibits before finalising this report.

2.3 I have also had more time to search the 222,254 PEAK records which were disclosed by the Defendant on 27 September 2018 shortly before my first report submission dated 16 October 2018. A further PEAK analysis including those received within the supplemental PEAK disclosure, in addition to an analysis of the Privileged User Logs and Master Service Change logs referred to above, is set out in section 3.

2.4 I understand that the Claimants' solicitors have requested further documents referred to in the Defendant's witness statements, by letter dated 22 January 2019.

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3. PEAK, MSC and Privileged User Log Analysis

Introduction

3.1 PEAKs are generally a valuable source of information as they are documents that are created when issues which need further analysis are reported. Generally, PEAKs conclude with the determination of the root cause of the issue and supporting guidance for closure of the record. Others conclude with the determination that a previous Known Error Log (KEL) has already recorded the issue and that, by following the known or advised course of action, any further incidents can be dealt with utilising information within the KEL.

3.2 KELs do not provide a comprehensive view of the specific impact to branch accounts. The KELs are generally a summary of an issue or error that has been identified within Horizon and provide information to other support users on interim workarounds and how to assess the problem in future should another support call be raised.

3.3 The KELs provide an overview of the *symptoms* and the interim resolution of the issue whilst the PEAKs relate more to the investigation and identification of the root *cause,* its impact on a particular branch along with any further detail (such as whether any account modification is required). Often, one KEL will be referred to by many different PEAKs.

3.4 Therefore, KELs on their own are not sufficient for establishing full branch impact in relation to analysing bugs/errors and defects or discrepancies as they do not contain isolated, branch specific, information in the way that PEAKs generally do (see Horizon Issue 1 PEAK observations at paragraphs 3.60 to 3.63 of this report).

3.5 Additionally, review of certain PEAK records have highlighted that known bugs/errors and defect records were closed with no remedy, but to provide a workaround from advice via a KEL for any future occurrences of the same (or related) issue, rather than detailing a bug fix. It is not clear how or if such PEAKs were transferred to a log or list of issues to be addressed at a later point. Where this is known to occur

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in other PEAKs it is usually stated in the detail that the issue will be rectified in a later fix. However, many records appear to just be closed without a documented future resolution.

3.6 I have identified from my analysis of the PEAK disclosure that Operational Change Process documents (OCPs) are the records in which changes to LIVE data are recorded. I believe that Managed Service Change (MSC) data is useful to analyse as they document what agreed changes should be made to the Horizon service. I understand that MSCs replaced OCPs[1] although the date at which they did so is not explicitly clear.

3.7 I received the MSCs on 21 December 2018 so I have not been able to review them in great detail. My initial review is contained later in this section from paragraph 3.307. I received the OCPs on 25 January 2019, so I have not had time to consider them as part of my report.

3.8 The Defendant has also provided "Privileged User" logs upon request. Such logs should record where Fujitsu support teams have gained (more advanced) access to that of a typical Horizon user within the Horizon system. Privileged User logs were provided with the MSC disclosure on 21 December 2018. I have set out my findings in relation to these from paragraph 3.316 onwards.

3.9 In this section of my report I set out the analysis which I have been able to carry out:

a. the PEAKs disclosed shortly prior to publication of my first report;

b. the PEAKS contained as part of the supplemental disclosure of PEAKs provided after my first report;

c. the MSC documents recently disclosed; and

d. the Privileged User logs recently disclosed.

[1] {First Witness Statement of Torstein Olav Godeseth dated 27 September 2018}

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Analysis of the PEAKs – Horizon Issues

3.10 The initial request for disclosure of the PEAKs was originally made via email on 20 July 2018. On the 27 September 2018, 218,367 PEAKs were disclosed by Post Office. At that stage, my report was in an advanced state and therefore only 1,262 (~0.5%) of these PEAKs were categorised/reviewed by the deadline for my first report submission. An additional 3,887 PEAKs were provided in a supplemental disclosure on 31 October 2018. Some PEAKs detail the first observations of a problem reported by a Horizon user recording user activity detail (what keys were pressed, screens viewed etc), the specific branch that encountered the issue (via a recorded "FAD" code) along with the discrepancy value and the concerns communicated by the user.

3.11 Other PEAKs are "cloned" from an original. I have observed that this typically occurs when a PEAK needs to be sent to another support department for further analysis or where another incident (i.e., in a differing branch) has been identified in relation to the same problem but has its own individual circumstances.

3.12 Despite the usefulness of PEAKs to identify recorded Horizon issues, they are not without their limitations and I have observed several reoccurring thematic issues.

3.13 For example, it appears that PEAKs are often closed or suggested to be closed if analysis has paused or has not uncovered a full diagnosis despite the Subpostmaster and/or Post Office not having a conclusion. It is also not always clear whether a Subpostmaster was informed of any action (e.g. modification of branch account data) or impact, following the raising and consequent resolution of the PEAK. I have seen PEAK records that are closed despite support not being able to diagnose a root cause whilst acknowledging that there clearly is some form of error occurring within the Horizon system.

3.14 Additionally, it appears that analysis and resolution can be delayed between Post Office, ATOS and Fujitsu, especially where there is a

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disjoint in the understanding of which party should be providing the evidential data or analysis/resolution of the issue.

3.15 I have also observed that certain PEAKs contain limited information so it is not always possible to identify which particular issue they relate to. In other instances, the root cause is inconsistent throughout different PEAKs. PEAKs arising from the same broad issue (i.e., deletion of session data) have their "Root Cause" diagnosis as both "General – User" and "Gen – Outside Programme Control" which in my opinion makes it difficult for the reader to clearly understand what the actual root cause diagnosis was.

3.16 The fact that PEAKs are cloned causes further difficulties because there is no succinct way to identify ALL PEAKS (and clones) that relate to a single bug, error or defect or how man bugs, errors and defects there are in existence and recorded within the total PEAK platform. The format of the PEAK disclosure provided requires that one must read through the entire PEAK to identify all potential related "clones" (if they have been cloned for further analysis). This is explained further in in Schedule 6 of a letter dated 28 July 2016[2] and is discussed in the next section of this report.

3.17 I have also discovered "Master PEAKs" which often document the PEAKs that may be related to a particular issue but do not necessarily capture all actual related PEAKs (for example, the Master PEAK in relation to the Receipts and Payments mismatch bug PC0204765[3] did not identify all the PEAK records of affected branches (only some of them) see paragraph 3.28-3.33).

3.18 There are also "Release PEAKs" that document the bug fix detail and those PEAKs in existence that may be fixed by the resolution documented (note: they may not always contain every actual related PEAK that might be resolved by the fix). Further, related PEAKs

[2] {Letter of Response from Post Office, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON*, 28 July 2016}
[3] PEAK PC0204765, 25 September 2010 {POL-0374542}

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contained within a Master PEAK may, individually, reference completely different KELs (see illustration below as an example and paragraphs 3.60-3.62 of this report for further detail).

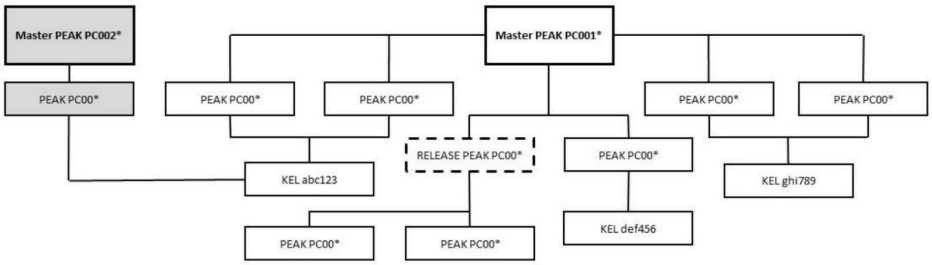


Figure 1 Illustration of identified relationship between: Master PEAKs, Release PEAKs, PEAKS and KELs

3.19 In my opinion the PEAK system is expansive and, whilst useful, is not without limitations or flaws. However, ultimately, PEAK records provide more comprehensive information in relation to identified bugs, errors and defects and their specific branch impact than what is provided or can be determined from the KEL records.

3.20 I have now reviewed more of these records using text search criteria and filtering. This has enabled me to address some issues more thoroughly and has enabled a more in-depth analysis in relation to the extent of the Horizon Issues and the overall robustness of Horizon.

3.21 For relevance, I have grouped the observed PEAKs in order of which Horizon Issue I believe them to relate. Due to the high number of PEAKs disclosed, it has not been possible to review them all, and therefore the PEAKs captured below are not an exhaustive representation of the potential bugs, errors and defects within Horizon. Not all of those PEAKs I have reviewed necessarily feature in this report, since disclosure was provided of PEAKs relative to LIVE environment incidents ("Quality Centre" PEAKs and others relative to testing have been excluded). I have provided Dr Worden with a list of PEAKs I was dealing with at the time to assist with his analysis.

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Table 1 Table of Bugs, Errors or Defects located in the PEAKs reviewed

Bug. Error or Defect Referred to as:	Horizon Issue	Evidence of Branch Impact	Paragraph	Page
Receipts and Payments Mismatch	1	Yes	3.27	12
Callendar Square / Falkirk	1	Yes	3.34	15
Suspense Account Bug	1	Yes	3.43	18
Branch Out Reach Issue (Dalmelington)	1	Yes	3.46	19
Remming In	1	Yes	3.56	22
Remming Out	1	Yes	3.67	26
Local Suspense Issue	1	Yes	3.78	30
Recovery Issues	1	Yes	3.84	32
Reversals		Yes	3.99	37
Data Tree Build Failure Discrepancies	1	Yes	3.106	38
Girobank Discrepancies	1	Yes	3.119	41
Counter Replacement Issues (Rebuild / One sided Transactions)	1	Yes	3.129	44
Withdrawn Stock Discrepancies	1	Yes	3.132	45
Bureau Discrepancies	1	Yes	3.140	46
Phantom Transactions	4	Yes	3.148	49
Reconciliation Issues	4	Yes	3.154	50
Branch Customer Discrepancies		Yes	3.174	54
Concurrent Loggins	4	No	3.179	55
Post & Go / TA discrepancies in POLSAP	4	Yes	3.185	56
Recovery Failures	4	Yes	3.191	58
Transaction Correction Issues	4	No	3.197	60
Bugs/Errors Defects introduced by previously applied PEAK Fixes	10	Yes	3.211	63

3.22 In relation to Issue 1 of the Horizon Issues, I opined in my previous report at paragraph 3.1 (Page 12) (and as agreed in the Experts' Joint Statement) that bugs errors and defects within Horizon have caused discrepancies within branch accounts. The PEAKs referred to in this section reinforce this opinion.

3.23 Review of the PEAKs has highlighted records provided from 1997 to 2018 illustrating varying bugs throughout the lifespan of both legacy Horizon and Horizon Online or 'HNG-X' as it is often referred to.

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3.24 It should be noted that it is possible that other PEAKs detailing bugs /errors and defects did cause financial discrepancy in branch accounts but are not detailed here as:

a. it has not been possible in the time of reporting to analyse all 220,000+ PEAKs; and

b. it is not always documented clearly within the PEAKs whether a Subpostmaster had a discrepancy, what its value might have been, or how it was resolved.

3.25 PEAK records typically focus on documenting the bug and its root cause and not necessarily its full impact or financial resolution (PEAK records are part of Fujitsu's investigation where the financial resolution is determined by Post Office). They rarely depict all other related occurrences of the same issue. However, several PEAKs I have reviewed clearly record an encountered financial discrepancy.

'Acknowledged Bugs' (Horizon Issue 1)

3.26 This subsection initially deals with the PEAKs which I have identified and which relate to the three initially acknowledged bugs (in Post Office's letter of response) and the Dalmellington / Branch Outreach issue bug which I addressed in my first report, and which is now dealt with by Mr Godeseth and Mr Parker in their responsive witness statements (which I separately respond to at section 4 below).

Receipts and Payments Mismatch Bug (Horizon Issue 1)

3.27 This bug is acknowledged by Post Office[4] as affecting 62 branches (37 of which were Subpostmasters as opposed to Crown offices/multiples) with the majority of incidents occurring between August and October 2010 within Horizon Online. In summary, when users followed certain process steps, it resulted in a differing accounting position between what was held in the branch and what was held on Post Office's back office figures in POLSAP and POLMIS. The effect of the bug meant that

[4] {Letter of Response from Post Office, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON*, 28 July 2016}

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discrepancy values 'disappeared' from a Subpostmaster's view of their account.

3.28 I have investigated the PEAKs/KELs within both the documentation referred to in the responsive witness statement of Mr Godeseth[5] (who documents the details of this bug) and documents identified by Dr Worden in order to determine whether said documents capture the full details of all 37 Subpostmasters affected.

3.29 The results of this investigation are set out below:

'Correcting Accounts for 'lost' discrepancies' {POL-0010769} dated 29 September 2010 (referred to by Mr Godeseth)		
PEAK/KEL	**Date**	**Observations**
PC0204765 {POL-0374542}	26 September 2010	It is stated in the document above that this PEAK should "record all affected branches". I cannot clearly see that there are 37 branches referenced within this PEAK. Refers to KEL wrightm33145J & ballantj1759Q
PC0204263 {POL-0374051}	13 September 2010	Records technical issue reported by branch (FAD) 002014 Refers to KELs chitikelaS1953M & ballantj1759Q
PC0203864 {POL-0373654}	02 September 2010	It is not clear to me which branch was affected in this instance, the branch identifier is not represented by a FAD code as with other PEAKs. Refers to KELs wrightm33145J, BrailsfordS130S & wrightm33145J
'ReceiptsPaymentsv0 4.doc' {POL-0215998} dated 16 May 2013 (relied upon by Dr Worden)		
PEAK/KEL	**Date**	**Observations**
PC0204263 {POL-0374051}	As above	As above
PC0204765 {POL-0374542}	As above	As above

[5] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}

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3.30 In respect of the above bug, it is important to note that whilst Post Office acknowledged that 62 branches were affected (of which 37 were Subpostmasters), in Mr Godeseth's responsive witness statement[6] at paragraph 42 he records that this bug affected 60 branches.

3.31 I have not been able to identify all Subpostmasters affected by this bug, nor to what extent they were affected due to the limitations above. Namely:

a. Mr Godeseth and Post Office have different numbers of affected branches;

b. PEAKs and KELs referenced by Dr Worden and Mr Godeseth (or within the documentation they rely upon) do not equate to 37 affected Subpostmasters nor their discrepancy figures.

3.32 Dr Worden has estimated "on statistical grounds" at paragraph 656 of his report that the net quantitative impact of this bug was £20,000 across 62 of 11,000 branches. The only figures I have seen (aside of those discrepancies documented within the three PEAKs above) are contained in the document referenced by Mr Godeseth:[7]

> *"Of the cases so far identified there is one for 330,611.16, one for £4,826.00 and the rest are all less than £350.*
>
> *I've been unable to work out yet if these are losses or gains!"*

3.33 Therefore, the true extent of this bug in my opinion is not fully confirmed. I have reviewed the basis of Dr Worden's estimates in section 5 below, and particularly in subsection 8. In summary, Dr Worden's estimates are based on assumption which are inaccurate as a matter of technical principle and as a matter of fact in relation to this

[6] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}
[7] 3429 SM BP Correcting Accounts for Lost Discrepancies - 102000790 - CD1.pdf, Correcting Accounts for "lost" Discrepancies, 29 September 2010 {POL-0010769}

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case. Therefore, in my opinion, it is very unlikely that a result on the basis of those assumptions will be accurate.

Callendar Square / Falkirk Bug (Horizon Issue 1)

3.34 This defect is acknowledged by Post Office[8] as being discovered in 2005 (fixed March 2006) within Legacy Horizon. It is reported by Post Office that the Falkirk anomaly came to the attention of Fujitsu when a Subpostmaster in the Callendar Square branch highlighted the issue. The symptoms of this defect result in stock transfers not being "seen" by other counters within a branch, due to data communication errors in Riposte. This leads to a discrepancy in the branch accounts since the double entry principle of accounting is not applied.

3.35 Using the documentation referred to in the responsive witness statement of Mr Godeseth and those documents identified by Dr Worden, I have investigated the PEAKs and KELs they set out in relation to this bug and whether the documents referred to capture full details of all branches affected in the table below.

Documents Referred to by Mr Godeseth		
PEAK/KEL	**Date**	**Observations**
PC0126042 {POL-0296514}	15 September 2005	Branch 160868 (Note Callendar Square branch), errors in Riposte causing a loss of £3489.69 to be rectified by error notice. No KEL referenced, PEAK detail states "*unable to find relevant kel*".
PC0126376 {POL-0296843}	21 September 2005	Branch 160868 (Note this is the same one referenced above, Callendar Square where the issues was identified in 2005), Approx £45.40 loss, "*another occurrence of last week's problem.*" References KELs Jballantyne5245K & JSimpkins338Q

[8] {Letter of Response from Post Office, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON*, 28 July 2016}

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JBallantyne5245K {POL-0444056}	Original date 02 November 2000 – revised 07 July 2005	Relates to Riposte error. References Branch 334832, PEAK PC0083101 and KEL JSimpkins338Q
JSimpkins338Q {POL-0444055}	Original date 10 May 2002 – revision date 11 January 2010	Relates to Riposte error notes: *"Feb 2003: Seeing a few of these each week"* refers to PEAK P0086212. *"June 2004: This event can give rise to transfer errors"* refers to PEAK PC0103864 *"Sept 2005: This problem is still occurring every week, in one case at the same site on 2 consecutive weeks. PC0126376 sent to development."* *"Update: 11/01/2010 PEAK PC0193012"*
Documents referred to by Dr Worden		
JBallantyne5245K {POL-0444056}	As above	As above
JSimpkins338Q {POL-0444055}	As above	As above
PC0075892 {POL-0249574}	02 May 2002	Branch (FAD) 312511, critical event raised. No associated KEL
PC0083101 {POL-0256175}	27 October 2002	Branch (FAD) 323329, critical event raised. References KELs JBallantyne5245k & JBallantyne1359R
PC0086212 {POL-0258908}	24 January 2003	Branch (FAD) 211801, recorded as no discrepancy occurring. No KEL referenced.
PC0103864 {POL-0275503}	03 June 2004	Branch (FAD) 281306 £22,290.00 discrepancy References KEL JSimpkins338Q & CObeng2025L
PC0126042 {POL-0296514}	As above	As above, Callendar Square branch.
PC0126376 {POL-0296843}	As above	As above, note second occurrence at Callendar Square branch.
PC0193012 {POL-0362963}	09 January 2010	PEAK documenting the need to stop and restart the Riposte service References KELs JSimpkins338Q & CObeng2025L

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3.36 It is important to note that whilst Post Office acknowledge this bug to have been *discovered* in 2005, that appears to only pertain to the particular incident at Callendar Square. In actuality, in my opinion, it is likely this bug appears to have been in effect since year 2000 (this is supported by Dr Worden at paragraph 660 of his report).

3.37 Mr Godeseth states in his second witness statement that in all, 30 branches were impacted by this bug. I have not been able to determine which 30 branches were impacted as per the witness statement of Mr Godeseth, nor the extent the discrepancies.

3.38 I have identified the following PEAK appears to be the incident documented in KEL JSimpkins338Q:

> *"June 2004: This event can give rise to transfer errors"*

3.39 PC0103864[9] created 3 June 2004 relates to an issue in which a Subpostmaster incurs a discrepancy due to a stock transfer bug. The PEAK detail states:

> *"Contacted Auditor John, explained that SSC discovered how the error occurred and they passed details to POL so that an error notice can be issued, Auditor wanted a contact no. for POL dept who issue error notices, advised that we do not have a no. for them and that he should go through NBSC. Auditor happy with information provided."*

3.40 However, the root cause of this PEAK is recorded as "*General – Unknown*" (where other PEAKs identifying the same bug are recorded as "*Development – Code*" [PC0116670[10]]) and the Call Status is recorded as "*Closed -- Unpublished known error*".

3.41 Despite support acknowledging that this issue is a flaw in Riposte and questioning whether it should be routed to Escher for a fix, there is no detail provided as to whether this was, and the 'Call Status' does not record a fix at future release. Therefore it is unclear how this bug was

[9] PEAK PC0103864, 3 June 2004 {POL-0275503}
[10] PEAK PC0116670, 24 February 2005 {POL-0288202}

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resolved, despite its symptoms requiring error notices to be sent to the branches to fix discrepancy.

3.42 In this instance, it illustrates that the "Callendar Square" bug was operating and resident in the system (and had been for years already) without any comprehensive linkage being observed by Fujitsu, since various occurrences of it were subsequently being recorded under differing KELs and PEAKs but were not identified as related.

Suspense Account Bug (Horizon Issue 1)

3.43 This bug is acknowledged by Post Office[11] as occurring from 2010 - 2013 within Horizon Online. Post Office sets out that this bug impacted 14 branches (4 crown and 10 Subpostmasters). In summary, the bug caused suspense account figures from 2010 to be erroneously reproduced in those branches' suspense accounts for the same monthly trading periods in 2011 and 2012. Post Office states that, despite the Subpostmasters querying this in 2012, the cause of issue was not identified until 2013.

'Local Suspense Problem' {POL-0444082} referred to by Mr Godeseth and Dr Worden.

PEAK/KEL	Date	Observations
This PEAK is nested within the document referred to above and not explicitly by Dr Worden or Mr Godeseth PC0223870 {POL-0393383}	22 March 2013	PEAK detail illustrates the following branches were impacted: BRANCH / AFFECTED TRADING PERIOD / AMOUNT 002647 9 -6.71 002840 9 140.61 010007 9 -0.01 011458 10 -9,799.88 012004 9 16.12 054011 9 3.34 101832 9 5.84 104937 9 -49.62

[11] {Letter of Response from Post Office, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON*, 28 July 2016}

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		155025	9	-113.14
		156715	9	11.55
		211844	9	-41.77
		243242	9	-0.51
		266418	9	3,186.70
		297611	9	160.92
		References KEL acha2230K		
acha2230K referred to by Stephen Paul Parker Witness Statement				
acha2230K {POL-0039583}	Raised 18 October 2013 last updated 25 October 2013	There is nothing to identify within the KEL text that this KEL relates particularly to the previously identified suspense account bug aside from it references the PEAK PC0223870 (referenced in Mr Jenkins report).		

3.44 Whilst Dr Worden records that 16 branches were affected, and this is the number of branches shown in the table within the 'local suspense note' produced by Gareth Jenkins), I have noticed that in another document (the 2013 POA Problem Management – Problem Review dated 11 February 2015 {POL-0138981}) only 14 branches[12] were referred to as having been affected..

3.45 In summary, this bug could have impacted branches prior to the Fujitsu investigation in 2012. Therefore, it is unlikely Post Office or Fujitsu have captured its full effects across each year that it arose.

Branch Outreach Issue / 'Dalmellington' (Horizon Issue 1)

3.46 This bug relates to the issue which arises when trying to transfer funds to outreach branches. Not previously acknowledged by Post Office, but now referred to in the Witness Statements of Mr Godeseth and Mr Parker in relation to KEL acha621P[13] (identified in my first report, paragraph 5.23 (page 47) and in the exhibit[14] referred to by Mr Godeseth provided

[12] 2013 POA Problem Management – Problem Review. {POL-0138981}
[13] KEL Acha621P, 15 October 2015 last updated 14 January 2016 {POL-0040340}
[14] _DOC_152848834(1)_Outreach BLE Extract Findings v6 091215.pdf, *Branch Outreach Issue (Initial Findings)*, 10 December 2015 {POL-0444078}

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as part of the responsive witness evidence (see also unredacted version[15])).

3.47 'Dalmellington' is the name of the branch which reported the issue in 2015.

Referred to by Mr Parker		
PEAK/KEL	**Date**	**Observations**
acha621P {POL-0040340}	Rasied 15 October 2015 last updated 14 January 2016	KEL text refers to the issue as identified for Dalmellington branch References PC0246949

3.48 Mr Godeseth states in relation to the Dalmellington bug that he understands from Gareth Jenkins (no document is referenced in relation to how) that the problem resided in branch to branch remittances. Whilst cash pouches were seen to be going out once from the core branch, they could effectively be accepted multiple times at the other side of the transaction.

3.49 Mr Godeseth refers to Exhibit TOG2 pages 13 to 27. Upon review of this document (and as acknowledged by Mr Godeseth) it identifies that there are two potentially separate issues at play within this bug. In total, initial findings of an audit found 112 occurrences of duplicate pouch IDs affecting 88 branches over a five-year period (some branches impacted up to five separate times).

3.50 In four instances, the document above records that correction was "*still to be confirmed*". Therefore, it is not clearly determined whether those Subpostmasters bore the financial cost. The range of the impact on branch accounts was between £0.01 and £25,000.

3.51 In summary, it is not clear whether the branch outreach investigation progressed further than "initial findings", nor is it clear how, in the four

[15] Outreach BLE Extract Findings v6 091215.pptx, *Branch Outreach Issue (Initial Findings)*, 10 December 2015 {POL-0220141}

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cases still to be confirmed, Subpostmasters might have been recompensed for a Horizon generated issue.

3.52 Mr Parker refers to Dalmellington is respect of KEL acha621P because it was identified in my first report. He states that Post Office issued Transaction Corrections or advised Subpostmasters how to take corrective actions to remove the discrepancies. He does not relate any further information as Mr Godeseth is responding to the KEL. It is important to note that the KEL referenced does not identify the full impact of this bug (one has to know that the Branch Outreach document is related in some way to gain a fuller understanding of the impact).

Referred to by Mr Parker		
PEAK/KEL	**Date**	**Observations**
acha621P {POL-0040340}	Raisedd 15 October 2015 last updated 14 January 2016	KEL text refers to the issue as identified for Dalmellington branch References PC0246949

3.53 Similarly, it is important to note that Dr Worden does not address the Dalmellington bug, but states in relation to the KEL (in response to my report paragraph 5.130):

> *"All remming errors produce a discrepancy between physical cash and Horizon cash, which gets corrected at monthly balancing or before (UEC) So no impact on branch accounts. Mr Coyne comments about correcting branch accounts are therefore inappropriate."*

3.54 In summary, I do not agree with Dr Worden since it is evident from the documentation produced by Fujitsu/Post Office that impact for four branches is still to be confirmed and in consideration that this bug operated for five years without detection.

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Dr Worden KELs with further PEAK Analysis

3.55 In this section I have looked at some of the KELs Dr Worden has listed in his report in the context of further detail discovered from my review of the PEAKs.

'Remming In' (Horizon Issue 1)

3.56 PC0203085[16] dated 17 August 2010 references KEL acha4221Q[17] and documents a bug that allows a user to "rem in" a cash pouch on two different counters, subsequently resulting in a loss for the Subpostmaster as this should only occur successfully once:

> *"A cash pouch was remmed in twice at branch 126109:*
>
> *Pouch barcode 399347067204*
>
> *2p coin £60*
>
> *50p coin £250*
>
> *5p coin £100*
>
> *Session 1-350379 16/09/2010 10:08*
>
> *Session 2-195226 16/09/2010 10:08*
>
> *The PM cannot reverse the transaction since rem reversal isn't allowed.*
>
> *This is NOT another example of the duplicate rem problem that we have ssn [sic] in the past, where use of the Prev key accepted the same pouch twice. In this case the pouch was processed on both counters...*
>
> *09:05 c2 get pouch status, retrieve pouch details*
>
> *09:06 c1 get pouch status, retrieve pouch details*
>
> *09:08 c2 settle pouch delivery*
>
> *09:08 c1 settle pouch delivery*
>
> *There were some printer problems on counter 2 which probably explain why this was done.*

[16] PEAKPC0203085, 17 August 2010 {POL-0372879}
[17] KEL acha4221Q, 2 March 2010 last updated 3 May 2011 {POL-0038476}

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Please send this info to POL via BIMS, because the branch now has a shortage of £410 as a result of this double rem in, and will need a correction. Then return the call to me and I'll get development to check whether it is working as intended."

3.57 It is stated further within this PEAK:

"Gareth Jenkins thinks that it should not be possible to complete the rem in on both counters. Please investigate."

3.58 However, as the investigation continued, a likely cause was established and fixed around 23 January 2011 (some ten months after the referenced KEL was raised) concluding that indeed, a cash pouch could be 'remmed in' twice, erroneously.

3.59 This bug was only brought to the attention of Fujitsu/Post Office following notification from the Subpostmaster. It is also my understanding that this is potentially a different manifestation of the Dalmellington bug.

3.60 The related KEL to this PEAK, acha4221Q,[18] is dealt with by Mr Parker in his first witness statement Appendix 2[19] and Dr Worden at table D4 of his Appendix D. Both Dr Worden and Mr Parker state that the impact of this defect (in relation to KEL acha4221Q) led to an £80.00 shortfall that was dealt with via a Transaction Correction and was subsequently fixed 19 April 2010. However, Dr Worden refers to PEAK PC0195380[20] in relation to this KEL, which relates to a differing manifestation resulting from the same core bug. In this case the PREV key is pressed causing the same discrepancy as I outlined above (PC0203085[21]).

3.61 Note that PC0203085 arose in August 2010 and PC0195380[22] April 2010.

3.62 This displays that Dr Worden and Mr Parker have not considered this in its entirety, since further manifestations record a cumulative shortfall

[18] KEL acha4221Q, 2 March 2010 last updated 3 May 2011 {POL-0038476}
[19] {Witness Statement of Stephen Paul Parker, 16 November 2018}
[20] PEAK PC0195380, 2 March 2010 {POL-0365285}
[21] PEAK PC0203085, 17 August 2010 {POL-0372879}
[22] PEAK PC0195380, 2 March 2010 {POL-0365285}

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value higher than the one £80.00 example they identified. Also, Mr Parker records that the incident was fixed on 19 April 2010 yet there is an associated PEAK to this KEL raised 23 April 2010 (and August 2010) that identifies a further discrepancy. Note there may be other PEAKs in relation to this bug that may reference a differing associated KEL (since application of the KEL reference is dependent on the support member applying the relevant one from the database).

3.63 It has not been possible in the time available to investigate and analyse every single PEAK that is possibly related to KEL acha4221Q.[23] However, upon a preliminary search, I have identified the following potentially relevant PEAKs as they contain reference to "acha4221Q" and noted similar preliminary observations.

acha4221Q raised 02 March 2010 – last updated 03 May 2011.

PEAK (explicitly documented in the KEL document) PC0195380[24]

Reference PEAK Key: Master PEAK (MP); Release Peak (RP); Other Peak (OP)

PEAK	Date Created	Reference PEAK	Observations
PC0195380 {POL-0365285}	02 March 2010	(RP) PC0195911 {POL-0365808}	£80.00 shortfall – Branch 506246
PC0195511 {POL-0365416}	03 March 2010	(OP) PC0195380 {POL-0365285}	£25,000 shortfall – Branch 069002
PC0196120 {POL-0366013}	17 March 2010	N/A	£500.00 shortfall – Branch 109013
PC0196154 {POL-0366046}	18 March 2010	(OP) PC0195380 {POL-0365285}	£2104.02 shortfall – Branch 506246 (further incident see PC0195380 above)
PC0196671 {POL-0366555}	29 March 2010	N/A	£5500 shortfall – Branch 003937
PC0197032 {POL-0366915}	31 March 2010	N/A	£25,000 shortfall – Branch 013004
PC0197034 {POL-0366917}	31 March 2010	N/A	No value documented - Branch 214405

[23] KEL acha4221Q, 2 March 2010 last updated 3 May 2011 {POL-0038476}
[24] PEAK PC0195380, 2 March 2010 {POL-0365285}

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PC0197605 {POL-0367480}	12 April 2010	N/A	Not Horizon Error – Branch 135002
PC0197651 {POL-0367524}	13 April 2010	N/A	£22,000 shortfall – branch 159713
PC0197753 {POL-0367623}	15 April 2010	N/A	£120.00 shortfall – Branch 060925
PC0197828 {POL-0367697}	16 April 2010	N/A	£1680 shortfall – Branch 436217
PC0197837 {POL-0367706}	16 April 2010	N/A	£5500 shortfall – Branch 225207
PC0197838 {POL-0367707}	16 April 2010	N/A	£7000 shortfall – Branch 005207
PC0197872 {POL-0367741}	19 April 2010	N/A	£1500 shortfall – Branch 187246
PC0197873 {POL-0367742}	19 April 2010	N/A	£144.87 shortfall – Branch 294306
PC0198115 {POL-0367979}	23 April 2010	N/A	£13,000 shortfall – Branch 183323
PC0203085 {POL-0372879}	17 August 2010	(RP) PC0207466 {POL-0377202} (OP) PC019151	£410.00 shortfall – Branch 126109
PC0226230 {POL-0395717}	07 June 2013	N/A	PEAK states "*There appears to be TWO different problems described in this call and the details are not very clear. Please raise separate calls supplying full details of the problem/s.*" Ticket is closed.
PC0246629 {POL-0415562}	25 September 2015	N/A	Not Horizon Error
PC0251952 {POL-0420451}	14 June 2016	N/A	Refers to remming out unusable notes – insufficient further detail.

3.64 The Release PEAK in relation to the fix for PC0195380[25] (referenced by Dr Worden and Mr Parker in relation to KEL acha4221Q) does not document every PEAK that would be impacted by the fix or reference that the fix specifically applied to KEL acha4221Q. It also does not

[25] PEAK PC0195380, 2 March 2010 {POL-0365285}

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record whether it was fully rolled out across the estate as at 19 April 2010 (the date given by Mr Parker in his witness statement).

3.65 The Release PEAK in relation to the fix for PC0203085[26] (alternative PEAK related by reference to KEL acha4221Q) in the table above is documented as PC0207466[27] created 4 January 2011.

3.66 Therefore, it is not clear from review of the KEL reference alone, what the full impact of the bug/error/defect referred to within the KEL was. Nor can the fix be clearly identified in relation to it, since different manifestations of a bug would be linked by a KEL reference (and may not just be limited to one KEL reference) which, in turn, had several fixes applied.

'Remming Out' (Horizon Issue 1)

3.67 PC0143435[28] created 12 Feb 2007 relates to issues when remitting out coins. Its associated KEL is documented as acha508S[29] which I note has been referred to in Mr Parker's witness statement Appendix 2[30] and within table D5 of Dr Worden's Appendix D.

3.68 Neither Mr Parker nor Dr Worden appear to have performed any analysis in relation to the PEAKs associated with KEL acha508S[31] (aside from Dr Worden referencing PC0143435[32] which is documented within the KEL). Whilst Dr Worden documents a single impact of £1,500 in relation to this KEL, he has not considered the PEAKs below.

3.69 Further, Mr Parker has not provided any substantial analysis in relation to this KEL but states that the issue was fixed in April 2007 and fully rolled out by June 2007.

[26] PEAK PC0203085, 17 August 2010 {POL-0372879}
[27] PEAK PC0207466, 4 January 2011 {POL-0377202}
[28] PEAK PC0143435, 12 February 2007 {POL-0313783}
[29] KEL acha508S, 12 February 2007 last updated 15 February 2007 {POL-0035513}
[30] {Witness Statement of Stephen Paul Parker, 16 November 2018}
[31] KEL acha508S, 12 February 2007 last updated 15 February 2007 {POL-0035513}
[32] PEAK PC0143435, 12 February 2007 {POL-0313783}

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3.70 The table below identifies PEAKs that reference KEL acha508S. Note, it is entirely possible that other PEAKs may exist in relation to this problem but have been assigned a different KEL reference.

Acha508S raised 12 February 2007 – last updated 15 February 2007. **PEAK (explicitly documented in the KEL document) PC0143435** *Reference PEAK Key: Master PEAK (MP); Release Peak (RP); Other Peak (OP)*			
PEAK	**Date Created**	**Referenced PEAK**	**Observations**
PC0143435 {POL-0313783}	12 February 2007	(RP) PC0140829 {POL-0311187} (RP) PC0140826 {POL-0311184} (OP) PC0140281 {POL-0310641} (OP) PC0141892 {POL-0312248} (OP) PC0142116 {POL-0312469} (OP) PC0143494 {POL-0313842}	£500.00 shortfall – Branch 175113
PC0143440 {POL-0313788}	12 February 2007	(OP) PC0141892 {POL-0312248}	£352.60 balancing error -Branch 020323
PC0143466 {POL-0313814}	12 February 2007	N/A	£466.60 shortfall – Branch 455329
PC0143499 {POL-0313847}	13 February 2007	(OP) PC0143439 {POL-0313787}	-£5.70 incomplete summaries report – Branch 305201
PC0143500 {POL-0313848}	13 February 2007	(OP) PC0143435 {POL-0313783}	No values documented – Incomplete summaries report affecting multiple branches 054946, 080025, 085109, 086939, 094005 & 095131
PC0143501 {POL-0313849}	13 February 2007	(OP) PC0143502 {POL-0313850}	No values documented – Incomplete summaries report affecting multiple branches 108006, 111840, 122014, 134912, 152406
PC0143502 {POL-0313850}	13 February 2007	(OP) PC0143435 {POL-0313783}	Seems to be duplicate of PC0143501[33]

[33] PEAK PC0143501, 13 February 2007 {POL-0313849}

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PC0143503 {POL-0313851}	13 February 2007	N/A	No values documented – Incomplete summaries report affecting multiple branches 162820, 173519, 175113, 175844, 176704
PC0143504 {POL-0313852}	13 February 2007	N/A	No values documented – Incomplete summaries report affecting multiple branches 178343, 179546, 180114, 180546, 181523
PC0143506 {POL-0313854}	13 February 2007	(OP) PC0143515 {POL-0313863}	No values documented – Incomplete summaries report affecting multiple branches 191504, 205539, 223939, 227555, 235201
PC0143507 {POL-0313855}	13 February 2007	(OP) PC0143515 {POL-0313863}	No values documented – Incomplete summaries report affecting multiple branches 249208, 257546, 266641, 272504, 274207
PC0143508 {POL-0313856}	13 February 2007	N/A	No values documented – Incomplete summaries report affecting multiple branches 283230, 293340, 301321, 305613, 310519
PC0143511 {POL-0313859}	13 February 2007	(OP) PC0143435 {POL-0313783}	No values documented – Incomplete summaries report affecting multiple branches 317246, 329642, 348201, 361420, 367642
PC0143513 {POL-0313861}	13 February 2007	N/A	No values documented – Incomplete summaries report affecting multiple branches 373311, 377136, 421136, 448420, 500227
PC0143514 {POL-0313862}	13 February 2007	N/A	£500 shortfall – Branch 235201
PC0143515 {POL-0313863}	13 February 2007	N/A	£500 shortfall – Branch 205539
PC0143539 {POL-0313887}	14 February 2007	N/A	No values documented – Incomplete summaries report affecting multiple branch 156205
PC0143682 {POL-0314029}	19 February 2007	N/A	£515 shortfall – Branch 140946
PC0143839 {POL-0314186}	23 February 2007	N/A	No values documented – Shortfall – Branch 293340

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PC0144933 {POL-0315272}	02 April 2007	(OP)PC0144937 {POL-0315276}	£3000 shortfall – Branch 251632
PC0144937 {POL-0315276}	02 April 2007	(OP)PC0144933 {POL-0315272}	£3000 shortfall – Branch 251632

3.71 Having identified the related PEAKs above, and the observations within them (including the values, where recorded) in my opinion Mr Parker and Dr Worden have failed to consider the full effect of this issue.

3.72 I note that Dr Worden states that since remming issues will always be visible to the Subpostmaster, they will always be reported and investigated and correctly resolved. In my opinion, it is not correct to make such broad assumptions. As with the Dalmellington issue above, it is entirely possible that not all Subpostmasters would have the ability to diagnose a Horizon generated error as the reason for discrepancy or be able to pursue it to ensure that it is correctly dealt with. Therefore, some Subpostmasters would risk bearingthe cost of the discrepancy.

3.73 PC0120937[34] created 13 May 2005 (referenced KEL GMaxwell3853P) records an instance where a Subpostmaster incurs a branch shortfall due to a lack of system control preventing the input error in relation to remming out coins. The issue arises from functionality that should not be available (but is) when the Horizon system is under load. The PEAK detail records:

> *"Weighing up the cost and risk of an attempted fix against the fact that this has only been reported once, I do not believe that we should make a code fix. If further incidents of this problem are reported we can review this decision. Gary has raised a KEL, so returning for closure as "Published Known Error"."*

3.74 Subsequently, it is decided that KEL GMaxwell3853P[35] is to be used as:

> *"Given the frequency of the problem & the apparent risk involved in introducing a code fix the KEL should be adequate."*

[34] PEAK PC0120937, 13 March 2005 {POL-0291445}
[35] KEL GMaxwell3853P, 17 May 2005 last updated 15 June 2005 {POL-0034666}

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3.75 The call record is closed with the root cause documented as "General – Unknown" despite the PEAK detail recording how the issue could occur.

3.76 This incident caused the value that could not be remmed out to be written to the Subpostmaster's suspense account and is an example of another Horizon generated discrepancy, on a similar theme to the remming out issues above, but a slightly different manifestation and different associated PEAK.

3.77 These related PEAKs illustrate how a bug that manifests in slightly different ways can be analysed and diagnosed differently amongst the varying technical support members. Different KELs appear to be applied to various PEAK records which results in potentially different advice given to the Subpostmasters in each occurrence of such a bug. The fact that fixes are applied across many releases of Horizon and yet Subpostmasters still encounter issues is indicative of the differing software versions in action across the estate. This lack of versioning consistency results in Fujitsu repeatedly dealing with errors which are known to be in existence.

Local Suspense Issue (Horizon Issue 1)

3.78 KEL acha5259Q[36] raised 22 April 2010 last updated 30 April 2010 is referred to by both Mr Parker in Appendix 2 attached to his witness statement[37] and Dr Worden within table D5 of Appendix D to his expert report. This KEL relates to a local suspense issue that affected the cash figure on the balance report causing a discrepancy in the new trading period. Note that it is not relative to the Suspense Account bug above (or least not identified within the documentation as being so). Mr Parker states that this only appeared to affect branches balancing in April 2010 and 33 identified branches were impacted; it was resolved in July 2010. Dr Worden identifies (in association with this KEL), PC0198077,

[36] KEL acha5259Q, 22 April 2010 last updated 30 April 2010 {POL-0037436}
[37] {Witness Statement of Stephen Paul Parker, 16 November 2018}

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PC0197409, PC0197797 and PC0204396, and records that it was fixed in September 2010.

3.79 It is important to note that the KEL states *"The reason for the exception is understood (PC0197409[38] / KEL PorterS199P[39])."*

3.80 This exemplifies two KELs each with differing associated PEAKs relative to the same bug, error or defect. It is interesting to also note that in one of the examples below (PC0194709) the call was first logged 17 February 2010 and yet even by 5 March 2010 the detail of the PEAK suggests that Post Office/Fujitsu did not know who should be investigating this type of issue. This demonstrates the complex relationship between PEAKs and KELS.

3.81 My observations and findings in relation to the above KELs are as follows:

PEAKs referenced BY KEL acha5259Q[40]	**PEAKs referenced BY KEL PorterS199P (received in latest "deleted KEL" disclosure)**	**PEAKs THAT reference KEL acha5259Q**	**PEAKs THAT reference KEL PorterS199P[41]**
PC0197409 {POL-0367287}	PC0197409 {POL-0367287}		PC0197409
PC0198077 {POL-0367945}		PC0198077 {POL-0367945}	
PC0197797 {POL-0367666}		PC0198066 {POL-0367934}	PC0194709
		PC0198677 {POL-0368532}	PC0197800
		PC0198678	

[38] PEAK PC0197409, 7 April 2010, {POL-0367287}
[39] KEL PorterS199P, 18 April 2010 last updated 21 April 2010 {POL-0448589}
[40] KEL acha5259Q, 22 April 2010 last updated 30 April 2010 {POL-0037436}
[41] KEL PorterS199P, 18 April 2010 last updated 21 April 2010 {POL-0448589}

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		{POL-0368533}	
		PC0198259 {POL-0441040}	
		PC0204396 {POL-0441123}	

3.82 I note that following Dr Worden's analysis of the KEL, he states:

"Visible to branch, and Fujitsu seem to have known about all instances."

3.83 In his report, Dr Worden refers to the spreadsheet attached to PC0197797[42]. However, the PEAK disclosure provided to me did not include any attached or embedded documents that the PEAKs refer to. It is therefore not clear how Dr Worden has satisfied himself of this, either:

a. Dr Worden has been able to review the attachments and embedded documents and is satisfied it captures all the branches affected as per the PEAK, and is satisfied the PEAK detail is accurate; or

b. Dr Worden is just re-stating the position as per the text within the documentation.

Recovery Issues (Horizon Issue 1)

3.84 PC0197769[43] created 15 April 2010 refers to a problem with recovery whereby the wrong Trading or Balancing Period may be updated. It's associated KEL is acha5650L[44] (raised 26 April 2010 last updated 17 December 2012).

3.85 I note that Dr Worden and Mr Parker both comment on this issue. Dr Worden states within table D4 of Appendix D to his report that "*no financial impact*" would be incurred from this issue. Further, in Mr Parker's analysis of the KELs (Appendix 2 of this responsive witness statement),[45] he maintains that since this issue would result in two

[42] PEAK PC0197797, 15 April 2010 {POL-0367666}
[43] PEAK PC0197769, 15 April 2010 {POL-0367639}
[44] KEL acha5650L, 26 April 2010 last raised 17 December 2012 {POL-0039245}
[45] {Witness Statement of Stephen Paul Parker, 16 November 2018}

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discrepancies cancelling each other out, there was no long-term impact on branches. I disagree for the following reasons:

a. The solution for KEL acha5650L states:

"…was the transaction ever included in a balance (i.e. did the stock unit subsequently roll into the TP/BP that the transactions were written into?). If so, raise a BIMS to say that the problem will have caused a discrepancy in period xx/xx but an equal but opposite discrepancy in period yy/yy, so overall there is no effect on the branch accounts. If the transactions were written into a period that had already been balanced (e.g. 1/1 but stock unit was already in 1/2), or a balance period that did not exist for the stock unit, raise a BIMS to say that the recovered transaction has not been included in the branch accounts and will have caused a discrepancy. However the data has been sent to POLMI / POLFS (because that ignores the TP/BP information).

Therefore the position "No Impact" is not correct.

b. There are a further 23 associated PEAKs (arising from a search of "acha5650L") of which I do not believe Dr Worden has analysed in full. Of these PEAKs, by randomly selecting one, I identified that PEAK PC0198352[46] created 2 May 2010 resulted in a discrepancy. The PEAK detail states:

"Recovered txn written to TP 12 BP 1, but the stock unit was in TP 12 BP 2. This caused a discrepancy of £380.00 for EE in TP 12 BP 2. Please inform POL. This problem caused a loss at the branch for which they should not be liable."

3.86 It is my opinion that with additional research, further financial discrepancies would be likely in respect of this same KEL issue.

3.87 PC0256566 created 17 January 2017 refers to a reconciliation incident whereby the Subpostmaster processed a transaction that did not appear on the transaction log. The settlement failed due to poor

[46] PEAK PC0198352, 29 April 2010 {POL-0368212}

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communications with the datacentre and then the recovery procedure also failed. The PEAK further states:

> *"This recovery failure was reported and investigated by us. Please see Peak call PC0256502 which was closed on 16/01/17 after supplying the necessary reconciliation information to POL. We have informed POL about this recovery failure and also advised them to do the necessary reconciliation for this sum of cash (Cash withdrawal for £244). We have no way of knowing the internal POL process as to when they will do the reconciliation if not done already."*

3.88 PC0256502 (The PEAK referred to in the quote above) created 16 January 2017 acknowledges the discrepancy in relation to branch 197327 above. However, it states, (in terms of impact):

> *"No impact. PEAK raised for the investigation of transaction(s) in a state other than Final as showing in daily Reconciliation report".*

3.89 This is despite further referring to the need for manual reconciliation. It therefore appears that the initial issue for the branch was logged under this PEAK as requiring manual reconciliation, to be passed back to Post Office but in the meantime a second call is generated by the Subpostmaster due to limited information regarding the discrepancy.

3.90 The resolution of this incident is not recorded within the PEAK detail as this would ultimately be down to Post Office to issue a Transaction Correction, whether they did or did not has been deemed out of scope by Post Office.

3.91 Further investigation of the matter above documents that KEL acha959T[47] applies (referenced by the PEAK above). This KEL was referenced within my first report in relation to failed recoveries or an incomplete transaction awaiting recovery at paragraph 5.43 (page 53). It has since been responded to by Mr Parker (Appendix 2) whom states (in relation to the KEL acha959T):

[47] KEL acha959T, 28 February 2010 last updated 19 October 2017 {POL-0041091}

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"There would be no impact if the user followed the recovery process presented by Horizon".

3.92 However, PC0256566 illustrates the opposite, Fujitsu identify that since the 'AUTHORISED' receipt was printed in relation to the transaction, the Subpostmaster should have handed the money over, but then the fact that the transaction was lost from the transaction log would have meant they had a cash discrepancy as no value was recorded to balance the cash out.

3.93 Further, Dr Worden states in his analysis of the KELs at Appendix D table D3 "This is another complex KEL..." as the extent of his analysis.

3.94 I have the following observations:

KEL acha959T raised 28 February 2010 last updated 19 October 2017

"This means a transaction is recorded on TES and/or at the FI, but the transaction has not been completed properly at the branch/in the BRDB."

"Possible Causes:

a) recovery has failed

b) transaction not completed, awaiting recovery

c) transaction was declined by pinpad but not reversed. See KEL cardc219R

d) PM pressed Cancel on counter moments after customer had entered PIN. See KEL dsed4010Ne) only the reversal info reached the data centre"

Note – TES is Transaction Enquiry Service and FI is Financial Institution

References other KELs/PEAKs:	**DATE**	**Observations**
KEL cardc219R (refers to PC0210052)	Raised 11 May 2011 – last updated 31 October 2013	This problem relates to transactions that aren't reversed in the end account despite being declined by the pinpad (14 associated PEAKs).
Dr Worden states of this KEL "...later reconciliation and a TC would correct any error in branch accounts."		
dsed4010N (refers to PC0223229)	Raised 28 January 2013 – last updated 20 November 2015	This problem relates to discrepancies arising due to cancelling a pinpad transaction at the same time it is trying to seek authorisation (1 other associated PEAK).
Other PEAKs and KELs that reference 'acha959T'		

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2,473 different associated PEAKs	2010 - 2018	Utilising 'acha959T' as the keyword for search in the supplemental PEAK disclosure.
KEL dsed2640M (references PC0193463)	Raised 01 March 2010 – updated 01 March 2010	Failed recovery due to printer issues rendering recovery unable to print a receipt due to a backlog. 214 PEAKs reference this KEL.
cardc464Q	Raised 30 April 2010 last updated 12 January 2011	Failed Recovery report entry where the banking transaction does not appear on the TES or the DRS. *Note: DRS = Data Reconcilaiton Service and TES = Transaction Enquiry Service* 326 associated PEAKs
Dr Worden states (table D3 Appendix D) "*Normally,* any failure to recover a transaction results eventually in a Transaction Correction which corrects any error in branch." Mr Parker states: "*... In this case there was no impact on branch account.*"		

3.95 In relation to Dr Worden and Mr Parker's comments above regarding KEL cardc464Q, I have randomly selected one of the associated PEAKs identified related to this KEL and have noted the following.

3.96 The PEAK is recorded as "No Impact", however the sentiment of this is unclear. This PEAK, and another referenced within it (PC0264632) relate to issues where customer transactions are part processed) but the transactions are not recorded in the Branch Database (BRDB) or on the Counter.

3.97 There would therefore be no ability to check the true status of the transaction and end customers could be either charged for something they have not received or receive something they have not been charged for. This would leave the Subpostmaster with a potential loss or gain dependent upon the transaction and method of payment.

3.98 In conclusion, there are various associated manifestations of recovery issues. Varying KELs recording varying symptoms. In my opinion, it is too broad an assumption to make (as done by Dr Worden and Mr Parker) that Subpostmasters would not bear any financial cost due to these Horizon generated issues since the actions of any potential recompense by Post Office has not been provided as part of disclosure.

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Reversals

3.99 PC0089918[48]created 25 April 2003 is a significant PEAK in which reversed "rems" are doubling. Rems are remittances and, in this instance, the Subpostmaster was trying to reverse a rem (effectively 'undoing' the transaction). However, instead of reversing the transaction to balance off the previous input, the transaction value doubled in the accounts. The PEAK detail states:

> *"I have looked at the messagestore and can see that the SaleValue (and Qty) have been incorrectly calculated by the system…*
>
> *… Routing to MSU. Can MSU please liaise with NBSC over this software issue. The*
>
> *Post Office is going to have to balance with a large discrepancy 2 x (£5,000 + £8,910) = £27,820. I have spoken to the PM and said that I would arrange for someone from NBSC to talk to her ASAP. When the reconciliation issues have been put in train can you please route the call back to me so that I can send it on to development for a code fix."*

3.100 The PEAK goes on to detail that the problem is to do with the fix introduced for PC0083954[49], further stating:

> *"Major problem with S30 Cash Account. POL will be aware because error notices for CA will need to be generated. More sites with this problem are coming out of the woodwork as cash account day approaches."*

3.101 It is unclear whether Post Office notified further branches which were operating on the S30 release of the software about this discrepancy or it was just left until a discrepancy was identified and an error notice subsequently issued.

3.102 However, it is clear from the introduction of these bugs that regression testing was not adequately performed when fixes had to be rolled out to fix other bugs.

[48] PEAK PC0089918, 25 April 2003 {POL-0262279}
[49] PEAK PC0083954, 29 November 2002 {POL-0256833}

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3.103 The KEL referenced within this PEAK is PSteed2847N. Dr Worden and Mr Parker have provided analysis in relation to the above KEL. Mr Parker states that this caused only a temporary financial impact as the incident was visible to the Subpostmaster and was corrected by Post Office issuing an error notice. Dr Worden similarly states there would be no adverse effect on the branch accounts.

3.104 I have not been able to confirm that the Subpostmaster was issued an error notice to correct the imbalance as this low-level detail in relation to specific discrepancies has not been disclosed.

Horizon Issue 1 PEAKs

3.105 The PEAKs analysed below are a small portion of the PEAKs I have identified as causing financial discrepancy in branch accounts outside of those bugs acknowledged by Post Office. It should be noted there are potentially thousands more PEAKs that illustrate financial discrepancy arising in branch accounts, this is only a small selected sample from keyword searched PEAKs.

Data Tree Build Failure Discrepancies (Horizon Issue 1)

3.106 PC0033128[50] (no KEL referenced) created 10 November 1999 documents an issue where the Dugannon branch suffered a £43,000 discrepancy but the cause was not immediately known. It is documented that the Branch Manager and Post Office agreed to amend the week 32 cash account figures manually in order to work around the issue. Note that this PEAK does not reference an associated KEL. Therefore, no analysis has been provided on it by Dr Worden or Mr Parker.

3.107 The PEAK detail further records of other branches that appear to be affected by the same bug with varying degrees of shortfall: £52,814.29 at the Yate Sodbury Branch and £9,368.40 at the Appleby Westmoreland branch.

[50] PEAK PC00331278, 10 November 1999 {POL-0221887}

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3.108 The root cause is eventually diagnosed as the PEAK detail states:

> *"Data trees have been failing to build fully, and the system has not been detecting this. Consequently, discrepancies in the balancing have been occurring. In the case of Dungannon a whole Payments node was missing. There have been a number of calls relating to this kind of issue."*

3.109 It is not clear whether the specific references within the detail of this PEAK capture the records for the entire "number of calls" referred to or if there were further incidents additional to those. I have identified the following PEAKs as likely related to this bug and provided preliminary observations in the table below.

PC0033128 dated 10 November 1999 {POL-0221887} *Reference PEAK Key: Master PEAK (MP); Release Peak (RP); Other Peak (OP)*			
PEAK	**Date Created**	**Referenced PEAK**	**Observations**
PC0033128 {POL-0221887}	10 November 1999	(OP) PC0032801[51] (OP) PC0045847 {POL-0223066} (OP) PC0043811 {POL-0222670}	£43,000 discrepancy – Branch/Customer Ref: BSM19991110001 – Dugannon Branch
PC0046811 {POL-0223228}	06 June 2000	(OP) PC0038631[52]	(£37.80 discrepancy) Branch ref unknown
PC0055964 {POL-01230806}	17 October 2000	(OP) PC0038631	Discrepancy value and branch unknown
PC0058161 {POL-0232985}	20 November 2000	(OP) PC0059497 {POL-0232986}	£3236 discrepancy – Branch 145004

3.110 PC0132133[53] created 10 February 2006 (referenced KEL MSCardifield2219S[54]) relates to a defect that is summarised as:

> *"PM states that she had desprepency [sic] that seemed to become greater over the course of 20mins. Then a few minutes later the descrepency [sic] vanished and normal figures remained normal."*

[51] PC0032801 not disclosed at time of writing this report.
[52] PC0038631 not disclosed at time of writing this report.
[53] PEAK PC0132133, 10 February 2006 {POL-0302553}
[54] KEL MSCardifield2219S, 15 July 2005 last updated 27 Novembeer 2007 {POL-0035721}

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3.111 The cause is documented as follows:

> *"It would appear that when working out the cash discrepancies on counter 2 the system has used an old 'data tree' (the one it used at the earlier trial balance) rather than creating a new one so the discrepancies were wrongly calculated. It wasn't until the PM later moved to counter 1 that a new 'data tree' was produced and the discrepancies were calculated correctly."*

3.112 Although the Subpostmaster did not suffer an actual discrepancy in the PEAK quoted directly above this bug shares similar elements to other PEAKs (see for example paragraph 3.115 below) whereby the issue has caused discrepancy. On this occasion a software bug fix was subsequently implemented:

> *"New versions of software have been released to the live estate both to fix a specific variant of the problem and also to provide additional diagnostics to help identify the root cause of other variants."*

3.113 I note that in relation to the KEL referenced within this particular PEAK (MSCardifield2219S) both Dr Worden and Mr Parker acknowledge that whilst a discrepancy was caused, it would have been resolved in another cash declaration made by the Subpostmaster.

3.114 In my opinion, this is too broad an assumption to make as it would require the discrepancy reason as being recognised as a Horizon generated bug and not one caused by the Subpostmaster, therefore requiring a TC that the Subpostmaster would not be liable to settle.

3.115 PC0144386[55] created 15 Mar 2007 (referenced KEL MSCardifield2219S) refers to a 'Published Known Issue' in which data held on the counter to provide quicker information recall could cause apparent discrepancies in cash declarations.

3.116 The PEAK concludes:

> *"This is only an issue with the figures displayed by the counter the values actually held behined the scenes are correct and can be updated either*

[55] PEAK PC0144386, 15 March 2007 {POL-0314727}

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by loging off and back on to a different counter or waiting for the overnight run to cause it to catch up.

This is a known problem and is documented in KEL MScardifield2219S."

3.117 Despite the 'Root Cause' being identified as "Development – Code" it appears this PEAK record is closed on account of the KEL advice being available to provide to Subpostmasters, with the assurance that values held behind the scenes are correct. However, it clearly introduced user input error as the KEL states:

"This will be potentially confusing and may lead to the clerk making unnecessary corrections. These will in turn show up as future inconsistencies (eg nothing gets lost in the end)."

3.118 It is not clear whether this bug was scheduled for a later fix from the detail provided within this PEAK record. However, it is important to note that the KEL above indicates this issue was fixed in 2006, yet this occurrence was 2007.

Girobank Discrepancies (Horizon Issue 1)

3.119 PC0044232[56] dated 5 May 2000 (copy from PC0044101 [not formally disclosed]) references KEL MWright531p, is a PEAK in which the timing of certain process operations is found to be the cause of discrepancies. The PEAK records:

"This difference (£505.72) between the Cash Account and the Daily reports is explained by KEL:MWright531P.htm There was a giro for this amount that was entered on the 13th Apr then reversed AFTER cutoff then re-entered again and reversed again. The Daily report would have shown the original £505.72 but the daily reports never show reversals. It would be nice to close the call as known error, however while investigating the message store I have identified another problem..."

3.120 The secondary problem refers to transactions that are counted twice in error due to the time they are performed (coinciding with a cut off report).

[56] PEAK PC0044232, 5 May 2000 {POL-0222723}

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3.121 The diagnosis further states:

> *"The fix for this issue should address all cut-off reporting, not just Girobank reports."*

3.122 This therefore indicates that this bug could apply in many circumstances not just when performing Girobank transactions. The bug fix appears to have been issued in July 2000.

3.123 It is noted that the above PEAK references KEL MWright531P.[57] Whilst that KEL does not appear to have been disclosed, a search utilising its name returns the following associated PEAKs:

PEAK	**Date Created**	**Further References**	**Observations**
PC0044232 {POL-0222723}	05 May 2000	(OP)PC0044101[58] (OP)PC0049280 {POL-0224421}	£505 discrepancy – Branch unknown
PC0050418 {POL-0225562}	17 July 2000	N/A	£422.66 discrepancy – Branch unknown – Closed insufficient evidence
PC0050861 {POL-0225998}	21 July 2000	N/A	Discrepancy (amount unknown) – Branch unknown
PC0052575 {POL-0228829}	13 September 2000	N/A	£40 discrepancy – Branch unknown
PC0052704 {POL-0227582}	18 August 2000	N/A	£363.94 discrepancy – Branch unknown
PC0052804 {POL-0227683}	21 August 2000	N/A	£55.00 discrepancy – Branch unknown
PC0053975 {POL-0228829}	13 September 2000	N/A	£40.00 discrepancy – Branch unknown
PC0054846 {POL-0229671}	28 September 2000		£99.13 discrepancy – Branch unknown

3.124 Appearing to document the same issue over a different timeframe, PC0068633[59] dated 27 July 2001 relates to a bug that caused a Girobank

[57] KEL MWright531P not disclosed at time of writing this report.
[58] PC0044101 not disclosed at time of writing this report.
[59] PC0068633, 27 July 2001 {POL-0242631}

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deposit to be duplicated in a Subpostmasters branch account therefore resulting in the Subpostmaster receiving an error notice.

3.125 It is likely that this bug was resident in the system for a period of time as the PEAK detail states:

> *"I have duplicated this bug. In fact it occurs in all reports that use dataserver (i.e. the majority). I shall now check to see whether or not the problem still occurs at S10."*

3.126 The KEL related to this PEAK is documented as 'AChambers4410R'[60] Similarly, this KEL does not appear to have been disclosed, therefore it has not been possible to ascertain what advice might have been given to a Subpostmaster should they be affected by this bug.

3.127 Further associated PEAKs that reference KEL AChambers4410R are provided in the table below.

PEAK	Date Created	Further References	Observations
PC0073855 {POL-0247668}	13 February 2002	(OP)PC0075312 {POL-0249033}	Affecting National Savings deposits. Interestingly, this call record is closed logged as "insufficient evidence" despite reference to fixes being applied as resolution
PC0075312 {POL-0249033}	10 April 2002	(OP)PC0073855 {POL-0247668}	Giro deposit cut off issue. DRowe440R[61] mentioned as applying
PC0076065 {POL-0249726}	09 May 2002	N/A	Giro deposit cut off issue – Branch unknown

3.128 The above PEAKs related to Girobank discrepancies are clear examples of bugs within Horizon that affect branch accounts by way of a financial discrepancy and illustrate, by their interlinking natures, the complexities of the problem records.

[60] AChambers4410R not disclosed at time of writing this report.
[61] KEL DRowe440R, 14 February 2002 last updated 28 January 2003 {POL-0033459}

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Counter Replacement Causing One Sided Transactions (Horizon Issue 1)

3.129 PC0058528[62] created 24 November 2000 refers to an instance where a receipts and payments mismatch was encountered by the branch displaying a £167.12 shortfall. The diagnosis illustrates that following a counter replacement (performed due to hardware error), a transaction was overwritten, disrupting the double entry principle and causing a one-sided transaction to be written to the accounts. Whilst Fujitsu were able to identify that which was overwritten, there is no further detail within the PEAK record as to how this was resolved financially for the Subpostmaster.

3.130 This PEAK's associated KEL is recorded as JBallantyne5328R.[63] Performing a search across the PEAK disclosure utilising this KEL name returns approximately 88 further PEAKs. Whilst I have not reviewed all of the PEAKs returned in detail, review of three randomly selected records illustrate:

PEAK	**Created Date**	**Observations**
PC0071836 {POL-0245811}	28 November 2001	Branch 214552 had a base counter replacement as PEAK above in which messages were overwritten causing a £3.27 gain. No documented discrepancy fix resolution.
PC0133822 {POL-0304212}	27 March 2006	Branch 109002 – Counter swap out causing transaction differences.
PC0153851 {POL-0324139}	07 February 2008	Branch 154311 – payments mismatch issue – PEAK record has multiple references to different KELs including JBallantyne5328R KELs

3.131 In conclusion, since Fujitsu support had the facility to insert items within the Horizon message store, without process audit (detailed further within Section 4 in response to Mr Godeseth's responsive witness statement and Section 5 Sub Section 11), the effects of one-sided

[62] PEAK PC0052528, 16 August 2000 {POL-0227413}
[63] KEL JBallantyne5328R, 1 December 2000 last updated 4 July 2007 {POL-0448249}

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transactions and their applied corrective fixes is clearly larger than the "one balancing transaction" as suggested by Post Office in their 28 July 2016 letter of response (Schedule 6).[64]

Withdrawn Stock Discrepancies (Horizon Issue 1)

3.132 PC0207834[65] created 19 January 2011 relates to a bug in which the Subpostmaster encountered various gains and discrepancies. It is reported in the PEAK that 8 other offices faced similar issues. The associated KEL is PothapragadaC4913L (raised 09 July 2010 last updated 09 July 2010).[66]

3.133 The PEAK was subsequently cloned after diagnosis to PC0208292[67] created 9 February 2011 and issued to development to investigate a bug fix and root cause. The summary was:

> *"Withdrawn stock items can be re-introduced into stock by making a stock declaration this can subsequently cause discrepancies at future rollovers."*

3.134 Release PEAK PC0208918[68] subsequently records the bug fix detail in which the data is applied to live 1 April 2011.

3.135 An associated record to the above bug, PEAK PC0209602[69] created 11 April 2011 illustrates in more detail the differences between how Legacy Horizon would have dealt with withdrawn stock in comparison to how Horizon Online does it. The Impact Statement within this PEAK details:

> *"Can cause confusion and unexpected (though hopefully temporary) discrepancies at branches by allowing them to declare stock which has already been withdrawn. Additional problems Spring 2011 highlighted that at least 60 or so branches managed to do this. Although the additional problems should be fixed before more products are withdrawn,*

[64] {Letter of Response from Post Office,"SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON", 28 July 2016}
[65] PEAK PC0207834, 19 January 2011 {POL-0377562}
[66] KEL PothapragadaC4913L, 9 July 2010 {POL-0037644}
[67] PEAK PC0208292, 9 February 2011 {POL-0378016}
[68] PEAK PC0208918, 10 March 2011 {POL-0378633}
[69] PEAK PC0209602, 11 April 2011 {POL-0379308}

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excluding these products from the Declare Stock picklist would be sensible, and in step with Horizon."

3.136 I have not been able to isolate the PEAKs for the 60 or so other branches referred to in relation to this incident.

3.137 In regard to further identifying how all records associated with a particular bug are to be identified, I have requested from Post Office in my Request for Information sent 14 December 2018 (Annex A), information as to how Fujitsu measure and account the impact of known bugs.

3.138 The response provided by Post Office (17 January 2019) sets out:

"It is not possible to provide a generic answer to this request – the way in which "the impact of a bug is assessed will depend on the nature, operation and effects of the bug. Information regarding the ways in which Fujitsu assessed the impact of the bugs referred to in paragraphs 12 – 16 and 34 - 61 of the second witness statement of Torstein Olav Godeseth dated 16 November 2018 is provided in those paragraphs.

3.139 As illustrated in Mr Godeseth's statement where a bug has been identified, Fujitsu's approach has been to seek to determine what branch was affected and to present this to Post Office, along with how they were proposing to resolve the issue. In my opinion, and as observed through the PEAK/KEL analysis and responses provided within the Defendant's Witness Statements, identification of issues through recorded branch impact alone does not appear to sufficiently enable identification of a full bugs impact, neither proactively or retrospectively.

Bureau Discrepancies (Horizon Issue 1)

3.140 PEAK PC0261541[70] dated 17 August 2017 relates to bureau pre-order currency transactions that cause discrepancy in branch accounts. Note that this PEAK does not reference a specific KEL. The PEAK detail records that the office was left £204.59 short after Horizon initially recorded the

[70] PEAK PC0261541, 17 August 2017 {POL-0429147}

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complete currency order but only actually processed one out of two currencies.

3.141 Upon investigation, on 23 August 2017 the PEAK detail is cloned to PC0261710[71] for future development investigation which records:

> *"OK we had a call from Largs post office, they hit a problem with bureau pre-order. We investigated and it's a fault in an ADC script. I've been trying to get our helpdesk to route it to your helpdesk but so far not working very well.*
>
> *It's a nasty thing with financial impact for the branch. What's best way to make sure someone at your end knows it needs fixing?"*

3.142 The issue is diagnosed as (in summary) being due to a network timeout. The subsequent advice is to return the call to Post Office for them to decide what reconciliation or Transaction Correction (TC) would be required to balance the office (effectively removing the shortfall).

3.143 No further information as to the advice that might have subsequently been given by Post Office is documented, and have I been able to find any other related PEAKs that record further information in relation to this branch incident.

3.144 Further manifestations of Bureau/Currency issues are identified below:

3.145 PC0265443[72] created 19 December 2017 is an extremely lengthy PEAK (mainly due to confusion regarding the issue and the support team attaching the wrong evidence to the record in the first instance) that pertains to a 4500 Euro discrepancy and illustrates the following:

a. Despite involvement of Accenture, Atos, Fujitsu and Post Office, no party appears to be able to effectively decipher what has caused the discrepancy between the branch's foreign currency account, against the figures held by POLSAP and Cash Management.

[71] PEAK PC026170, 23 August 2017 {POL-0429314}
[72] PEAK PC0265443, 19 December 2017 {POL-0432829}

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b. The PEAK details the frustration felt by the Subpostmaster's Area Manager who chases resolution of the issue over a three-month period:

"You mentioned on 8th March that you were aiming to get this resolved. As you can see below, with the exception of Matthew and Andrew I am getting extremely frustrated by the total lack of response I am getting to this request.

I really don t think it is acceptable that I should have to send 40+ emails over 3 months and attend 2 x 1 hour long conference call to resolve this issue. All I am asking is that we find out and rectify why my branches figures do not match those that Andrew Keighley has.

I recognise that everyone thinks if they don t answer that I will eventually give up but I am absolutely not prepared to do this.

Nobody appears to know what to do with this query and I cannot tell you how frustrating this is getting.

SOMEONE PLEASE HELP!!!"

c. Aside from Atos suggesting that the Subpostmaster be requested to perform a "dummy transaction of 4500 Euros" in order to register the transaction that is missing in POLSAP and causing the discrepancy (which appears to be rejected in principle by the Subpostmasters Area Manager), the ticket appears to be closed without any detailed explanation as to why Post Office's Cash Management Centre recorded different currency values to those in the branch for Euros and Dollars.

3.146 It appears to show that this PEAK relates to a one-sided transaction in which the branch had a record of a Euro sale but that was not reflected in Post Office's POLSAP system therefore causing discrepancy.

<u>PEAKs that relate to errors in data recorded within Horizon (Horizon Issue 4)</u>

3.147 The following PEAKs have been identified as relevant to Horizon Issue 4 to illustrate the varying types of errors in data recorded within Horizon, arising from (a) data entry, (b) transfer or (c) processing of data.

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Phantom Transactions (Horizon Issue 4)

3.148 PC0065021[73] created 17 April 2001 relates to the "Master Call for Phantom Txs" PEAK. This suggests that it was the intention for all phantom transactions reported to be captured within this PEAK.

3.149 The first incident recorded within this PEAK documents a Subpostmaster alleging to have paid out over £1,500 in losses "due to these problems". Further detail within the PEAK states:

> *"02/05/01 14:12 uk052436Information: Romec have been to site today and fitted shielded cabling and suppressors. Romec engineer advises that he has witnessed further phantom transactions whilst on site. He will carry out further tests and advise results."*

3.150 PC0052025[74] created 9 August 2000 (referenced KEL RColeman2110J[75]) appears to be another record of suspected phantom transactions (certain transactions appear to be duplicated at a later time in the same order day). Further, the Subposmaster notes that the 'Customer Reference' number recorded for one of the British Telecom transactions "*is EXACTLY the same as the British Gas trans*."

3.151 The diagnosis concludes that the additional transactions were processed due to a suspended session on the Counter that was later "forcefully committed". It appears that Horizon will, after periods of inactivity, ultimately commit transactions a Subpostmaster has not fully completed themselves.

3.152 The Subpostmaster also notes that icons on the Counter have changed on their own. The PEAK detail references that KEL RColeman2110J applies, however I have not been able to review this KEL as it does not appear to have been disclosed. A search within the PEAK disclosure utilising RColeman2110J returns one further PEAK potentially related to this issue.

[73] PEAK PC0065021, 17 April 2001 {POL-0440162}
[74] PEAK PC0052025, 9 August 2000 {POL-0227064}
[75] Not disclosed at the time of submitting this report.

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3.153 The above PEAKs illustrate potential for errors in data recorded within Horizon arising from Hardware failure and accepted design features.

Reconciliation Issues (Horizon Issue 4)

3.154 PC0039832[76] created 3 March 2000 (no referenced KEL) documents a bug in relation to a Subpostmasters Cash Account Period (CAP) in which reconciliation discrepancies have appeared but did not feature on the expected reconciliation exception reports. The following appears in the PEAK:

> *"The discrepancy reported by the reconciliation software appears to be related to the value of two transactions (one for £8.06 the other for £0.08) which were actually 'brought forward' values from the previous week's Cash Account. This being the case, I suspect that the reconciliation software has mis-calculated the Table 3 value, rather than the Cash Account being incorrect."*

3.155 Although the discrepancy amounts are small on this occasion the PEAK still warrants a bug fix that is rolled out to the Live Estate rather than awaiting a next functionality release documented as follows:

> *"I have also noticed that the Cash Account reconciliation for the previous week also reported an £8.14 discrepancy on Table 3. Since the reconciliation process uses it's [sic] own brought forward values for the suspense account I suspect that this issue may well have its roots in an earlier CAP. Given that this is a financial reconciliation issue, I suggest that this will require correction before CI4."*

3.156 The above raises a concern as neither the Subpostmaster or the Post Office noticed the earlier £8.14 from the previous week.

3.157 PC0039832[77] (detailed above) was subsequently fixed as part of PC0047955[78] in August 2000 and five months after the original PEAK was raised.

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[76] PEAK PC0039832, 3 March 2000 {POL-0222262}
[77] PEAK PC0039832, 3 March 2000 {POL-0222262}
[78] PEAK PC0047955, 19 June 2000 {POL-0223659}

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3.158 PEAKs PC0075240[79] (created 08 April 2002, referenced KEL DRowe304L[80]), PC0075415[81] (created 12 April 2002 referenced KEL DRowe304L) and PC0077508[82] (created 12 April 2002, referenced KEL DRowe304L) all relate to an issue where a Branch Counter total differs from the Host Amount (total generated by integrity checking through Horizon processing).

3.159 The issue predominately relates to a Horizon reconciliation report (TPSC268A) that illustrates a discrepancy for the branches documented in which the Cash Account totals differ by 1p.

3.160 The summary of the issue is that program code values of 0.01 and 0.0099 were checked for zero values. The 0.0099 values were returned as zero as the code ignored values after two decimal places.

3.161 The fix is documented within PC0075415 as a "straightforward change to Cash Account Common Code..." However, the combined PEAKs illustrate that the fix for this issue was revoked, due to the following (PC0077508):

> *"The work package WP13953 caused TPSC265 to run VERY slowly, so it has been withdrawn. That means that the problem in this pinicl is liable to reappear."*

3.162 Later in the month it appears another bug fix was issued for this and the records are subsequently closed.

3.163 PC0049578[83] created 6 July 2000 documents a bug that restricts the reporting set TPSC260 to correctly count the number of files read within the system. The implications of this might have affected reconciliation as integrity checks supplied by the report totals would have been incorrect.

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[79] PEAK PC0075240, 8 April 2002 {POL-0248963}
[80] Not disclosed at the time of submitting this report.
[81] PEAK PC0075415, 12 April 2002 {POL-0249128}
[82] PEAK PC0077508, 12 April 2002 {POL-0249130}
[83] PC0049578, 6 July 2000 {POL-0224722})

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3.164 The PEAKs referred to above can all be classified as errors in data recorded within Horizon arising from the incorrect processing of data within Horizon, therefore Issue 4 part (c).

3.165 PC0045847[84] documents the occurrence of a message store corruption that resulted in a branch discrepancy of £4462.46. The PEAK states:

> *"…The NT event log indicates that at the time of the balance the Riposte system recorded numerous errors indicating that there was a corruption of the message store (CRC failure) resulting in the current 'query' being destroyed. This is almost certainly the cause of the missing balance records at rollover. Passing to EPOSS-FP to determine whether there is anything that can be done to improve the system error handling within the dataserver.*

3.166 It is noted that this error must have occurred previously since the PEAK further states another PEAK reference and:

> *"This is supposed to be fixed in the near future so close this as duplicate call."*

3.167 In summary, this issue arose from an error in the transfer of data within Horizon (Horizon Issue 4) when the Stock Unit in the branch was rolled into its new cash account period, the system failed to record the correct values.

3.168 The following PEAKs provide a mechanism for further understanding in relation to Issue 5 and how Horizon compares transaction data recorded by Horizon against transaction data from sources outside of Horizon. They should also be considered under Issue 4 (errors in data recorded within Horizon) and are also examples of how mechanisms were in place to detect and report errors in Horizon (Issue 6).

[84] PEAK PC0045847, 22 January 2013 {POL-0223066}

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3.169 Whilst outside of particular Subpostmaster effect, the following PEAKs illustrate the role of external client input in the reconciliation process and identifying discrepancies in Horizon.

3.170 PC0236246[85] dated 2014 relates to Post Office's client Allpay.net and records that the issue is:

> *"The Client Transaction Summary from 4/8/14 is missing £110,706.86 when compared to the Client File and POLSAP entries."*

3.171 The Client Transaction Summary (CTS) is ultimately derived from the Automatic Payments Service (APS) which copies the transactions from the branch database in Horizon Online.

3.172 PC0204872[86] dated September 2010 again highlights discrepancies between CTS report figures and external client figures. The issue is noted as following:

> *"The CTS report is received daily and is compared with the vendor (in this case A&L) reports. The figures for each day should match.*
>
> *If the CTS report is larger than the vendor figure, the vendor account will be credited. The credit usually shows a couple of days later as a positive discrepancy.*
>
> *The CTS report was showing as being larger than the vendor figures on the following dates, although there does not appear to have been any counter credit showing on the vendor figures following on from this:*
>
> *7th May 2010 - CTS was greater than vendor figures by £84.86. POL have suggested that this may have been related to an event from 27th February for FAD 490519, although we can find no BIMS record of this from a Reconciliation perspective.*
>
> *25th July 2010 - CTS was greater than the vendor figures by £3,260.00. No additional information is available.*
>
> *27th August 2010 - CTS was greater than the vendor figures by £846.00. No additional information is available."*

[85] PEAK PC0236246, 7 August 2014 {POL-0405575})
[86] PEAK PC0204872, 29 September 2010 {POL-0374647}

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3.173 It is unclear from the statement above *"although we can find no BIMS record of this from a Reconciliation perspective"* (BIMS being a business incident record of where an anomaly has occurred) whether the Subpostmaster might therefore also have been impacted by this discrepancy in their branch accounts (given that they would reflect different figures than those summarised for the CTS file). I have not had full visibility of Post Office's processing policies in respect of external client reconciliation and how they could relate back to specific branch account discrepancies but, as noted above, this reflects instances where measures and controls exist for detecting errors arising in Horizon.

Branch Customer Discrepancies (Horizon Issue 4)

3.174 Review of PEAK records have identified instances where the Post Office Customer, in branch, may have encountered a discrepancy from Horizon shortfalls.

3.175 PC0156246[87], 26 March 2008 details an incident whereby the Financial Institution (FI) contacted Post Office in relation to a settlement difference. Although the Subpostmaster declined the transactions at the Counter (after recovery of them initiated) and the transaction was therefore reversed (so as to cancel the debit request from the branch account perspective), the end Customer's account was still debited by the FI.

3.176 The PEAK detail records:

> *"…So it is likely that the branch balanced but the customer's account now needs rectifying for the loss - which is why Citibank are showing the discrepancy.*
>
> *So I am passing this call back with the note to MSU: that before this customer's a/c is rectified for his loss of £165.26 that POL contact the PM at the branch to double check that NO money did change hands for certain, before finally ensuring that this financial discrepancy is dealt with."*

[87] PEAK PC0156246, 26 March 2008 {POL-0326528}

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3.177 This occurrence further emphasises the need for sufficient process adherence and clarity between Post Office and the support teams in order to appropriately identify and correct discrepancies. Whilst there may not have been an anomaly in the branch account, the Subpostmaster would not have the ability to review the processing systems as Post Office have the ability to check.

3.178 *"It is likely the branch balanced"* is not a clear diagnosis. This PEAK is similar in nature to the incident described by Mrs Burke in her Witness Statement. In Mrs Burke's case, she was able to contact the end customer to produce their receipt of successful withdrawal. However it would be difficult for a Subpostmaster to do this in every event of a suspected failed recovery procedure (along with the fact that some customers might not be regulars at the branch in question).

Concurrent Logins (Horrizon Issue 4)?

3.179 Several PEAK's identify that Fujitsu have to investigate issues that are encountered due to users logging onto multiple Counters at the same time which can cause transactions to be abandoned and risk discrepancies. It is not understood why this often occurred, in legacy Horizon it appears as though the ability to login concurrently was classed as an error.

3.180 PC0027581[88] dated 9 July 1999 provides an example of a concurrent login issue. Despite the issue being passed to multiple support and development teams no solution was ever found, and the case was closed on 7 February 2002 on the basis that Mr Lui was no longer employed by the Post Office and the call could be reopened should the issue reoccur. It is troubling that Fujitsu was aware, as evidenced by a case log entry dated 13 July 2001 by Walter Wright, that there was a "deficiency" with Riposte in allowing simultaneous logon but did not follow this up properly with Escher (the case was ultimately closed).

[88] PEAK PC0027581, 9 July 1999 {POL-0221763}

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3.181 PC0051327[89] dated 28 July 2000 also indicates a failure in respect of concurrent logons. The PEAK detail diagnoses that the discrepancy has arisen as a result of *"a failure in the logon checks"*.

> *"A message <GroupId:182432><Id:3><Num:9921> was produced on counter 3 saying that the session transfer had failed but in fact the log in succeeded and hence you got a user logged in to two terminals at once. This is a situation not catered for in EPOSS code and hence you get the later problems already described. If it is desired to progress this further the bug must be assigned to the Agent team to find out why the Stop Desk Transfer service failed to prevent the user logging in on counter 4 (and subsequently doing the Transfer Out which caused the problems)."*

3.182 The call record is closed on 30 November 2000 with the following

> *"As this is fixed at CI45 then I am happy to close this call".*

3.183 In respect of the incidents referenced above, it is not clear what the full effects or resolutions were regarding the discrepancies.

Network Banking Bug

3.184 PC0109020[90] details issues with regards to Network Banking (NWB) and Online Services transactions due to an ISDN fault. The issues in connectivity subsequently caused an imbalance in the Subpostmasters accounts due to end customer accounts being debited and customers therefore requesting the funds.

Post & Go / TA discrepancies in POLSAP (Horizon Issue 4)

3.185 PEAK PC0220393[91] created 29 August 2012 details inconsistences between source data received in POLSAP and Horizon which could have impacted branch accounts. The text suggests a duplication of a transaction from Wincor, the text reads:

> *"An example the customer has provided shows amounts of 115.05, 46.88, 52.13 & 75.23 totalling 289.29 received on the file from Wincor and into POLSAP via BLE.*

[89] PEAK PC0051327, 28 July 2000 {POL-0226410}
[90] PEAK PC0109020, 1 October 2004 {POL-0280615}
[91] PEAK PC0220393, 29 August 2012 {POL-0389956}

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The same (contra) amounts are also showing as being received from the branch when the TA has been accepted and are closed items in the account (netted off to 0.00).

However, there is another amount of 289.29 which just has the date in the assignment field."

3.186 A response from Dave Allen (Fujitsu) reads:

"Postings on the TfS call refer to a similar previous incident (A1040049 => Peak PC0219432[92]), which was resolved between POL and Wincor Nixdorf; no details of this resolution are available to us. This incident is a week old, but only came to SSC late last night… The trading-date in this call, 2012-08-09, is three weeks ago which too old for us to be able to see the incoming file from Wincor Nixdorf… There is no evidence of a fault in HNG-X, and without the incoming file from Wincor Nixdorf there is nothing further for us to investigate.

We can only suggest that POL do the same as they did with A1040049, and refer the matter to Wincor Nixdorf."

3.187 This suggests that the matter was reported too late to determine what the fault may have been. However, a few days later Anne Chambers (Fujitsu) adds to the PEAK:

"Branch 020511 has many entries in the Subfiles_on_hold report. This report should be monitored (by ?) to make sure problems are followed up - this should be resolved before closing this call.

Horizon is receiving PG data for 6 separate PG tills at the branch, but only 4 of them have associated stock units. This causes the entire subfile for the branch to be Held, and the transaction data is not being sent to POLSAP. However the TA data for the 4 tills which are properly associated IS being sent through, and I think this is probably the cause of the POLSAP anomalies.

[92] PEAK PC0219432, 13 July 2012 {POL-0389009}

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The two unassociated tills are not doing any cash transactions - this is a known problem (see PC0218702[93]), and means the PM isn't prompted to create an association. This may need fixing via MSC.

Other branches on the report may also need similar action. We have found that 007113 has been closed for 18 months, so the PG txns were misdirected, but I don't understand exactly what happened"

3.188 A bug fix to the Horizon system was identified by Fujitsu, scheduled for implementation 13 September 2012 after 1800hrs and the Branches stock was to be corrected at 1700hrs that same day.

3.189 On the 17 September Anne Chambers reported in the PEAK that:

"Following a change made centrally to facilitate this, the stock unit associations for the two new Post and Go terminals have been created by the branch and all the held external data (43 different days) has now been processed and passed through to POLSAP… We strongly recommend that POL monitor the SubfilesOnHold report which is sent to them daily, so that any other external terminals with problems can be investigated quickly in case a similar correction is needed.

3.190 A couple of observations can be made from the PEAK. It appears that the underlying bug, error or defect impacted branch accounts for 43 days until resolved and also that Post Office had not been monitoring the "SubfilesOnHold report" which Fujitsu send to them daily. If they had of been monitoring it, the fault would not have impacted for this length of time.

Recovery Failures (Horizon Issue 4)

3.191 PC0220532[94] created 5 September 2012 documents an instance where a branch (391230) alleges Horizon caused a loss. The information within the PEAK is limited with the concluding text of the PEAK stating:

"If further investigation by Fujitsu is required, Post Office will have to request that the branch transaction data is retrieved from the audit server. If there is any possibility that this is required for litigation, it must

[93] PEAK PC0218702, 13 June 2012 {POL-0388291}
[94] PEAK PC0220532, 5 September 2012 {POL-0441342}

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come through the Security (ARQ) route. Otherwise queries of this nature should be sent via Mark Wardle at POL, and should be routed to the reconciliation team in the first instance. Such requests may be chargeable."

3.192 It is unclear (as with most PEAKs relating to possible financial discrepancies) what the full resolution or conclusion of the issue was since Post Office have not disclosed in detail full Transaction Correction information for all reported discrepancies.

3.193 PC0241242[95] created 23 February 2015 relates to a branch (2693232) in which poor communications with the Data Centre resulted in a failed recovery of a Health Lottery transaction. Whilst it is not suspected that this instance caused the Subpostmaster a discrepancy, the PEAK records that support have *"asked POL (via ATOS) to authorise us to remove the Health Lottery txn..which is preventing successful recovery."*

3.194 PC0197643[96] created 14 April 2010 refers to branch 166948 in which a £240.00 transaction failed in recovery. Whilst a table exists in the database to potentially capture failed recovery transactions, these then have to be manually reconciled. The PEAK states:

"Looking at the PostOfficeCounterLog, the receipt printed ok for this after authorisation was received, the receipt that printed for the cash withdrawel states "Authorised", so it's possible that the clerk handed over the monney [sic]."

3.195 As this was passed to Post Office, it is unclear what their final resolution was. It is not documented if Fujitsu removed the transaction and if they did, how they did it.

3.196 Horizon recovery issues are also noted under PEAKs relative to Horizon Issue 1 and illustrate there are potentially many recovery failure

[95] PEAK PC0241242, 23 February 2015 {POL-0441722}
[96] PEAK PC0197643, 13 April 2010 {POL-0367516}

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manifestations. In many instances, they cause financial discrepancy that ought to be requested by a Transaction Correction.

Transaction Correction Issues (Horizon Issue 4)

3.197 The following PEAKs are relevant to Horizon Issue 15 and how Horizon processes and records Transaction Corrections. They provide an insight in relation to technical flaws surrounding the processing of Transaction Corrections.

3.198 PC0129587[97] dated 1 December 2005 relates to Transaction Corrections (TC) and issues with counter freezes during acceptance of the Transaction Correction. It should be noted that SSC were able to diagnose the problem after importing the message store (from the branch Counter) onto an SSC (Fujitsu) counter. The issue is predominately related to the options functionality of the Transaction Correction and length of the Transaction Correction text. PC0130056[98] is a cloned call of PC0129587.

3.199 The PEAK detail further states:

> *"…(d) PEAK PC0120459, raised on S80 E2E XI, reported the same symptoms and this was found to be missing/incorrect reference data."*
>
> *…*
>
> *"This is certainly a bug in the code but is given a challenge with the continuous unspaced text."*

3.200 It is recorded that the inability to accept the TCs would impact Subpostmasters as they would not be able to "roll over" into a new accounting period. The PEAK states:

> *"I have raised the issue formally with POL, via Julie Welsh, to ask them to stop creating TCs with long text.*
>
> *Ravinder has/will be contacting the 6 affected FADs: 010937, 015937, 182937, 262539, 322519 and 559323 to explain the avoidance action:*

[97] PEAK PC0129587, 1 December 2005 {POL-0300024}
[98] PEAK PC0130056, 14 December 2005 {POL-0300490}

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rollover all but one stock unit. All want to rollover on 14/12/05 except for 262539 (who wanted to roll today 07/12/05)."

3.201 PC0120459[99] dated 04 May 2005 whilst referred in PEAK PC0129587[100] as "reported the same symptoms" actually records Transaction Correction button functionality issues for a different branch in which the PEAK detail states *"Confirmed issue caused by a missing Work package, lost after the rig reset.".*

3.202 This PEAK is also cloned to PC0118562.[101] PC0118562 dated 11 April 2005 further refers to PC0114154[102] (dated 18 January 2005). However again, these latter two PEAKs relate more to the Transaction Correction button functionality presented on screen rather than the system freezes referred to in PC0129587 and PC0130056.[103] PC0121331[104] again relates to the same issue.

3.203 Further Transaction Correction issue PEAKS are PC0130057[105] (replication of FAD 182937 issue under PC0129587) and PC0129774[106] (again a replication of this PEAK due to a lack of visibility on Powerhelp).

3.204 PC0204350[107] relative to Transaction Correction reports highlights confusion faced by a Subpostmaster when trying to investigate a discrepancy.

3.205 A Ssmmary of the issue is that the Subpostmaster had a *"cash loss of around £80 since 08/09/10…"* and would not make good the loss which he believed was due to a system error, alongside an issue of not being able to see transaction corrections that he had accepted on the system in a transaction correction report requested for 12/07/10 to 10/09/10.

[99] PEAK PC0120459, 4 May 2005 {POL-0290969}
[100] PEAK PC0129587, 1 December 2005 {POL-0300024}
[101] PEAK PC0118562, 11 April 2005 {POL-0290080}
[102] PEAK PC0114154, 18 January 2005 {POL-0285697}
[103] PEAK PC0130056, 14 December 2005 {POL-0300490}
[104] PEAK PC0121331, 26 May 2005 {POL-0291837}
[105] PEAK PC0130057, 14 December 2005 {POL-0300491}
[106] PEAK PC0129774, 6 December 2005 {POL-0300210}
[107] PEAK PC0204350, 14 September 2010 {POL-0374134}

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3.206 After support close the call due to "insufficient evidence", the call is re-opened by a customer call and NBSC report that they *"…can offer no explanation as to why accepted transaction corrections do not show on the Processed Transaction Correction report."*

3.207 However, the NBSC advisor escalates again requesting a valid explanation before the pm will agree to close the call.

3.208 The PEAK detail records the following:

> *"Details of TC messages are kept in the BRSS for 42 days. This would be why a query beyond a certain date is not showing the oldest TC put through the system. The following are still available and visible [in line with what the PM is reporting]:*
>
> *Date/Time Ref Amount*
>
> *08/09/2010 07:51 600024457612542000 £40*
>
> *22/09/2010 07:43 600023979612542000 £10*
>
> *25/09/2010 07:49 600027600112542000 £136*
>
> *06/10/2010 08:02 600028125312542000 £1000*
>
> *18/10/2010 09:06 600029206112542000 £35*
>
> *however, beyond that, I will have to request archived data from our Audit Team in order to confirm those TC txns in July 2010."*

3.209 It is not documented within the PEAK whether the Audit data is actually requested to clarify the position on the earlier TCs (which might allow the Subpostmaster to investigate the discrepancy further). The call is cloned to PC025567[108] with additional detail:

> *"One of the issues the user raise here is that fact that the 'Valid Date Range' on the counter suggests that there is data available for two months, e.g. 21/08/2010 to 20/10/2010. According to information from BRDB_ARCHIVED_TABLES, the retention period for TC data in the TPS_TXN_CORRECTION table is for 40 days only and as such it is*

[108] Not disclosed at time of report writing

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confusing if the user is presented with a date range which is greater than the data that is available to be retrieved."

3.210 The further PEAK detail relates to the requirement of changing the database retention period of TCs to 60 days. It is not clear how the Subpostmasters cash discrepancy was actually resolved.

Bugs/Errors/Defects introduced by previous applied PEAK fixes (Horizon Issue 4 and to an extent 10)

3.211 The following PEAKs illustrate applied fixes for bugs, errors and defects that have caused further bugs, errors and defects.

3.212 PC0053160[109] created 29 August 2000 documents an EPOSS issue relative to both training and live environments affecting Counters. The detail of the issue further documents the fix that was applied caused regression bugs.

3.213 PC0098230,[110] created 30 Jan 2004 is a bug suspected as an occurrence to a fix previously rolled out for PC0097081.[111] This issue is reported to double the value of cheques declared as stock:

"This results in a discrepancy between the system cheque figure and the declared figure. Something has changed in the counter code recently (I think at COUNTER_EPOSS 20_3; released end Nov) which causes the discrepancy to be recorded wrongly; so the cheque discrepancy; instead of being cleared; is doubled; and the cash is also wrongly adjusted."

3.214 Whilst this PEAK documents that the Subpostmaster was operating outside of process alongside this bug occurring:

"Spoke to PM and explained that there is a new software problem; so that what he has been doing for 2 years no longer works. He's happy with this. Also spoke to the auditor who was onsite; explained that I had advised him not to declare these cheques in this way - she confirmed that they should be put in the suspense account; and said she would talk him through the procedures."

[109] PEAK PC0053160, 29 August 2000 {POL-0228020}
[110] PEAK PC0098230, 13 January 2004 {POL-0270225})
[111] PEAK PC0097081, 17 November 2003 {POL-0269113}

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3.215 Evidence of this 'out of process' working was later provided for the Subpostmasters disciplinary hearing however it is noted that the PEAK further states:

> *"I'd like to add that this can occur when a clerk declares any cheque short of what the system has calculated; the fact that the clerk/PM in this instance was going against normal procedure is irrelevant. Multiply this potentially several thousands of times over there could be an awful lot of 'repair' work to do when S50R kicks in for real."*

3.216 It is unclear whether this branch was operating on the S50 release as a live trial. However it is documented that the software fix to fix this bug is planned for the S60 release therefore this issue could have happened at other branches.

3.217 PC0052776[112] dated August 2000 refers to a reconciliation discrepancy which records: *"This is exactly the same scenario as PinICL PC0049702".*

3.218 PC0049702[113] is dated July 2000 and relates to a payments discrepancy at Danby House branch, is summary the PEAK detail records:

> *"The problem was that the 99990701 CashAccLine was being written out with negative sign when it should have been written out with a positive sign. This problem was introduced when fixing PinICL PC0047518 - during which even more drastic problems with CashAccLines were fixed."*

3.219 This bug was subsequently fixed by a software fix and both PEAK records subsequently closed by August and Mid-September 2000.

<u>Evidence of Insertions/Deletions within Branch Accounts (Horizon Issue 10)</u>

3.220 In relation to Issue 10 of the Horizon Issues, I opined in my previous report at paragraph 9.43 (Page 144) that Fujitsu did have the ability to delete transaction data. Review of the PEAKs and those referenced below 'Deletion of Transaction Data' evidence that Fujitsu could and did insert, inject, delete and rebuild transaction data or data in branch

[112] PEAK PC0052776, 21 August 2000 {POL-0227657}
[113] PEAK PC0049702, 7 July 2000 {POL-0224840}

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accounts. Occurrences are evidenced where this was both with and without the knowledge and consent of the Subpostmaster.

Remote Access and Branch Data Alteration (Horizon Issue 10)

3.221 PEAK PC0051855[114] created 5 August 2000 relates to an incident where the messagestore has to be deleted and re-instated from a mirror copy. The PEAK detail states:

> *" I was concerned that the latest messages from site had not been replicated to the correspondence server, but I have found that they are in the riposte mirror, therefore we can continue to delete the main riposte message store."*

3.222 The associated KEL to this PEAK is documented as DRowe5014K, which has not been provided in disclosure. Performing a search across the PEAKs utilising this KEL name returns three further associated PEAKs.

3.223 PEAK PC0195962[115] created 12 March 2010 suggests that the modifications by Fujitsu support staff to the Horizon Branch Database (BRDB) is not unusual. Within this document Gareth Seemungal of Fujitsu discusses making a fix to the transaction correction tool templates, the benefit is described as follows:

> *"SSC will be able to fix BR*DB transactions quicker and with more confidence" *and* "making it less likely that mistakes will occur when SSC are trying to resolve problems with transactions in BRDB".

3.224 PC0128969[116] dated 17 November 2005 is a PEAK which was considered a one-off issue and closed (after the stock unit data and figures were 'reset'). The bug then re-appeared in several other branches in the application of a fast track fix to the live environment due to its severity.

3.225 The PEAK detail states:

> *"We are proposing to reset Stock Unit AA back to TP8 BP1, so that the PM can rollover again, this time with a correct set of figures. Discussed with Joanne at NBSC Tier 2 and she thinks it would be a sensible way*

[114] PEAK PC0051855, 5 August 2000 {POL-0226902}
[115] PEAK PC0195962, 12 March 2010 {POL-0365857}
[116] PEAK PC0128969, 17 November 2005 {POL-0299414}

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forward. Phoned the branch but the PM is on holiday. Spoke to a relief PM and advised her not to rollover into another BP until we have sorted it out.

OCP12388 raised, awaiting approval by POL."

3.226 It has not been possible to review the detail of the OCP as they were disclosed on the 25 January 2019 and, given the proximity of this date to the deadline for my report submission. I have not had time to consider them as part of this report.

3.227 It is assumed however that Post Office approved the OCP since the PEAK detail further states:

"The reporting FAD has been repaired so I suggest that we close this PEAK and repoen if it occurs again and or elsewhere."

3.228 Other referenced PEAKs relative to this same issue are noted as, but not limited to: PC0130275,[117] PC0130461,[118] PC0130855,[119] PC0135486,[120] PC0137766,[121] PC0137051.[122]

3.229 In summary, the issue observed was stock unit rollovers returning zero values. This resulted in Subpostmasters' branch reports returning very large discrepancies.

3.230 In PC0130275 [123]the PEAK detail states:

"…This has resulted in a gain of approximately £18000.

We are unable to correct the system figures safely. We can however provide accurate figures for what should have been in the Final Balance for BB, to enable POL to make the correction perhaps by using a Transaction Correction.

POL need to make a decision on whether they are able to correct the problem in this way, however we do not see any other alternative.

[117] PEAK PC0130275, 21 December 2005 {POL-0300707}
[118] PEAK PC0130461, 29 December 2005 {POL-0300893}
[119] PEAK PC0130855, 12 January 2006 {POL-0301284}
[120] PEAK PC0135486, 12 May 2006 {POL-0305863}
[121] PEAK PC0137766, 21 July 2006 {POL-0308133}
[122] PEAK PC0137051, 26 June 2006 {POL-0307421}
[123] PEAK PC0130275, 21 December 2005 {POL-0300707}

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Corrective action should be taken before 11th January when the branch is due to roll into TP10.

The cause of the problem is unknown and is under investigation."

And further:

"If we get to the problem before the office is rolled we are able to change objects in the messagestore to reset the stockunit back to the CAP (TP) rollover trailer. The PM can then rollover. PM should get a large shortage which cancels out the large gain.

We don't want to be having to do this as making manual changes to the messagestore is open to error and each time we have to seek authorisation from POL to make the changes.

If we get to the problem after the office is rolled (as in this call) then we are unable to correct the system figures safely. Its not been decided how we get the PM sorted out."

3.231 It therefore appears that aside from instances where a Transaction Correction might have been issued in order to re-balance the accounts, the alternative (prior to roll-over fix) was to amend the stock unit / messagestore data. This illustrates that Fujitsu can and did alter branch data with any consequent errors not being visible to Post Office or the Subpostmaster unless they were identified and notified by Fujitsu.

3.232 PC0146066[124] and (cloned) PC0146094[125] relate to an issue where a Subpostmaster has a negative value discrepancy which is diagnosed as the reference data for this product being recently removed leaving the negative holding stranded on the system and preventing the stock unit rollover.

3.233 The cloned PEAK detail is quite limited as the root cause and OCP files (documenting the actual change detail) are attachments that were not provided in disclosure. However, it states *"Opening figures messages added using ripostemessagefile to convert the -1p ROL to cash".* It

[124] PEAK PC0146066, 15 May 2007 {POL-0316398}
[125] PEAK PC0146094, 16 May 2007 {POL-0316426}

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appears that this was likely a modification to the data within the branch accounts.

3.234 PC0152014[126] dated 2007 relates to an issue in which no settlement value was written for a product transacted in branch. This caused a discrepancy (as effectively the balancing transaction to net the value to zero was missing). The PEAK detail states:

> *"The counter problem which caused the first issue has been corrected by inserting a message into the messagestore, for equal but opposite values/quantities, as agreed with POL (OCP 17510).*
>
> *As a result of this corrective action, the net effect on POLFS is zero, and POLFS figures are in line with the branch. POLMIS received both the original message and the corrective message.*
>
> *Once the problem was corrected, there should have been no impact on the branch. However it has been noted that the stock unit BDC had a loss of $1000, which was generated after the correction was made. We have already notified Gary Blackburn at POL (email attached). This appears to be a genuine loss at the branch, not a consequence of the problem or correction."*

3.235 Further detail within the PEAK states:

> *"Worth noting that the branch did not have any issues with the mismatched transactions because this was fixed before they did the roll. The branch is not aware of this and it's best that the branch is not advised."*

3.236 This indicates that there has been more than one Balancing Transaction applied within Horizon and also, remote corrective actions were applied without the knowledge of the Subpostmaster.

3.237 The 'Master PEAK' suggested for this issue is listed as PC0147357[127]. However, it appears the PEAKs actually assigned under this Master PEAK

[126] PEAK PC0152014, 7 December 2007 {POL-0322311}
[127] PEAK PC0147357, 26 June 2007 {POL-0317682}

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are for different manifestations of the issue (but however suspected as ultimately the same cause for PC0152014[128]). The detail records that the PEAK is considered low incidence (despite support acknowledging that this bug causes erroneous transaction data to be written in the accounts) and could potentially be an Escher bug for which there is no Escher support contract. Therefore, the suggestion is to create a KEL and close the call record (It is closed as 'Programme approved – No fix required).

3.238 Further affected PEAKs listed in the Master PEAK are; PC0152203,[129], PC0151724,[130] PC0109649,[131] PC0109772,[132] PC0114129,[133] and PC0133933[134] "etc". The majority of these relate to anomalies relative to transactions missing a "mode" attribute therefore being caught by the TPSC254 report and would not impact the branch accounts as PC0152014[135] did, where the settlement was missing, it therefore appears that PEAKs are grouped and related by KELs despite the bug presenting different symptoms.

3.239 Further, PC0151724[136] records that the fix applied to the data using the Transaction Repair Tool (TRT) (for PC0151628[137]) was initially set to the wrong Transaction Mode ID although it is later stated that mode is irrelevant, and all POL FS data is now correct.

[128] PEAK PC0152014, 7 December 2007 {POL-0322311}
[129] PEAK PC0152203, 14 December 2007 {POL-0322498}
[130] PEAK PC0151724, 27 November 2007 {POL-0322025}
[131] PEAK PC0109649, 15 October 2004 {POL-0281236}
[132] PEAK PC0109772, 18 October 2004 {POL-0281362}
[133] PEAK PC0114129, 18 January 2005 {POL-0285672}
[134] PEAK PC0133933, 27 March 2006 {POL-0304323}
[135] PEAK PC0152014, 7 December 2007 {POL-0322311}
[136] PEAK PC0151724, 27 November 2007 {POL-0322025}
[137] PEAK PC0151628, 23 November 2007 {POL-0321929}

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3.240 Further PEAKs relevant to PC0152014 (not listed in the Master PEAK above) are identified as PC0140063[138], PC0176680[139], PC0175821 [140]and PC0151718[141].

3.241 PC0151718 is the same issue as PC0152014. PC0140063[142] and PC0176680[143] detail how the corrective fix would apply to POL FS accounts but does not document any branch account impact. PC0175821 indicates further balancing transactions were added to fix the branch accounts for the branch affected in that particular PEAK.

3.242 I have noted that inputting the KEL reference returns many more related PEAKs (and does so where other KELs are referenced for other bugs) than those acknowledged in the Master PEAK. I have not been able to review all of these in the time available.

3.243 PEAKs PC0159445[144] PC0159702[145]and PC0159759[146] relate to an issue where various branches feature on reconciliation exception reports. The issue is diagnosed as due to changes (CP4461 and CP4616) to the TPS Harvester (Transaction Processing System that harvests branch transactions). development had to produce scripts to repair rejected transactions and apply them to the live environment.

3.244 The PEAK detail goes on to state how certain missing transaction data attributes had to be "invented" in order to process the transactions where the data was missing. This was authorised through an OCP request.

3.245 PC0159759 states:

> *"That stupid mails code omitted mandatory fields Startdate, StartTimeFraction EndDate and EndTimeFraction from four messages. I*

[138] PEAK PC0140063, 10 October 2006 {POL-0310423}
[139] PEAK PC0176680, 4 March 2009 {POL-0346844}
[140] PEAK PC0175821, 19 February 2009 {POL-0345994}
[141] PEAK PC0151718, 27 November 2007 {POL-0322019}
[142] PEAK PC0140063, 10 October 2006 {POL-0310423}
[143] PEAK PC0176680, 4 March 2009 {POL-0346844}
[144] PEAK PC0159445, 1 June 2008 {POL-0440631}
[145] PEAK PC0159702, 6 June 2008 {POL-0329973}
[146] PEAK PC0159759, 9 June 2008 {POL-0330030}

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have used the TRT to insert suitable values. They should go to POL this evening."

3.246 It is not clear what "suitable values" were applied using the Transaction Repair Tool (TRT) in this instance or what process would set out how support were to derive the values of data that they had to create. Again, the authorisation to modify data appears to have been granted from Post Office by an OCP request, as aforementioned, these have not been considered as part of this report due to the timing of their disclosure.

3.247 PC0172841 created 8 January 2009 refers to a defect where if a branch does not poll (send its data and transactions through Horizon to Post Office), then any transactions after 36 days could potentially be lost. The PEAK detail states:

"What does the user have to do to get this problem? A non-polling branch with txns older than 36 days will potentially lose txns if any result in exceptions. How does it affect them when it occurs? SSC have to manually rebuild the SQL insert statements, risking data due to bugs and mistakes made via SQL."

3.248 The PEAK above therefore indicates that Fujitsu support had the capabilities to manually rebuild data.

Data Rebuilding

3.249 PC0057909[147] dated November 2000 refers to an issue occurring as a result of a branch's counter base unit replacement. A base unit is effectively the computing machine that enables the Counter in branch to operate. The Subpostmistress in this instance identified that some transactions were missing upon printing reports after the installation and therefore re-added the transactions. After re-printing, the 'missing' transactions had appeared and therefore the Subpostmistress had to reverse the ones she had added.

3.250 Five days after opening the call record and the Subpostmistress chasing for an update four times, a support team member who cannot

[147] PEAK PC0057909, 15 November 2000 {POL-0232732}

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understand the discrepancies states, *"PM has not been contacted, closing as insufficient evidence."* The defect and root cause is then updated to "*40: General – User*".

3.251 The call is re-opened (and cloned to new PEAK PC0058435[148]) three days later and the diagnosis for the missing transactions and their sudden re-appearance is confirmed as a communications defect between the main counter in branch (the gateway counter) and the two other counters in branch failing to synchronise the correct data. Therefore, in my opinion the evidence suggests that some issues that are diagnosed as "user error" were the result of a misdiagnosis.

3.252 Despite the diagnosis there still appears to be unknowns queried by the support team member:

> *"Can development please investigate on whether there is a deficiency in Riposte and what can be done to stop this happening again. Also, need advice on how to get the messagestores in sync and to include the missing transactions. I suspect we will need to trash the messagestores on counters 2 and 3 and insert the missing messages onto counter 1 (or can the PM get away with inputting the transactions). Some of the transactions are APS. Also how will this affect their balancing. They are currently in CAP 34."*

3.253 I assume "trash the messagestores" to mean delete them and potentially rebuild them.

3.254 After another five days the Subpostmistress calls again for another update due to concerns about balancing. The following is stated:

> *"Note to be passed onto customer for balancing: this problem has occurred with replication before (in essence due to a failure in Riposte for whatever to replicate back down). It should be perfectly OK to continue balancing on Nodes 2 or 3 but noton [sic] node 1 where the failure occurred.*
>
> *From the Riposte point of view there seems to be a major disagreement on what the contents of <id:1><Num:510416> for about 50 messages*

[148] PEAK PC0058435, 15 November 2000 {POL-0232733}

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should be. There are minor glitches here and there but this seems to be the major discrepancy. Therein lies the heart of the matter in that there are EPOSSTransactions present on node 2's viewpoint, but what appears to be AP Recovery messages on node 1. This blows my whole understanding of what Riposte should be handling on our behalf i.e. replication not deviation across nodes. Passing to QFP for onward routing to Escher-Dev…

… I should also add that they should repeat the AP recovery if they can. The trouble with this scenario is that EPOSSTransactions have occurred on both sides of the divide, both apprantley on node 1. QFP might also want to seek the advice of the APS team on this also who might disagree with the above. The EPOSSTransactions on counter 2 cannot easily be autorecovered, whereas the APS ones via their recovery tools might be better equipped. Whatever happens, this bug should end up with Esher-dev."

3.255 On 11 December 2000 details Gareth Jenkins states:

"I don't know that I can add anything useful here. This is another example of recovery having gone wrong after a box swap. It would appear that Counter 1 (the gateway) had been working normally and communicating with counter 2 up until a log out on counter 1 at 11:44 on 14/11. A new box was installed at about 12:04 that day and for some reason it was recovered from the Data Centre (which last synchronised at 11:24) rather than the slave. This resulted in about 50 messages being lost. The gateway did not communicate with the slave until it had written at least 50 messages (ie until 15:30 with the gateway first being used at 15:09). For this reason there was no Error indicating a Self Orriginating [sic] message being found. I also note that having allowed the user to use the gateway from 15:09 until 15:20 the gateway was rebooted and the user logged on at 15:30.Other than pursuing the known problem of how do we handle fouled up recovery (covered by PinICL 52823), I don't think I can add anything further to this PinICL and so it might as well be closed. I assume that the missing transactions have been recovered manually."

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3.256 Whilst this PEAK was closed 12 December 2000 as a duplicate of PC0052823[149], there are further peaks that result from hardware:

3.257 PC0052823 is a different PEAK focusing on the technical issues at the heart of the bug.

3.258 Meanwhile PC0058435[150] is cloned to PC0059052[151] in which the support team continue investigations.

3.259 It appears that the Subpostmistress followed the advice regarding repeating the Automated Payments (AP) Recovery, as this PEAK then goes on to state:

> *"The PM has rolled over and is now in CAP 37.*
>
> *However, because she had to recover 2 AP transactions in order to balance her cash account, the 2 customers have been paid twice in error."*

3.260 The PEAK concludes with support querying whether the customers have been paid twice and MSU-Incident Management stating that they see no reconciliation errors and to close the call.

3.261 It is therefore not possible to determine whether the customers where indeed paid twice or how the Subpostmistress recovered from her imbalances.

3.262 It should also be noted that the Subpostmistress raised this query in CAP (Cash Account Period 34) and therefore would have had three Cash Account Periods potentially with a discrepancy whilst the root cause was determined.

3.263 PC0197987[152] created 20 April 2010 documents:

3.264 *"Unable to connect to counter to attempt manual rebuild as counter is on site. Action required Advise PM not to trade at present as he is at risk of data loss - Node 31 being disconnected means the mirror service is not working and failure of the main disk could leave him without a backup if the unit has not been*

[149] PEAK PC0052823, 21 August 2000 {POL-0227701}
[150] PEAK PC0058435, 15 November 2000 {POL-0232733}
[151] PEAK PC0059052, 5 November 2000 {POL-0232734}
[152] PEAK PC0197987, 20 April 2010 {POL-0367856}

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replicating with the COR servers. Arrange for engineer to visit site to replace mirror disk."

3.265 The fact that this PEAK states "...to attempt manual rebuild" implies that there was the capability and process of doing so in relation to branch accounts.

Deletion of Data

3.266 Relevant to Horizon Issue 10, PC0241528[153] details an issue requiring deletion of session data:

> *"Please raise a TFS call with ATOS and ask POL to formally authorise us to delete this Health Lottery session so that office is able to use Node:1 again. This will enable the office to use Node:1 again quickly."*

3.267 It has previously been said by Post Office that whilst Fujitsu could modify transaction data to perform corrective fixes, they would not have delete capabilities (see paragraph 9.24 of my original report).

3.268 This PEAK also exemplifies a lack of communication between Post Office and Fujitsu in that the request for deletion of session data to be granted was actually also for a secondary branch impacted by the issue. However, Fujitsu and Post Office appear to spend days (impacting the Subpostmasters ability to operate the Counter) discussing and clarifying which branches actually needed the corrective action performing against them.

3.269 The typical response from Fujitsu where such issues as raised in this PEAK arise is:

> *"If there was an uncompleted customer session (basket) when the counter was removed, this might lead to a financial discrepancy. We cannot tell whether there was such a customer session, and Fujitsu Services will not accept responsibility for any potential financial discrepancy as a result of deleting the user session."*

[153] PEAK PC0241528, 3 March 2015 {POL-0410687}

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3.270 PC0234786[154] is a similar PEAK to that above relating to a failed session requiring Fujitsu to perform deletion of session data however this PEAK detail does not conclude whether the deletion occurred.

3.271 PC0263716[155] is again a similar PEAK in which the fix requires deletion of data. The PEAK detail specifically documents the command used to delete the recovery transactions and session data from the Branch Database in order to remove the data that was restricting the Subpostmaster from 'rolling over' into the next trading period.

3.272 The PEAK states:

> *"Due to the circumstances at the branch this session can be removed but the branch must be made aware that if there are any losses/gains from removing it then they will be liable."*

3.273 It is not fully clear whether "they will be liable" relates to the branch, Post Office or Fujitsu.

3.274 However, whereas my previous report opines at paragraph 9.43 (page 144) that Fujitsu did have the ability to (potentially) delete transaction data. I opine that Fujitsu could and did delete transaction data (not least by the deletion of session data which contained transaction data), and there is evidence that this occurred on several occasions (not limited to the PEAKs referenced above).

3.275 PC0197592[156] dated April 2010 details an error whereby rollover cannot be completed due to system error. Gareth Jenkins of Fujitsu states:

> *"What we need to do is the following: (I know the SQL is wrong, but BRDB Host team can correct it and fill in the gaps.) 1. Update BRDB_BRANCH_STOCK_UNITS WHERE fad_hash = ??? AND Branch_accounting_code = 314642 AND stock_Unit = ?DEF? setting trading_period to 11 2. Delete BRDB_SU_OPENING_FIGURES WHERE fad_hash = ??? AND Branch_accounting_code = 314642 AND stock_Unit = ?DEF? trading_period = 12 (Anne asserts that there is one such row*

[154] PEAK PC0234786, 11 June 2014 {POL-0404158}
[155] PEAK PC0263716, 26 October 2017 {POL-0431210}
[156] PEAK PC0197592, 12 April 2010 {POL-0367467

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with zero value for prod_id = 1. I suggest that this is checked by doing a SELECT first.

What this will do is re-align SU DEF?s TP with that of the Branch. It should then be OK to rollover the Branch again. BRDB Host will fix this by OCP."

3.276 This is indicative that Fujitsu, by creating SQL scripts, could delete relevant records in order to negate previous operations. Whilst this is not necessarily deletion of transaction data, it is the modification to operations that are all intrinsic to transaction accounting.

Peaks with Evidence of Remote Access (Horizon Issue 11)

3.277 PEAK PC0208119[157] dated 10 March 2012 is titled "*SSC Databases users do not have correct permissions*". It records Fujitsu concerns that "*SSC users affected have more access than is required to database resources. This is contrary to security policy"* and further, "*The customer is not aware of this problem or change".*

3.278 The PEAK includes a comment from Anne Chambers; "*When we go offpiste we use appsup*."

3.279 'Appsup' is described briefly in the same PEAK (also including a warning) by Andy Beardmore in 2011:

"The optional role 'APPSUP' is extremely powerful. The original BRDB design was that 3rd line support should be given the 'SSC' role (which is select_any_table + select_catalogue) and only given the optional role 'APPSUP' temporarily (by Security Ops authorisation) if required to make emergency amendments in BRDB Live. Since then Host-Dev have delivered a series of auditable amendment tools for known SSC data amendment operations in Live, and these are assigned by role to individual SSC user accounts. As such SSC should not require the APPSUP role in BRDB, unless there is an unforeseen update required to Live. Transferring to Steve Parker for review/assessment… It is a security breach if any user write access is not audited on Branch Database, hence the emergency MSC for any APPSUP role activity must have session logs

[157] PEAK PC0208119, 1 February 2011 {POL-0441177}

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attached under the MSC. Host-Dev previously provided scipts, such as the Transaction Correction Tool, are written to run under the SSC role and also write to the audit logs."

3.280 I understand Mr Beardmore to be explaining that APPSUP should not be used to access the branch database. It was only designed for emergency amendments to the live branch database but acknowledging that such action whilst logged is not audited, Mr Beardmore advises that "auditable amendment tools" are available to SSC.

3.281 From the privileged user access logs I can see that APP$UP usergroup was used 2175 times between 2009 and 2018 with users names; "ACHAM01, JCHAR01, CTURR01,GMAXW01" and others. The evidence suggests the following:

a. They were making emergency amendments to the live branch database;

b. There actions when logged on would not appear in the audit logs.

3.282 The PEAK specifically references the use of the Transaction Correction Tool and the access to this and other scripts should be reduced.

Policy Adherence (Horizon Issue 11)

3.283 It appears from review of the PEAKs that require deletion of session data that Fujitsu typically will not proceed until authorisation is given and evidence of that authorisation is placed onto the system.

3.284 PC0254133[158]dated 22 September 2016, details:

"One failed session for FAD 266329 Node 3 removed from BRDB, per KEL surs3213P and MSC Task 043T0092285. Authorised by Mark Wood (Debt Recovery Manager, Post Office Ltd) Witnessed by Phil Breakspear (Fujitsu SSC) SSC actions complete: closing Peak and returning call to TfS."

3.285 It is noted however, that not all PEAKs that relate to deletion of data from the BRDB provide as much detail as the one above, specifically not

[158] PEAK PC0254133, 22 September 2016, {POL-0422459}

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in relation to compliance of policy adherence in respect of receipt of authorisation from Post Office.

3.286 It appears the above restriction in respect of requiring authorisation and evidence of it is not exercised at all times. PEAK PC0234267[159] dated 22 May 2014 which also relates to the requirement to delete a user session data does not evidence an attachment of authorisation granted from Post Office. It appears that Fujitsu delete the session data on NBSC branch support verbal approval rather than requesting evidence be emailed and uploaded to the system. The typical process that should be exercised is documented in PC0239932:[160]

> *"…POL will need to authorise SSC to clear the incomplete user session. The POL authorisation needs to say; "Authorise to delete failed session". If the authorisation is being sent by email then the original email needs to be sent to SSC duty manager. Fujitsu Services will not accept responsibility for any financial discrepancy as a result of deleting the user session."*

3.287 Further observations in relation to Fujistu permission controls are documented in Section 5, Sub Section 11, Issue 11.

Limitations of PEAK Records – Examples

3.288 Whilst the PEAKs have provided a further view of bugs/errors and defects recorded within Horizon, observations arising from the PEAK records that ought to be caveated are as follows:

Limited Detail

3.289 PC0037445[161] dated November 1999 documents an issue where a Subpostmaster had a gain of £3564.35 in cash and £964.23 in stamps. The Subpostmaster had an on-screen message reporting memory loss whilst trying to balance.

3.290 The PEAK detail states:

[159] PEAK PC0234267, 22 May 2014 {POL-0403643}
[160] PEAK PC0239932, 24 December 2014 {POL-0409173}
[161] PEAK PC0037445, 6 November 1999 {POL-0221880}

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> *"I have looked through the EventLogs; it is apparent that there was a Virtual Memory error message written on the date the call was logged. Development, please ignore the discrepancy part of the call and investigate 'Memory Loss' event. EventLogs and MessageStore attached."*

3.291 The position appears to be that the event logs were only looked at following the report of a discrepancy by the Subpostmaster. If the Subpostmaster had not noted the discrepancy or reported the fault then it is likely that this defect would not have been detected. It is therefore unclear what the root cause of the discrepancy actually was, and there is little detail regarding the causation of the memory issue, the PEAK defect cause is updated to "14: Development – Code" and subsequently closed in October 2000.

3.292 There is no detail regarding whether information was provided to the Subpostmaster or how the discrepancy was further investigated.

Inconsistent Advice

3.293 Another dimension to the risk within Horizon and branch account integrity relates to how issues were handled and or resolved.

3.294 PC0225995[162] created 30 May 2013 (referenced KEL obengc3348L) relates to a transaction that initially occurred 28 May 2013 and appeared in reporting as an unmatched reversal 29 May 2013. The transaction was reversed by the recovery process due to a counter communications issue. The initial diagnosis states:

> *"PM was doing this txn on 28/5/13 @16:58.*
>
> *However the fast cash settlement failed due to poor comms; connection timed out. Counter produced zero value disconnected session receipts. The disconnected session receipts indicated no money should have changed hands.*
>
> *On 29/5/13 @16:52, when PM logged into the system the recovery (system correction) started. The recovery reversed the txn and strangely enough advised PM to pay £260 to customer.*

[162] PEAK PC0225995, 30 May 2013 {POL-0395484}

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Please note that the initial txn on 28/5/13, according to printed receipts shouldn't have exchanged any cash. However the automated recovery reversal advised PM to pay the money out. If PM paid the money out then there would be a cash shortage of the same amount.

I suspect this is a software error where the initial txn had progressed far enough in the database which caused this £260 reversal but still printed out initial disconnect session receipts with zero value"

3.295 It is not until four days later after the call has been escalated to 4th Line Support that the actual diagnosis of the issue is provided by Gareth Jenkins of Fujitsu. He states:

"Isn't this a case of Rollback Recovery? In that case the Recovery receipt would indicate that money should be returned, but as the customer wasn't present there is no one to give it to.

Vani: Please confirm that this was a normal Rollback recovery from the logs.

I accept that for Rollback recovery we produce a normal Recovery receipt and it may be a bit confusion [sic], but that is how it has always been and conforms to the specs in the Recovery HLD (DES/APP/HLD/0083 I think)."

3.296 Therefore, it appears that not only was the process confusing for the support teams to appropriately diagnose and inform the Subpostmaster but it is possible that misleading advice may have also been provided to them on that basis where other support team members potentially might have also misinterpreted Horizon procedures.

Delays awaiting Post Office authorisation

3.297 PC0244638[163] (amongst others) illustrates the delay incurred when applying fixes due to the multi-party support team's involvement and the delay in gaining approval from Post Office that Fujitsu state is needed for deleting session data where it may cause a financial

[163] PEAK PC0244638, 7 July 2015 {POL-0413670}

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discrepancy in branch. This PEAK is opened 2 July 2015 with a target closure date of 7 July 2015.

3.298 The call relating to this PEAK appears to have been closed on the same day it was opened after a suitable KEL is found to apply. However, the PEAK is subsequently reopened by a customer call. It is recorded that ATOS requested POLs authorisation for the fix to be applied 2 July 2015. Authorisation was not granted until 28 July 2015. Meanwhile, the Subpostmaster would not have been able to roll over the stock unit in order to comply with POLs procedures.

Reliance on Third Party Fixes

3.299 PC0037458[164] created 01 November 1999 documents a bug relating to APS transaction receipt prints that causes the system to 'crash' thus forcing a Subpostmaster to 'reboot' the Counter. The PEAK was raised in November 1999 and was subsequently diagnosed as follows:

> *"The background to this problem is that, in live, counters hang occasionally. Other PinICLs have been closed as duplicates of this one. The symptoms are:-1. A "Please wait while receipts are printed" message, or 2. A Printer tablet with "printing" message. In both cases the message does not go away and a reboot is necessary. This has proved extremely difficult to reproduce at will and, despite Brian's comments, there is no guaranteed formula for doing so that I can find. However, it seems to happen most often while a pair of APS receipts are being printed during an APS transaction and something goes wrong with the tally printer (e.g. out of paper). Bearing in mind the large volume of APS txns that are done on a daily basis, it is not surprising that such a problem would be found there. I have no idea what Escher have purported to have fixed. Unfortunately, I cannot test this out for APS transactions in the link test environment because of the secure nature of the APS dll. APS is unavailable to me. However, the "fix" does not seem to have had any adverse effect on EPOSS receipt/report printing and I am unable to induce the symptoms described."*

[164] PEAK PC0037458, 1 November 1999 {POL-0221867}

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3.300 In August 2000 the bug is therefore assumed to have been fixed by Escher and the defect cause is updated to "General – in Procedure" with the call record subsequently closed. It is noted that due to the length of the call record being open, the PM (Subpostmaster) was not contacted.

3.301 It is unlikely that this issue caused a discrepancy but it is an instance of error in processing data in Horizon. It further illustrates the risks introduced within Horizon since Escher were responsible for the fix and Fujitsu EPOSS team are reluctant to unit test fixes introduced by error.

3.302 PC0068699 [165]refers to a "known Escher bug" that duplicates cheque values and related PEAK PC0068231[166] is *"…fixed in Build 223 Update 31 which is designated for s10.".*

PEAK closure without identified resolution

3.303 PC0063914[167] created 15 March 2001 details an issue that has been reported by several branches whereby opting to press a "preview" button for the trial balance report results in a stock unit roll over to a new cash account period. It is recorded that:

> *"This type of problem has been reported from more than one PO.*
>
> *Please see PinICL: PC0056710, pc0063957 and a KEL: PSteed34T.htm."*

3.304 It appears that the support team do not understand the problem:

> *"Having spent a few days on this (as has Alex Kaiser in previous incarnations of this problem) I have no choice but to pass back as 'insufficient evidence' but would ask that EDSC keeps an eye out to see If any patterns arise or any sign of the problem actually being reproduced at will. Clearley [sic] we need to keep an eye on this type of problem. The systems we have tried to reproduce on contains additional bug fixes which might be preventing us to reproduce the problem. On the other hand when these fixes are released to PO's then problem might go away."*

3.305 I have previously seen this terminology where the support team claim an issue cannot be investigated due to insufficient evidence provided by

[165] PEAK PC0068699, 4 August 2001 {POL-0242869}
[166] PEAK PC0068231, 20 July 2001 {POL-0242467}
[167] PEAK PC0063914, 15 March 2001 {POL-0238446}

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the caller (Subpostmaster or NBSC). However, it is implied here due to investigations not being able to identify the root cause or replicate the issue.

3.306 Further, it is unclear how many other problems the support team were unable to replicate or diagnose due to their systems operating bug fixes that might obscure a specific Subpostmaster's issue. This is significant as failure to diagnose a problem will likely result in the Subpostmaster having to deal with a branch account anomaly.

Managed Service Change Disclosure

3.307 I understand that Managed Service Changes recorded agreed changes to the Horizon system and service. Following a letter dated 21 December 2018, I was provided with 20,826 Managed Service Change logs.

3.308 By requesting the MSC data, my intention was to review any significant changes to the Horizon system that might indicate where changes had been performed due to bug/errors and/or defect fixes applied to the Live service.

3.309 I received instruction in relation to how to interpret the various files (see attached at Appendix A). However, these instructions were insufficient and, upon receipt of the data, the analysis I have been able to perform was limited by the following:

3.310 The logs are very difficult to read, the first document received[168] starts with an ID of 60460 dated 2006. It is not clear if these records should have started at 1, but this is the first in the list provided and it relates to "RequestNo 043J0060460". This file also starts with a reference to 043J0060460 and then contains 679,051 lines of text. The third document received[169] also starts at 043J0060460 and contains 303,109 lines.

3.311 Given these difficulties, I have not had adequate time to fully analyse this data. However, I have carried out the following select analysis,

[168] MSC_Complete_Data_POA.xlsx, *Master Service Change logs* {POL-0444102}
[169] MSC_RTI_Answers_POA (1).csv, *Master Service Change logs* {POL-444104}

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along with the limited analysis that time has allowed elsewhere in this report (e.g. section 5, subsections 10 & 11).

3.312 I have taken MSC_Complete_Data_POA.xlsx and searched for the words 'BRDB' or 'message'. There are 183 lines that relate to Fujitsu working on the Branch database and/or its related hardware platform.

3.313 I have then searched for "FAD", used by Fujitsu and Post Office's to reference to specific branches. 39 records have FAD in the title, whilst the majority of these appear to be unrelated to this dispute a few titles warrant further investigation, if time permits:

"FAD 309801 needs BRDB correction to allow branch to rollover into new TP"
"FAD 184937 needs BRDB correction to allow branch to rollover into new TP"
"FAD 379704 needs BRDB correction to allow branch to rollover into new TP"
"FAD 010007 CURRENT_TRADING_PERIOD for stock unit DEF to be changed from 4 to 3"
"FAD 009641 CURRENT_TRADING_PERIOD for stock unit DEF to be changed from 4 to 3"
"FAD 311201 CURRENT_TRADING_PERIOD for stock unit DEF to be changed from 4 to 3"

3.314 I have searched for PC0* (typically PEAKs start with PC0) in the "OriginatorRef" column. I have identified that 455 of the MSC's records contain a reference to a PEAK. This may be consistent with Horizon changes as a result of PEAKS.

3.315 The following may be of interest but have not been fully considered:

"Removal of Cash Declarations for Deleted Stock Units" – relating to PEAK PC0199654 and KEL acha3347Q refer to at 5.424a of this report
"Actions to rectify Streams Duplicate Data Errors" – relating to PEAK PC0200596
"Branch Database - Tidy-up Branch Declarations that are older than 01-JAN-2011" – relating to PEAK PC0211010

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"Generate missing TAs for FAD 020511 [POL Info Only]"- Relating to PEAK PC0220393 and MSC043J0355958 and involved the SQL insertion of "dummy transactions" into the Branch Database

Privileged User Log Disclosure

3.316 As aforementioned, Privilege User logs were provided by the Defendant following a letter dated 21 December 2018 (see Appendix A). The purpose of the request was to answer of Issue 12 (how often facilities were used that could alter branch accounts).

3.317 Following a letter from the Defendants dated 21 December 2019 I was provided 81,958,608 lines[170] of Privileged User Logs.

3.318 The letter provided by the Defendant sets out that Privileged User logs have only been provided back to 2009, as Fujitsu cannot provide data prior to that. The letter further sets out some typical USERIDs and their capabilities:

3.319 OPS$BRDB user is stated in the letter as pertaining to the user/schema that holds the data tables that hold branch accounting data.

3.320 Review of access has identified the following:

2009	145 different times
2010	1133 different times
2011	435 different times
2012	396 different times
2013	309 different times
2014	8 different times
2015	99 different times
2016	31 different times

[170] More POL-*.txt | wc -l on the files POL-0444105.txt to POL-0447287.txt

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2017	17 different times
2018 (No logs after April 2018)	19 different times

3.321 The relatively low number of different access times suggests that these accesses are by a human, but there is no evidence in the logs to display what changes were made during any the access session.

3.322 The user OPS$OGGADMIN is said to have:

> *"wide ranging access e.g UPDATE ANY TABLE (i.e ability to update any table within the database, irrespective of the user/schema e.g anything in OPS$BRDB)*
>
> *DELETE ANY TABLE (i.e ability to delete from any table within the database, irrespective of the user/scheme e.. anything in OPS$BRDB"*

3.323 From my analysis I have determined that the logs which start in 2015 display access was provided to the OPS$OGGADMIN user in the following years:

2015	88231 different times
2016	141954 different times
2017	141622 different times
2018 (No logs after April 2018)	67806 different times

3.324 The high number of different access times suggests that the many of the accesses are likely by an automated process, but there is no evidence in the logs to display what changes were made due to any such access.

3.325 b. The user LVBALUSERS is said to have:

> *"High Level of access…mostly INSERT & SELECT privileges on the OPS$BRBD tables, some UPDATE ability and DELETE abilitiy on 4 tables"*

3.326 The logs which start in 2009 display that access was provided to the LVBALUSERS users frequently. The letter of the 21 December 2019 suggests that Users are *"coming in from the OSR applications on the*

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BAL platforms", and clearly many accesses appear to be automated. However there are two accesses that appear to be from support team users, one in 2009 the other in 2012. There is no evidence in the logs to display what changes were made during any such access session.

3.327 The logs do have an indicator that may suggest that it was a human (rather than another system) that was accessing with privileged access. This indicator is called "Terminal" and if present displays a "pts/" number which I believe relates to the specific terminal used to gain privileged access to the Horizon. In the logs there are 80 different privileged USERID's that had accessed Horizon at some point or another since 2009, the logs do not show what access rights they had or what actions they completed whilst they had access. Fujitsu should have a record of what access rights they have today (possibly even historically) but it is unlikely that they have any log of what actions were taken by the human users. This USERIDs are recorded in Appendix C

3.328 I have not had time to fully identify the most relevant USERIDs which would indicate specific privileged access dates and times where UPDATE/INSERT/DELETE operations were performed in relation to branch accounts. Provided more time, I may be able to identify these.

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4. Defendant's Responsive Witness Statements

4.1 I have received the Responsive Witness Statements produced by the Defendant in relation to the Horizon Issues trial and insofar as they fall within my area of expertise and experience, and I believe it may assist the Court, in this section of my report I comment on those statements below.

Torstein Olav Godeseth

Callendar Square / Falkirk

4.2 In the second Witness Statement of Mr Godeseth [171]dated 16 November 2018, at paragraphs 12 to 13.9 he discusses the "Callendar Square" bug occurring in 2005. I have set out my observations with regards to the Callendar Square / Falkirk bug, and the documentation provided as referenced by Mr Godeseth at 3.34 of this report. In summary, I note that Mr Godeseth references six documents relating to this bug comprising of:

a. Two PEAK records: PC0125677[172] created 8 September 2005 and PC0126376[173] created 21 September 2005;

b. Charles McLachlan report dated 10 October 2010;[174]

c. The Witness Statement of Gareth Idris Jenkins dated 08 October 2010 (prepared for the criminal prosecution trial of Ms Seema Misra);[175] and

d. Two KELs JSimpkins338Q[176] and JBallantyne5245K[177].

[171] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}
[172] PEAK PC0125677, 8 September 2005 {POL-0296154}
[173] PEAK PC0126376, 21 September 2005 {POL-0296843}
[174] Final report of Charles Alastair McLachlan, 30 September 2010 {POL-0011264}
[175] Witness Statement of Gareth Idris Jenkins dated 08 October 2010 {POL-0017084}
[176] KEL JSimpkins338Q 10 May 2005 last updated 11 January 2010 {POL-0444055}
[177] KEL JBallantyne5245K 2 November 2000 last updated 7 July 2005 {POL-0444056}

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4.3 My observations in respect of the documents and information referenced by Mr Godeseth are as follows:

a. Mr Godeseth references the witness statement of Gareth Jenkins[178] in relation to the description of the Callendar Square issue however the majority of the rest of his testimony relies upon "speaking" with Mr Jenkins, which does not refer to any supportive documents that I can review and analyse. For example, at paragraph 13.5 Mr Godeseth reports that he is aware that Subpostmasters were provided with advice (which he has not seen) and therefore which I cannot review.

b. Within the Witness Statement of Mr Jenkins (upon which Mr Godeseth is relying), there are no recorded PEAK or KEL references, it is therefore difficult to understand how Mr Godeseth identified those related PEAKs and KELS that he has, or assessed the references provided captured the full extent of the Callendar Square issue.

c. I note that the KELs referenced by Mr Godeseth were not provided in the initial KEL disclosure which I received on 10 May 2018 and were only provided as responsive evidence.

d. Mr Godeseth explains that the Callendar Square "bug" occurred in 2005. Whilst that incident at that particular branch may have occurred in 2005, the KELs he refers to in association with the issue span from 2000 to 2010. Further, the absence of a full Impact Assessment in relation to this bug indicates to me that it is highly likely this bug could have been impacting Branch Accounts prior to 2005.

4.4 In relation to the Callendar Square bug Mr Godeseth further sets out at paragraphs 15 and 16 that he understands from Matthew Lenton (of Fujistu) that this bug affected thirty branches, resulting in mismatches at twenty. He does not identify the branches, provide the date(s) they

[178] Witness Statement of Gareth Idris Jenkins dated 08 October 2010 {POL-0017084}

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were affected, or the sums concerned. He also does not state how the Subpostmasters were advised at the time or dealt with the subsequent mismatch imbalances. I have noted that PC0126376[179] states that any duplicate transfers made as a result of a Subpostmaster retrying the transfers would be dealt with via a Transaction Correction, but I have not seen any evidence that this was done or when or what Subpostmasters were told.

4.5 Mr Godeseth does not clearly explain the process by which the affected branches were identified. He states that event logs and reconciliation processes would indicate an issue which would in turn flag a PEAK and be visible to Fujitsu, but it is not clear from Mr Godeseth if this means that it would only have been visible if the Subpostmaster had identified it and a PEAK had been created. Mr Godeseth does not provide the PEAK references for all affected branches aside from the two he references at paragraph 13 of his witness statement (PC0126376[180] and PC0126042[181]), which do not seem to account for 30 branches which he describes as being affected.

4.6 It is also unclear how (of the ten branches which did not display a mismatch) any reconciliation measure would isolate those in relation to such a bug or make them identifiable to the Subpostmaster, via a receipts and payments mismatch (paragraph 13.6), when symptoms of the underlying bug did not always manifest in such a way.

4.7 I have previously requested from Post Office (via the RFI – See Annex A) further specific detail in relation to this bug, such as how Subpostmasters were informed and whether there was a full Impact Assessment available in relation to this (and other) bugs. However, in response I was referred back to Mr Godeseth's Witness Statement: "It is not possible to provide a generic answer to this request – the way in which the impact of a bug is assessed will depend on the nature,

[179] PEAK PC0126376, 21 September 2005 {POL-0296843}
[180] PEAK PC0126376, 21 September 2005 {POL-0296843}
[181] PEAK PC0126042, 15 September 2005 {POL-0296514}

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operation and effects of the bug. Information regarding the ways in which Fujitsu assessed the impact of the bugs referred to in paragraphs 12 – 16 and 34 - 61 of the second witness statement of Torstein Olav Godeseth dated 16 November 2018 is provided in those paragraphs. As illustrated in Mr Godeseth's statement where a bug has been identified, Fujitsu's approach has been to seek to determine what branch was affected and to present this to Post Office, along with how they were proposing to resolve the issue."This has not satisfied my request since Post Office have not communicated how Subpostmasters were informed and Mr Godeseth's Witness Statement diverges from my findings which illustrate that in actuality, the bug was likely in operation prior to the Callendar Square incident.

Payments Made to Incorrect Customer Account

4.8 At paragraph 25 of his second Witness Statement Mr Godeseth[182] refers to this bug in relation to the interface between Riposte and the barcode reader. The symptoms of the bug were that different transactions would ultimately go to the same client account. Mr Godeseth does not identify any documents which might relate to this problem, the impact of the Horizon code change he refers to, or dates of any events. Without more information, I have not been able to analyse or opine on Mr Godeseth's account that this bug would not have caused a shortfall in branch accounts. I have however, (in my further PEAK analysis) reviewed a PEAK in relation to phantom transactions whereby the same customer account number for a BT payment was recorded against a British Gas transaction. See paragraph 3.150.

Global Branches

4.9 At paragraph 30 Mr Godeseth responds to statements made in my first report regarding Global Branches.

4.10 Mr Godeseth states:

[182] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}

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> *"Mr Coyne's allegation at paragraph 9.18 of his expert report that "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" is not correct. To enter a transaction for a physical branch would mean that Fujitsu would have to be physically present at that branch.*
>
> *33. Similarly with paragraph 9.19 of Mr Coyne's expert report, where Mr Coyne alleges that "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 [...]. Such would identify where and what transactions had been performed by Fujitsu global branches and not a Subpostmaster". This allegation is meaningless because to enter a transaction a global user has to be physically present at a branch."*

4.11 Reading Mr Godeseth's reading of my first report, I realise there is some ambiguity and I will therefore clarify and explain further the points I intended to make in my first report.

4.12 Global Users may perform transactions whilst physically situated in a branch, i.e. those of an Auditor. The actions which have been performed by a Global User will all be auditable in the Horizon systems.

4.13 Further, there are Global Users whom have administrator capabilities, that may log on to a global branch as though it were the physical branch counter, to perform certain remote administrative activities (not transactions).

4.14 The document 'HNG-X Counter Business Application Support Guide'[183] (as referenced in my original report) sets out how ADMIN Users may use global branches to remotely interact with a branch Counter to perform Stock Unit and Branch User Management activities and how they will be recorded within the Horizon systems. Only those with Admin capabilities can perform Admin activities within the global branch.

[183] DEVAPPSPG0017_7.1.doc, HNG-X Counter Business Application Support Guide, 8 January 2014 {POL-0134853}

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4.15 Whilst document ARC/SOL/ARC/006[184] dated 2009 (referred to by Mr Godeseth in his first witness statement) states:

> *"The intention is that Global Users will be managed by HSD staff, thus utilising the existing Help Desk mechanisms for controlling the activities. A Global User Administration application is required to enable Global Users to be managed and also to support the capability of resetting a Local Branch Manager's password should it be forgotten. It is proposed that this is achieved by deploying one or more standard HNG-X counters in the Help Desk location. From an infrastructure perspective, this will be managed as a normal Branch.* ***However there will be constraints on the use of the Branch to ensure that no trading can take place at that Branch and that it is dedicated to Global User Administration****." [Emphasis Added]*

4.16 Despite the intention expressed in this document for there to be these contstraints, I have formed the view that transaction capabilities were possible from the global branches situated within Fujitsu's work space, for the reasons I explain below:

4.17 Firstly, the evidence of PEAK PC0205725[185] dated 2010 states:

> *"Jon: When you sort out the review comments on in DES/GEN/SPE/0007, please can you consider the following:*
>
> *1. Need to add a statement somewhere (probably section 9) as to what roles can Log on where. I believe the rules are (and this is what Nicola is after):*
>
> *a. ADMIN can only Log On in Global Branch*
>
> *b. All other Roles can Log On to any type of Branch (ie normal, CTO, Global)…"…*

4.18 Further, review of design document DES/GEN/SPE/0007_6.2[186] (referred to above and also within ARC/SOL/ARC/006 version 6.2 dated post 2009) illustrates at Section 9 'Access Control':

[184] ARCSOLARC0006_1.doc, *HNG-X Architecture - Global Users*, 15 July 2009 {POL-0440076}
[185] PEAK PC0205725, 25 October 2010 {POL-0375491}
[186] DESGENSPE0007_6.2.doc, *HNG-X Menu Hierarchy and Messages*, 5 April 2018 {POL-0153568}

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Branch Type	MIGRATE	MANAGERS	SUPERVISORS	CLERK	AUDITOR	AUDITOR E	SUPPORT	ENGINEER	SETUP	TRAINER	ADMIN	NOTLOGGEDIN
Normal Branch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	
Training Branch (CTO)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	
Global Branch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

Table 4 – User Roles Login Table

Figure 2 Excerpt from design document HNG-X Menu Hierarchy and Messages

4.19 This table is indicative that transaction capabilities (amongst others) for branches could be performed remotely from global branches if logged on under the role such as "Clerk" (and/or potentially others that permit transactional input). See Appendix B for the full list of 'Role Capabilities' documented in DESGENSPE007, Section 9.2.

4.20 I appreciate Mr Godeseth says this is not possible, but I have not seen any document which reflects a change to the planned design in this design document above, or any other documentary evidence for the restrictions that Mr Godeseth says were in place.

4.21 Regarding paragraph 9.19 of my first report (page 139), no records have been disclosed which reveal the transactions carried out at global branches or any of the global branch codes. Mr Godeseth states that branch WAK01, Branch Code 999993 (which Mr Godeseth didn't refer to in his first statement[187] but I identified for my first report) is no longer used and was closed in September 2016 however, further information about this branch, e.g. it's full period of operation, is not provided.

4.22 Paragraph 9.19 of my first report was intended to identify that there should be records available, that are identifiable by the global branch ID, in order to establish the activities performed by them.

[187] {Witness Statement of Torstein Olav Godeseth, 27 September 2018}

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Receipts and Payments Mismatch

4.23 At paragraph 34 of his second Witness Statement Mr Godeseth[188] states that, in addition to the Callendar Square issue, he has been asked by Post Office to explain how the following three bugs came to light and were resolved (payments mismatch, local suspense issue and the Dalmellington/branch outreach issue).

4.24 I have assumed at paragraph 35 under the heading "Receipts and payments mismatch" that Mr Godeseth is dealing with the "Payments Mismatch" bug acknowledged by Post Office in their Letter of Response (Schedule 6)[189] since Mr Godeseth states (which aligns with my own opinion):

> *"At the outset it should be noted that while I understand that this bug has become known as "the receipts and payments mismatch bug", a receipts and payments mismatch is actually a symptom of the issue."*

4.25 Firstly, I note that whilst Mr Godeseth states that this bug affected 60 branches, the Letter of Response (Schedule 6) document provided by Post Office in relation to these bugs states that 62 branches were affected.

4.26 Mr Godeseth only refers to one document authored by Gareth Jenkins dated 29 September 2010[190] in relation to this issue in his attempt to explain how this bug came to light and how it was resolved.

4.27 Within this 29 September 2010 document there is other information which Mr Godeseth has not included in his witness statement that in my opinion is important to take into account.

4.28 At Section 3 of the document (Identifying Affected Branches) it states, "*Processes should be in place such that SMC pick up these events and raise a peak for each occurrence of these events",* then there is a

[188] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}
[189] {Letter of Response from Post Office,"SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON", 28 July 2016}
[190] 3429 SM BP Correcting Accounts for Lost Discrepancies - 102000790 - CD1.pdf, *Correcting Accounts for "lost" Discrepancies*, 29 September 2010 {POL-0010769}

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comment (by Mr Jenkins), *"I don't believe that this has happened and this needs to be investigated further*.

4.29 I have not been able to identify 60 PEAKs relating to this bug from the total set of PEAKs disclosed, which may be because 60 PEAKS were not created, or may be because the PEAKs which were created were not clearly identified as relating to this problem. Mr Jenkins in his report refers to only three PEAK records which are recorded in his report as follows: *"PC0204765 and PC0204263 (and also PC0203864 which is a duplicate of PC0204263)."*

4.30 I have set out my observations further in relation to this bug at paragraph 3.27. Unlike Mr Jenkins, I do not identify PC0203864[191] as a duplicate of PC0204263[192] as it references a differing impacted branch and values. Also, nested within the PEAKs referenced by Mr Jenkins, I have identified further related PEAKs to this issue. PC0204537,[193] PC0204889[194] and PC0205076.[195] I have also identified that KELs wrightm33145J[196] and ballantj1759Q[197] are referenced within the PEAKs

4.31 At section 4 of the Jenkins document (Analysis Required for each Affected Branch), it is set out that several items need to be ascertained such as dates, values and whether a call was raised by the branch. This is the sort of analysis I would expect to see as part of an Impact Assessment (as I stated previously, I would have expected to see one for Callendar Square also), but I have not seen any evidence of analysis or the results thereof documented by Post Office or Fujitsu in any detailed level.

4.32 At section 6 of the same document,[198] (Communication with Post Office Ltd) there is reference to Fujitsu communicating the problem to Post

[191] PEAK PC0203864, 2 September 2010 {POL-0373654}
[192] PEAK PC0204263, 13 September 2010 {POL-0374051,
[193] PEAK PC0204537, 17 September 2010 {POL-0374316}
[194] PEAK PC0204889, 30 September 2010 {POL-0374664}
[195] PEAK PC0205076, 6 October 2010 {POL-0374849}
[196] KEL wrightm33145J, 23 September 2010 last updated 1 April 2016 {POL-0040409}
[197] KEL ballantj1759Q, 12 February 2010 last updated 17 May 2011 {POL-0038508}
[198] 3429 SM BP Correcting Accounts for Lost Discrepancies - 102000790 - CD1.pdf, Correcting Accounts for "lost" Discrepancies, 29 September 2010 {POL-0010769}

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Office through "the problem management mechanisms". I haven't seen any records which show how or when this was done in this case, although I would expect this to be documented.

4.33 There is also reference to the value of the discrepancies which had been identified by that date, which are not separately listed, but are described as "*one for £30,611.16, one for £4,826 and the rest are all for less than £350*", there is then a comment (again Mr Jenkins specific input) "*I've been unable to work out yet if these are losses or gains*!".

4.34 To conclude, I cannot be confident, due to the limitations regarding the documentation set out above, that the full extent or impact of this bug was suitably assessed.

Local suspense issue

4.35 At paragraphs 46 – 54 of his second Witness Statement, Mr Godeseth refers to the 'Local suspense issue' that was identified in 2013,by reference to a note prepared by Gareth Jenkins headed 'Local Suspense Problem' (which in the exhibit has a date of 16 November 2018, but I understand this date is incorrect) and PEAK PC0223870[199] dated 25 February 2013 (which is referenced within the 'local suspense issue' document by Mr Jenkins).

4.36 This 'Local Suspense Problem' note provides further information about the problem and identifies the affected branches. It appears from this document that there was a specific investigation into this problem and that other documents were created (including a preliminary report) but these are not identified by Mr Godeseth.

4.37 There are some very important points which arise from Mr Godeseth's description of this bug, including that: (1) it appears that Post Office did not take any steps to identify the cause of the problem when it first arose, or tell Fujitsu about it (2) it is apparent that Post Office and Fujitsu were reliant upon Subpostmasters identifying this problem

[199] PEAK PC0223870, 25 February 2013 {POL-0393383}

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rather than any independent monitoring of branch accounts, and (3) it appears that the reason the affected Subpostmaster was able to identify the problem was because the discrepancy value was so high in his case, but the fact is there was an effect on other Subpostmasters that was not identified by them or Post Office in the first instance.

4.38 The way in which this bug arose (as described at paragraph 48.2 of Mr Godeseth's Witness Statement) indicates that there was a lack of effective regression testing of this fix.

4.39 At paragraph 52 Mr Godeseth states that the old records which caused the issue were deleted but does not explain the process used to delete these records, i.e., whether it was by privileged user. No records have been disclosed which show how these deletions were made.

4.40 At paragraph 53 Mr Godeseth states that further checks were introduced during the balancing process to identify recurrence and raise alert, but there is no description of what those checks were and again no documents have been disclosed which describe these.

4.41 I note that within the 'Local Suspense Problem' note there is draft text of a letter to be sent to the Subpostmaster. Mr Godeseth does not say within his Witness Statement whether this letter was in fact sent and I have not seen any copy of any communication to the affected Subpostmasters from Post Office.

4.42 In a Request for Information (RFI) document sent to Post Office (Annex A) I have previously enquired as to how Subpostmasters were notified about the Local Suspense Account problem. Post Office responded on the 8th August 2018 stating:

"SPMs were notified about the "Local Suspense Account" issue."

4.43 I have provided fuller observations in respect of this bug at paragraph 3.43 above. In summary, since Fujitsu did not investigate this bug when it first arose in 2011, there is no clear record of what the full impact of its effects were. The documentation referenced here only relates to the incident that occurred in 2012.

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Dalmellington / Branch Outreach Issue

4.44 I referred to the Dalmellington issue in my first report (paragraphs 5.16 to 5.19 pages 45 to 46) after identifying some emails relating to a problem affecting this branch where a cash pouch was remmed in to an outreach branch multiple times causing a £16,000 discrepancy in Subpostmaster's branch accounts. It appears the bug was related to a "log off issue" but not one caused by any Subpostmaster user, this is supported by Mr Godeseth who states that the stock unit in question timed out and logged off due to inactivity.

4.45 This was not one of the bugs which Post Office had acknowledged in its Letter of Response[200] or to my knowledge, otherwise in these proceedings. Mr Godeseth now deals with this bug in his witness statement and refers to a Fujitsu presentation dated 10 December 2015 headed "Branch Outreach Issue (Initial Findings)".

4.46 I have also, through my own analysis found related PEAKs to this issue. PEAK PC0247207[201] states that this issue may have existed within Horizon for:

> *"...several years so it likely to have happened before but we have no record of it having been reported to us. I can only check back two months; I've found 4 other instances (outreach branches 214869, 106444, 110444, 207828)..."*

PEAK PC0246949[202] (October 2015) further states:

> *"Note: NBSC has confirmed that they following discussions and checks with the user that this is not a user error issue, but an issue within the system requiring Fujitsu investigation."*

4.47 The investigation notes contained within PEAK PC0246949 also illustrate the potential for misunderstanding between Post Office and its

[200] {Letter of Response from Post Office, *SCHEDULE 6: REBUTTAL OF ALLEGATIONS AGAINST HORIZON*, 28 July 2016}
[201] PEAK PC0247207, 21 October 2015 {POL-0416073}
[202] PEAK PC0246949, 13 October {POL-0415840}

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subcontractors since email exchanges outside of the PEAK detail states that Chesterfield (Post Office) have previously been aware of this issue.[203]

4.48 Whilst Post Office agreed that this Horizon bug needed to be fixed, the issue is logged as a "*Process*" issue and NBSC staff are advised how to work around it.

4.49 The 'Branch Outreach Issue (Initial Findings)' presentation[204] referred to by Mr Godeseth indicates that an audit identified 112 occurrences of duplicate pouch IDs in relation to this issue overall, of which 108 were corrected "at the time" either by a Transaction Correction issued by Post Office or the Subpostmaster completing a reversal. I do not know the circumstances which led to Transaction Corrections being issued to each of these Subpostmasters (where this was done) and whether this required the Subpostmaster to identify the specific problem to Post Office. However, it seems likely this was the case as the records indicate this is what happened at Dalmellington. I note that Mr Godeseth says that in the case of the Dalmellington branch a Transaction Correction was issued prior to the completion of the Branch Trading statement on 29 October 2015 (paragraph 60).[205]

4.50 Many branches experienced this effect on more than one occasion, as is apparent from page 10 of the Branch Outreach Issue presentation, which lists how many occurrences each branch had.

4.51 Whilst Mr Godeseth states in his witness statement that there were 112 incidences of duplicate barcodes issued, he does not explain that of those 112, the presentation refers to there being: *"4 items still to be confirmed"* and *"No correction records obvious in database Post Office to advise if any corrections etc raised".* This suggests that there were four occasions of duplicate pouches affecting branches which were not

[203] Email thread between ATOS and CWU, 23 October 2015 {C-0005343}
[204] Outreach BLE Extract Findings v6 091215.pptx, *Branch Outreach Issue (Initial Findings)*, 10 December 2015 {POL-0220141}
[205] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}

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corrected at the time either by a reversal or by a Transaction Correction. The detailed preliminary findings within the report refer to two of these "unknown" occasions occurring in 2013:

a. FAD 157242, value £25,000 (on 18 February 2013); and

b. FAD 209311 value £2,500 (on 1 March 2013).

4.52 In my opinion, I believe it should have been relatively easy for Fujitsu or Post Office to review the branch data for those branches (including branch trading statements) to identify how the amounts were resolved or otherwise treated in the accounts i.e. whether they were settled centrally and ultimately, if so, the Subpostmaster was held liable for them. It is not clear from the Fujitsu presentation or Mr Godeseth's witness statement whether there was in fact further communication with those Subpostmasters or if any previous errors were corrected following the audit referred to.

4.53 I have searched the disclosed PEAKs relating to these FAD codes and although I have found PEAKS relating to other issues for those branches, none of these PEAKs appear to relate to the dates and amounts which are identified in the Fujitsu presentation as being related to the Branch Outreach issue.

4.54 I have looked at the "2015 POA Problem Management – Problem Review" dated 6 July 2016,[206] which refers to this problem with code A10821106. This records that a "regression" test for this type of failure could be run on new releases before they are "released into the Live environment" and that "a regression test has been added to the LST test suite to validate for this scenario in future releases". I agree that it was appropriate to improve the regression testing once this error was identified but the fact that this error arose indicates that there were initial failures in testing.

[206] SVMSDMINR3037_1.DOCX, 2015 POA Problem Management – Problem Review, 6 July 2016 {POL-0146645}

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Post Office Account Customer Service Management Procedure

4.55 In my first report I referred to a document entitled 'Post Office Account Customer Service Problem Management Procedure'[207] dated 12 July 2016 (which was version 5 of this document). Mr Godeseth in his statement refers to a later version of the same document, dated 15 September 2017 (version 5.2). I had anticipated when preparing my first report that the procedure would have been implemented, because the rationale for the process was to *"measure effectiveness of the process and drive performance of the process and overall service in general"*. However, Mr Godeseth's Witness Statement says the procedure was not implemented, but does not explain why, other than to say *"I understand from Steve [Bansal] that Saheed Salawu's replacement did not wish to implement the changes".* In my opinion this decreases the extent to which measures and controls existed in Horizon to prevent any bugs/error or defects as an issue was recognised and an important measure and control was not implemented.

4.56 At paragraphs 64 to 65 Mr Godeseth specifies that during Legacy Horizon, Problem Management was reported in a specific section within the Service Review Book (SRB). In his next paragraph Mr Godeseth states that there was no Problem Management reporting between September 2010 to September 2014, but there were annual Problem Review Reports produced for the years 2014 to 2017 which Mr Godeseth has identified.

4.57 These documents do not contain the metrics or degree of scrutiny of the problems which arose, or the management process which was envisaged by the Post Office Account Customer Service Problem Management Procedure. An example of the level of scrutiny contained within these reports is the way that the Branch Outreach problem is described (as mentioned above), where e.g. the numbers of affected branches, the time taken to identify and resolve the problem, and the

[207] SVMSDMPRO0025_5.doc, *Post Office Account Customer Service Problem Management Procedure*, 12 July 2016 {POL-0146787}

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prospect of there being affected branches without resolution, is not identified or explained.

4.58 Paragraph 67 refers to the "Problem Review Tracker". This document was only provided to me on the 11 January 2019 so I have not yet had an opportunity to consider it in full. However, I do refer to specific problems reviewed in the tracker at 5.144, 5.177 and 5.281 below.

4.59 Paragraph 68 refers to the Major Account Control team (MAC), and a related process "Flow for Incident Life Cycle". These are very recent documents, dated November 2018 and August 2018 (they were not disclosed prior to Post Office's responsive witness statements), and it is not clear to me why these processes were introduced or what changes these documents introduced.

Tracy Jane Wendy Mather

Credence

4.60 At paragraphs 9 to 17 of Ms Mather's witness statement[208] she deals with her experience as an end user of Credence. She states at paragraph 14 that she has never heard of a bug in Credence in her time at Post Office - I explain below at 5.54 and 5.131 how Credence is used by Post Office to attempt to validate branch accounts but contains insufficient audit data for that purpose.

4.61 At paragraph 15 Ms Mather states:

> *"Looking at the Helen Rose report referred to in paragraph 5.49 of Mr Coyne's report, Post Office was able to use Credence to identify that a Subpostmaster had reversed a transaction but had also taken £76.09 payment from the customer. In reversing the transaction, the Subpostmaster had effectively removed the payment to British Telecomm, [sic] making the bill unpaid."*

[208] {Witness Statement of Trace Jane Wendy Mather, 16 November 2018}

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4.62 Firstly, the comments from Gareth Jenkins within the Helen Rose report,[209] convey that it was a system reversal, not a Subpostmaster initiated reversal. The feedback further states:

> *"It isn't clear what failed, but if it was a comms error, then the system would have printed a disconnected session receipt and the Clerk should have given the customer £80 and told him his Bill was unpaid. The fact that there is no indication of such a receipt in the events table suggests the counter may have been rebooted and so perhaps may have crashed in which case the clerk may not have been told exactly what to do."*

4.63 Therefore, the contemporaneous evidence is consistent with the determination that Horizon initiated the reversal, NOT the Subpostmaster. In my first report I had explained (at paragraph 4.61) that the Subpostmaster had not reversed the transaction, this had been a reversal generated by the system as part of recovery. Credence data appeared to show (or was interpreted as) being a reversal initiated by the Subpostmaster. This difference of position arose from Post Office looking at Credence data and Gareth Jenkins of Fujitsu looking at audit data and system logs. This demonstrates two positions:

a. Credence data, most commonly used by Post Office for their investigations, is either wrong or does not provide sufficient information to complete the full picture; and

b. It was only after the Subpostmaster involved an external forensic accountant that the Audit data was requested.

4.64 The conclusion of the Rose report itself does suggest the possibility of losses occurring as a result of this issue and Subpostmasters being considered liable for a loss that ultimately arose from a Horizon initiated event. The report states that a change should be made to the system to make system created reversals clearly identifiable to both Fujitsu and Credence.[210]

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[209] comments from Gareth Jenkins within the Helen Rose report
[210] Horizon data Lepton SPSO 191320 CONFIDENTIAL.DOCX, *Horizon data - Lepton SPSO 191320, 12 June 2013* {POL-0221677}

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ARQ Requests

4.65 Ms Mather states at paragraph 18:

> *"I understand that Mr Coyne has alleged that Post Office staff were deterred from making ARQ requests because of fees or penalties."*

4.66 Ms Tracy Mather does not reference a particular paragraph of my first report, I do not believe this is stated at any point within it.

4.67 In her statement Ms Mather references the number of ARQ requests per year. If it is correct that the contractual limit of 720 per year has never been exceeded except for this litigation, then in my view Post Office is not utilising the audit data sufficiently and certainly is not checking the audit data prior to issuing Transaction Corrections.

4.68 In 2011/2012 using the figure that Dr Worden produces at his Table 9.3 (section 9.6, page 208) there were 107,583 Transaction Corrections but only a fraction[211] of these were validated by the audit data. This is consistent with Dr Worden's position at his paragraph 1086 where he states:

> *"When Post Office is investigating anomalies reported by Subpostmasters they use Credence and their other management systems in the first instance – but, when they need to confirm the transactions handled in a branch, they can also ask Fujitsu to retrieve the corresponding data from audit." [[See Horizon Issue 8]]'*[212]

Angela Margaret Van Den Bogerd

4.69 Mrs Van Den Bogerd has provided a witness statement[213] commenting on individual cases and various disparate factual matters, which I do not attempt to comment on in detail here. I note the following discrete points:

[211] Less than 0.67% of the total Transaction Corrections could have been investigated with Full Audit if less than 720 ARQs were requested by POL
[212] {Witness Statement of Andy Dunks, 16 November 2018}
[213] {Second Witness Statement of Angela Margaret Van Den Bogerd, 16 November 2018}

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Phantom Transactions

4.70 At paragraph 13 and the further discussion of potential "The Phantom Transaction" in relation to Mr Singh (paragraphs 35 to 50). I have seen evidence of phantom sales recorded in the disclosed documents. PEAKs PC0065021[214] and PC0052025.[215] (documented in further detail at Section 3, 'Phantom Transactions (Horizon Issue 4)' above) refer to phantom transactions in branches, the former which was observed by an engineer on site at the branch and the latter which refers to discrepancy arising from them.

Transactions not associated with a Subpostamster's ID

4.71 At paragraph 18.4 Mrs Van Den Bogerd refers to transactions inserted by SSC as being "*clearly identifiable in the audit trail as having been inserted by SSC*". I disagree that transactions inserted by SSC would have been clearly identifiable by a Subpostmaster or other person inspecting the Subpostmaster's accounts. Mr Parker in his second witness statement says:

> "Transactions injected into a counter would appear on the transaction logs availa*ble* on Horizon as *if* it had been carried out by the user that was logged into the counter at the time…"

4.72 Even if the transaction had a counter position over 32 (because it had been inserted at the correspondence server (as stated by Mr Godeseth in his first witness statement), finding this would require the Subpostmaster/inspector of the accounts to review the relevant record where this is shown, to know what time/date such an activity occurred or if this had occurred at all, and to know the significance of the counter position. If the transaction had been inserted at the counter, appearing at the normal branch counter position, this would be very difficult for a Subpostmaster to find without specific, precise knowledge of what had been done and when. Finding this would require the action and process

[214] PEAK PC0065021, 17 April 2001 {POL-0440162}
[215] PEAK PC0052025, 9 August 2000 {POL-0227064}

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of dispute/investigation to be conducted and ultimately likely that the audit file would need to be consulted for this precise period to find what had happened.

Foreign Currency Transactions

4.73 At paragraph 19 Mrs Van Den Bogerd refers to foreign currency transactions, I have located evidence within the PEAKS that Horizon has suffered from bug/errors and defects causing Bureau discrepancies. These appear in this report starting at 3.140 above.

Further Technical Issues

4.74 Regarding the various references to the recovery process in relation to Mr Singh (paragraph 53), Mr Tank (paragraph 78), Mrs Burke (paragraphs 103 to 110) and Mrs Stubbs (paragraphs 118 to 119) it is apparent that several Subpostmasters had problems following connectivity issues and also following the recovery process described by Mrs Van Den Bogerd. Incidents in relation to recovery and its failed procedure are documented above at Section 3 ('Recovery Issues' and 'Recovery Failures').

4.75 I note that in relation to the Transaction Acknowledgement process for lottery introduced after 2012, Mrs Van Den Bogerd describes a data entry error by Post Office affecting Mr Latif which caused the stock of scratch cards to decrease rather than increase (paragraph 98). This example illustrates the potential for errors in branch accounts to be introduced by the Transaction Acknowledgement process. The same potential is evident for Transaction Corrections as the two processes are similar in operation and impact. Mrs Van Den Bogerd says that the Subpostmaster could have noticed that the Transaction Acknowledgments were not for a positive number and could have challenged them at that point, but it is not clear to me how obvious it would have been to the Subpostmaster that the Transaction Acknowledgement was incorrect, or what the dispute process was in relation to a Transaction Acknowledgement.

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4.76 I am not clear on what the process was for disputing any Transaction Acknowledgements, or how a dispute would have been investigated.

Failed Reversals

4.77 In relation to system reversals, Ms Angela Van Den Bogerd states:

> *"the concerns were based on the fact that reversals were not being shown on the particular data sets reviewed / reports typically run by Subpostmasters in branch on Horizon;*
>
> *transaction reversal data can be extracted from Horizon;*
>
> *the issue was therefore surrounding how the transaction reversals were displayed / accessible in branch and that there was no issue with Horizon itself.*
>
> *There is therefore no indication that the reversal was not notified to the Subpostmaster. When recovery was carried out a discontinued session receipt would have been printed and messages would have been clearly displayed to the user in branch during the recovery process."*

4.78 As dealt with above at paragraph 4.62, the excerpt from Gareth Jenkins within the Helen Rose report indicates that there was no evidence of the creation of a disconnected session receipt, unless further diagnosis (which I do not believe has been disclosed to me) has since been conducted and reviewed by Angela Van Den Bogerd. I have reported on what was diagnosed contemporaneously by Mr Jenkins, particularly:

> *"However what I was able to confirm from my look at live data a couple of weeks ago and is also held in the underlying raw logs is confirmation that the reversal was generated by the system (and not manually by the user). What might also be available in the underlying logs is whether or not the system was re-booted – I suspect it was but have no evidence one way or the other (and it isn't in what was extracted this time either)."*

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Stephen Paul Parker

Remote Access

4.79 In Mr Parker's witness statement dated 16 November 2018[216] at paragraph 19 Mr Parker states:

> *"The suggestion that Fujitsu edited or deleted transaction data is not correct. In Legacy Horizon it was not possible to delete or edit messages that had been committed to the message store."*

4.80 I have provided excerpts from PEAK records that illustrate edits and deletions of messagestore data within the PEAK analysis (Section 3, 'Evidence of Insertions/Deletions within Branch Accounts (Horizon Issue 10)' above).

4.81 It should be noted that PEAK PC0051855[217] (and others referenced further within this report from paragraph 3.266 onwards) document activities of deletions in relation to messagestore corruptions and issues. Whilst there is a redundant copy of the messagestore (also known as a mirror) that data could be re-instated from, I consider deletion of messagestore items to be deletions of messages (which held transactional data).

4.82 Mr Parker's statement here should also be considered with those of Mr Torstein Godeseth from his first statement at paragraph 35 where he states:

> *"Users with sufficient access permissions could inject additional messages (i.e. data) at the correspondence server"*

4.83 Much of Mr Parker's second witness statement is directed to factual matters relating to the first witness statement of Mr Richard Roll [218]and Fujitsu's ability to edit, delete or insert transactions or the possibility of bugs and errors affecting branch accounts during the Legacy Horizon period. Mr Roll has also served a second witness statement which deals

[216] {Witness Statement of Stephen Paul Parker, 16 November 2018}
[217] PEAK PC0051855, 5 August 2000 {POL-0226902}
[218] {Witness Statement of Richard Roll, 11 July 2016}

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with a number of these points. There are factual disagreements between Mr Parker and Mr Roll which I have taken into account when preparing this report. Two potentially important points in relation to remote access and Legacy Horizon are:

a. Mr Parker at paragraph 20.2 says that *"Some members of the SSC were (and some remain) able to insert transaction data. SSC access privilege gave the ability to inject transactions, but appropriate change controls were in place and no such insertion would have happened without complying with those controls."* I understand this to be a reference to the Operational Change Procedure, which required the creation of an "OCP". Post Office disclosed the OCPs on 25 January 2019 and, given the time constraints due to this proximity to my report submission date I have not considered them in this report, I will provide a further analysis at a later date in review of these.

b. Mr Roll in his second witness statement states at paragraph 20 that transactions were injected by SSC at the counter in such a way that they would appear on the transaction log as if they had been inserted within the branch. Additionally, it is claimed by Mr Roll that the method described in Mr Godeseth's first witness statement of inserting at the correspondence server (which would result in a counter position greater than 32 being shown) was not always used.

c. In the process of finalising this report, I have been shown a further witness statement from Mr Parker,[219] dated 29 January 2019, and my attention has been directed to paragraph 27 of that statement where Mr Parker in fact agrees with Mr Roll that this was possible and was done, but he says that he believes in the majority of cases injecting at the correspondence server was the default option. I have not otherwise had the opportunity to consider this statement from Mr Parker in detail, given its timing.

[219] {Second Witness Statement of Stephen Paul Parker, 16 January 2019}

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4.84 My findings in relation to remote access facilities available to Fujitsu/Post Office are detailed within Section 5 sub section 11 of this report) and are inconsistent with Mr Parker's statement in many ways, particularly, as I explain from paragraph 5.406, in relation to the capabilities surrounding insertion/injection, edit and deletion of transactions.

4.85 At paragraph 40 of Mr Parker's statement, he refers to call volumes in relation to response codes allocated to incidents (PEAKs) reported between January 2010 (I believe this to be a typographical error and the intended date to be 2001) and 31 December 2004. In doing this, I understand Mr Parker's intention to be to refute evidence by Mr Rolls (first witness statement) regarding *"fire fighting coding problems within the Horizon system."*

4.86 However, Mr Parker's figures denote that the largest percentage of calls were indeed relative to performing analysis in relation to known issues and workarounds, which in my opinion, seems more to support Mr Roll's evidence.

Payments and Receipts Mismatch

4.87 With regards to Mr Parker's paragraph 42.1 (of his first Witness Statement), in which he maintains there have been 735 live incidents referring to "Payments and Receipt mismatch", I have submitted a request for information (RFI) – See Annex A). Particularly, to identify the specific PEAKs relative to those, so that I may assess the types of errors diagnosed at the heart of the mismatch in question.

KELs and PEAKS

4.88 At paragraphs 60 to 61.10, Mr Parker describes the process for the creation of KELs and PEAKs. There are many limitations in the process relating to KELs as he has described it, for example:

a. no mandated rules for when a KEL should be created (paragraph 61.3);

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b. KEL not considered the definitive source of all information (paragraph 61.5);

c. dates given in KELs not precise (paragraph 61.6);

d. no fixed routine for the review of KELs (paragraph 61.7);

e. duplicated information is present in the KEL system (paragraph 61.8);

f. not all current KELs are still relevant (paragraph 61.9); and

g. KELs do not record all PEAKs they are relevant to, and no requirement to update a KEL when it is reused to provide guidance on a different incident (paragraph 61.10).

4.89 I would certainly agree with Mr Parker's observations with regards to KELs, in that they are difficult to navigate and KEL to defect relationships are difficult to understand also noting that PEAKs refer to the same issue but different KELs.

4.90 This, in my opinion, makes any investigation of a bug/error or defects full impact very difficult to assess. It is also one the reasons why I believe Dr Worden's statistical analysis in relation to the financial impact of bugs/errors and defects is ultimately flawed.

4.91 At paragraphs 62 to 62.9 Mr Parker describes an overview of the process of PEAKs. I have explained in the PEAK analysis section of my report above why, although PEAKs are generally a better source of information about a particular problem than KELs, there are limitations also with this system, including; because the content recorded within PEAKs is variable, the cloning of PEAKs is problematic and it appears that PEAKs are closed prior to resolution being reached or the Subpostmaster being informed of the outcome. In my opinion the way in which PEAKs are authored and controlled would limit the ability for Fujitsu to identify the full effect of a particular problem, which problems may be linked, and to carry out any trend analysis or audit of the problems or fixes.

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Paul Smith

4.92 Mr Smith's witness statement[220] provides information about volumes of disputed Transaction Correction and success rates. It is difficult to comment on this information because there are no source documents provided for the figures. Furthermore, Mr Smith does not explain either the process by which Post Office or the individual teams decide to issue a Transaction Correction, or the process by which disputes are resolved. The figures also do not give the value of the Transaction Corrections concerned.

4.93 At paragraphs 30 to 33, Mr Smith responds to paragraph 6.66 of my first report, where I stated that there was both a credit and a debit Transaction Correction for £810,000 for the same branch, indicating that the initial Transaction Correction may have been in error. I do not know the source of the further information provided by Mr Smith (no further documents are exhibited), so it is difficult to consider his explanation fully.

4.94 At paragraph 23 of Mr Smith's Witness Statement he explains that in the Financial Year 2016/17 Santander reported 19,491 "Errors" to Post Office. These errors are likely relevant to Horizon Issue 5 (how, if at all, does the Horizon system itself compare transaction data recorded by Horizon against transaction data from outside of it).

4.95 Mr Smith's analysis appears to show that these "Errors" lead to Transaction Corrections being issued to the Subpostmasters. When these Transaction Corrections were received 2,890 of them were disputed by the Subpostmasters and 2,222 (77%) of these disputes where upheld by Post Office.

4.96 This evidence suggests to me that:

a. Reconciliation data from Santander received into Horizon was incorrect.

[220] {Witness Statement of Paul Ian Michael Smith, 16 November 2018}

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b. Post Office issued Transaction Corrections to the Subpostmaster based on this incorrect Santander data before checking its own audit data.

c. Post Office only checked its own audit data once a dispute was raised by the Subpostmaster and therefore upheld the dispute.

4.97 It is not clear if Post Office, on discovering that a high percentage of the Santander data was incorrect, checked with other Subpostmasters' branch accounts which did not dispute the Transaction Corrections that they received to check if there were in fact further incorrect TCs which Subpostmasters had mistakenly accepted.

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5. Dr Worden's Expert Report

Introduction and Overview

5.1 In this section of my report, I respond to the expert report of Dr Worden, dealing with each Section and set of issues as grouped by him in the body of his report (which are slightly different to my own groupings within my first report).

5.2 In this introduction, I provide an overview below of some important points of agreement or disagreement between us, and where our approaches have differed.

Horizon Overview

5.3 Dr Worden's report covers business applications in Old Horizon and Horizon Online. In many respects, the factual matters identified by Dr Worden are non-contentious. I believe that Dr Worden and I have each attempted to set out the extensive Horizon estate and its business processes in a way which will assist the parties and the court. Where my understanding or opinion differs from Dr Worden on these issues, I have stated so and why, although the substance of our disagreements tends to arise in relation to the substantive Horizon issues so is addressed in later sections.

Robustness

5.4 Section 7 of Dr Worden's report addresses "robustness", dealing with issues 3, 4 and 6, and of which he says (at paragraph 48) that in his opinion he considers the most important to be Horizon Issue 3 (to what extent is Horizon 'robust' and extremely unlikely to be the cause of shortfalls in branches). Dr Worden then concludes Horizon was 'very robust' (paragraph 49.1), relying in particular on his 18 defined countermeasures.

5.5 I do not agree with Dr Worden's analysis of these countermeasures for reasons I explain in response to his section 6 below. But I also disagree that the most important focus of the enquiry should be by reference to

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"robustness". This term is relative. One system may be more or less robust than another, in different respects and with different consequences. It is not a well defined or accurate term to use as a benchmark. In my view issues 1 (possible or likely for bugs, errors and defects), 4 (potential for errors in data) and 6 (measures and controls) are practically the more important issues, because they are more concrete issues which can be assessed with more certainty.

5.6 In this respect I note that, Dr Worden states at paragraph 52 of his report that robustness involves ensuring harmful events do not have harmful consequences but, where they do, that they are kept within an acceptable limit. I don't know what Dr Worden would consider to be 'acceptable' on the facts of this case, where financial consequences may fall directly on an individual Subpostmaster, who has not been party to designing the system.

5.7 My experience of other commercial technology disputes is that often the Court is asked by the parties to determine if a computer system was of satisfactory quality, was fit for its intended purpose or if the parties exercised reasonable skill and care in the system's implementation. My experience of these disputes is that the parties are, often, the system vendor and purchaser.

5.8 In such disputes, there will often be a Service Level Agreement (SLA) setting out acceptable levels of defects, levels of system uptime or availability. Post Office may have such a document with Fujitsu or ATOS, but I do not perceive such agreements will have any relevance for this dispute.

5.9 It is a matter of fact that Post Office acknowledge that Horizon has had at least three bugs/errors and defects that did impact branch accounts, with a number of bugs/error and defects having been undetected for a number of years. A significant difference between Dr Worden and I is the extent to which we consider and assess the importance of other bugs/errors and defects which did or may have impacted branch accounts, in much the same ways as those acknowledged by Post Office.

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Whilst Dr Worden does not consider a number of other bugs within his report, in his assessment of robustness, his focus is very much on the three bugs originally acknowledged by Post Office in their Letter of Response, without really engaging with the impact of the other bugs which can be identified from the documents. Further, where Dr Worden does comment on the acknowledged Post Office bugs, his review is largely limited to what is said within the Responsive Witness Evidence served by Post Office, rather than the further work to identify related PEAKs, which has been an important part of my analysis.

5.10 Regarding those acknowledged by Post Office, Dr Worden's review is largely limited to the statements of others taken from Responsive Witness statements.

5.11 The Horizon system has been operational for at least 18 years and many aspects of Design, Build and Support have changed multiple times throughout its lifetime which makes providing any definitive opinion as to Horizon's state (or "Robustness") over any period a challenge.

5.12 As part of his assessment of robustness, Dr Worden claims that Horizon is a "'green fields development" "essentially unencumbered" by any IT legacy (paragraphs 57 and 336). However, I believe this is incorrect, as the initial project commenced in 1995 was initially going to be the benefits agency system, and only when this failed was the software re-purposed for the Post Office counters.

5.13 As I have said above. Dr Worden's position on robustness is in many respects based on countermeasures, which in turn are based largely on the designer's aspirations. He states that *"it is possible to classify the types of counter measures, to assess how each type was applied in the building of Horizon".* Whilst Dr Worden is correct, it is possible, some obvious limitations of this approach are as follows:

a. To have confidence in your opinions you would need to study the detailed designs of all the elements of Horizon, not just overviews.

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b. To have confidence that the detailed designs were followed during the build one would need to see quality assurance documents displaying that the designs aspirations where checked against the actual delivery.

c. The 19,842 release notes suggest that Horizon has changed frequently since its inception, without the detail of these release notes it would be impossible to know the impact of each change to the Horizon system throughout its lifetime.

d. The Horizon design documents that are available are either: -

i. At a high level, recording the broad design aspirations of the Horizon estate, with very little detail of how these design aspirations are implemented in each aspect of the horizon system (which is clearly required to rule out gaps in design), or;

ii. At a detailed level, recording how an element of the horizon system should be built, requiring the review of hundreds (if not thousands) of detailed designs to achieve confidence in one's coverage of the design aspirations into the specific elements to provide an opinion of Horizon as a whole.

e. Whatever point in time Dr Worden may select a design document to analyse, that design may only be valid for the time the design was implemented until the Horizon system was later changed;

f. The detail as to what changed within Horizon and when, largely unknown to us as technical expert witnesses. The detailed release notes documenting the 19,842 changes have not been provided (although I did request them on 12 July 2018)

5.14 With the above points in mind, I find it difficult to understand why Dr Worden would select the methodology that he has. Essentially, utilising broad design aspirations at a single point in time of Horizon's service lifetime.

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5.15 From this methodology, Dr Worden opines that Horizon would have at all practical times adhered to those designs and further where designs are flawed, the impact would have been caught by largely manual processes or that such failures are statistically immaterial. I disagree that this is an appropriate methodology.

5.16 Dr Worden says that he has used the risk assessment methodology contained within the Prince2 project management framework and applied it retrospectively (paragraphs 53 and 362 of his report). I am a certified Prince2 practitioner and will often apply its Risk Management principles in my IT delivery projects. Prince2 is good at assessing likely risks in discrete IT projects however I do not believe it is designed or appropriate to be used to retrospectively assess historic occurrences of bugs/errors and defects. In Prince2 practice, one would consider each of the possible risks or failure modes then attribute a measurement of how likely it would be that this risk could trigger. The very definition of a risk in project management, using Prince2 as a management framework is an uncertain event or condition that could impact the project. Looking back using this methodology is largely meaningless as the risk has either triggered or it has not. My approach in tackling the assessment of the extent of robustness was to look at occurrences of bugs/errors and defects actually recorded in the disclosed material in order to assess whether these errors were of significance to branch account impact. I would then traverse upward, in trying to understand the resolution of the bug/error or defect in order to assess its magnitude

Countermeasures

5.17 Section 6 of Dr Worden's report is titled "Architectural Topics Across Old Horizon and Horizon Online", but much of this section of his report is identifying and commenting on what he describes as "robustness countermeasures". Dr Worden provides a table at paragraph 60 of the three letter acronyms to explain what he has characterised s 18 countermeasures (he acknowledges that these acronyms are not common industry terms). I respond to each of the countermeasures in

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my response to Dr Worden's section 6 below. Fundamentally, where he and I differ is that I believe Dr Worden's countermeasures are basic elements of practical system design, and in many respects he is relying on design aspirations, rather than evidence of how bugs and errors in fact arose and were resolved by Post Office and Fujitsu.

5.18 Increasing the number, type or position of the countermeasures, may indeed improve the index of relative robustness at a point in time but Dr Worden and I agree, that no combination of design aspirations or "countermeasures" can provide an infallible Horizon (or any other system or service), but differ on the relative effectiveness of the countermeasures individually or together.

5.19 A number of the countermeasures identified by Dr Worden (Bug Finding and Correction, Manual Inspection of Data) are simply that a human (either Post Office, or Fujitsu or the Subpostmaster) would likely spot the impact of the error and therefore have it corrected. Whilst it is true, human checking is a form of system check, describing a Subpostmaster spotting an error as a countermeasure is stretching the definition of a countermeasure to its very limit. My starting point would be that where it has been necessary for a Subpostmaster to identify the problem, that means that the system is lacking robustness, and countermeasures within the system have failed. This "countermeasure" is also dependent on Subpostmasters' knowledge and understanding of Horizon and their accounts, which I expect will be variable between Subpostmasters depending on e.g. age and experience, or how and when the problem arises.

5.20 I have dealt with the "robustness countermeasures" as defined by Dr Worden in more detail at Sub Section 6 of this report.

KEL and PEAK analyses

5.21 As part of Dr Worden's analysis he has looked at a number of KELs, and he states that his analysis of the KELs "*implies to me that the countermeasures in Horizon worked well in the live use of Horizon*". I

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have set out my opinion and further observations in relation the weaknesses of utilising KELs alone to identify the full effect of bugs/errors and defects within Section 3 of this report 'Analysis of the PEAKs' and also identified these at Section 4 above, noting the limitations identified by Mr Stephen Paul Parker in his 16 November witness statement. I also disagree with Dr Worden's assessment of how well his countermeasures have worked, as I have explained.

5.22 KELs are by their very nature "known" error logs and are often created as a result of Fujitsu identifying multiple branches who experience the same bug/error or defect to enable support the detection of new occurrences of the same bug/error or defect.

5.23 In my opinion, Dr Worden does not give sufficient consideration to the information which is contained within the disclosed PEAKs, which for the reasons I have explained in section 3 above, are a very important source of information, nor does he realistically assess the prospect of bugs or errors arising which are not picked up, do not become the subject of a PEAK or KEL, but nonetheless cause discrepancies in branch

Financial Analyses

5.24 In contrast to Dr Worden, I have not performed any financial analysis on any Claimant data. Whilst I have focused on the extent it was possible or likely for bugs/errors or defects to cause discrepancies/shortfalls and undermine the reliability of Horizon to accurately process and record transactions, I have not been concerned with the value of such discrepancies/shortfalls other than to note that the discrepancy range across branches is often wide.

5.25 For completeness, I have reviewed Dr Worden's analysis in this regard, and I believe that his assumption that bugs affect all claimants equally is technically flawed. In summary, there is no technical basis to assume that bugs/errors or defects impact all users or branches equally either in frequency or quantum, in fact there is greater evidence available

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which shows that this assumption is incorrect in relation to the Horizon system.

Sections 3,4 & 5: Business Applications & Horizon

Section 3 – Horizon Online (2010-Present day)

5.26 Within Section 3 of his report, Dr Worden sets out the various business elements of Horizon. I believe that Dr Worden has adequately set out a summary of the high-level requirements pertaining to Horizon that provides additional information to the Business Scope I have set out in my first report at paragraphs 1.7 to 1.8 (Pages 1 to 2).

Section 4 – Legacy Horizon (1998 – 2010)

5.27 Within Section 4 of his report, Dr Worden simplifies the Horizon architecture for readability, which I am largely in agreement with, however, I wish to add or disagree with the below points:

5.28 Dr Worden references at paragraph 147 the nature of the Riposte functionality. He states:

> *"Riposte guaranteed that the same data would be available on the campuses – although if the underlying network was unreliable, it might take some time for Riposte to deliver this guarantee. Replication guaranteed that despite any network failures, no change to data made at a branch would be omitted at the campus or made more than once at the campus."*

5.29 Dr Worden, in my opinion over emphasises a 'Riposte guarantee'. He does not reference that it was indeed the replicative nature of Riposte that was often attributable to errors and defects that occurred in Horizon, see for example, PEAK PC0058435[221] referenced at paragraph 3.251 of this report.

[221] PEAK PC0058435, 15 November 2000 {POL-0232733}

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5.30 Further, later in Dr Worden's report Appendix D he provides an example where the nature of the bug/error or defect has arisen due to a deficiency within Riposte (KEL LKiang3014S[222]). This same KEL is also referenced in my first report at paragraph: 5.24 (Page 47).

Hardware and Software in Branches

5.31 With respect to hardware and software in branches, Dr Worden states at paragraph 151 of his report:

> *"... there were strong measures built into Old Horizon to ensure that hardware failures and communication failures could not adversely affect branch accounts."*

5.32 Dr Worden then references external literature that discusses theoretical availability, disaster recovery and data communication papers that have no specific relevance to Horizon or its own design documents that might set out the measures he refers to as "strong" and "built into". Whilst I do not disagree that Horizon did indeed have measures built in that were designed to ensure branch accounts were not adversely affected by communications and hardware failures, there is significant evidence of PEAKs within this report that set out that these measures did not always prevent such occurrences.

5.33 Further, at paragraph 156.3 of his report, Dr Worden sets out his view on transaction integrity. I disagree with his statement that:

> *"This transactional integrity was enforced by the Riposte infrastructure... Therefore, it was impossible in any event (such as hardware failure) for a **part-completed** set of updates to be recorded in the branch and then replicated to the back-office systems." [emphasis added]*

5.34 This was indeed a design aspiration for Horizon but in live operation it was not the case that transactions would *"...either succeed completely or would fail completely and have no impact"* as there is evidence within the PEAKs documented within this report that the recovery procedure (which was designed to provide the above integrity) was flawed.

[222] KEL LKiang3014S, 27November 2002 last updated 22 February 2002 {POL-0035520}

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Further, Dr Worden has acknowledged in his report the Balancing Transaction (BT) acknowledged by Post Office, where an equal but opposing transaction must be manually inserted due to double entry principle failures in Horizon occurring, therefore it cannot be said it is impossible.

5.35 Dr Worden further states (regarding recovery) that:

> *"In these cases, the user on the counter would be guided through a short set of recovery steps, to produce a consistent zero-sum result which reflected what had happened. It was, of course, possible for the user to make some mistake in these steps, which may have been unfamiliar. In these cases, the mistake would often be detected later by a reconciliation process, which would typically lead to a TC. This robustness measure was a correction of user errors (UEC)."*

5.36 Dr Worden points to the possibility of user mistake here yet he does not consider that there is evidence of recovery failing electronically (i.e. not a user mistake) or, the ambiguity of advice provided within the recovery steps that meant a Subpostmaster suffered a shortfall (See Section 3 of this report 'Recovery Issues' for an example PEAK or the Witness Statement of Angela Burke [223].

5.37 Additionally, such activities leading to a TC are ambiguous and the PEAKs I have analysed do not support the assertion that *"the mistake would often be detected later by the reconciliation process, which would typically lead to a TC. This robustness measure was a correction of user errors (UEC)."*

5.38 I am not aware that Post Office has set out what TCs were issued due to Horizon generated issues compared to those issued due to user error across the whole lifespan of Horizon. On this basis I do not understand where Dr Worden has gained his assumption from.

5.39 At paragraph 156.4 of his report Dr Worden comments on applications driven by reference data. Whilst I agree with his summary of the

[223] {Witness Statement of Angela Burke, 28 September 2018}

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benefits of reference data as opposed to hard coded values (of which though there were still some within the Horizon system), reference data changes were often the cause of discrepancies and disruptions within branch accounts as detailed in my first report and further supported by the PEAKs illustrated in Section 3 'Withdrawn Stock' of this report.

Back End Architecture

5.40 At paragraph 164.3 of his report, Dr Worden makes reference to the Management Information System (MIS) and it being a robustness countermeasure. From the Witness Statements of Torstein Godeseth[224] and Paul Ian Michael Smith[225] I understand Credence was utilised as one of Post Office's Management Information Systems. I have set out the limitations of utilising Credence as an error proof source of determining financial integrity in my first report at paragraphs 5.174 to 5.182 (Pages 88 to 90) and also, within this report in response to the inaccuracies within the Witness Statements of Tracy Jane Wendy Mather [226]and Angela Van Den Bogerd [227](which dispute a system reversal however ultimately refer to the fact that Credence did not detail sufficient information in respect of a disputed discrepancy).

5.41 Dr Worden continues to state that:

> *"Many pairs of eyes are inspecting the outputs of the MIS, in hundreds of different reports or spreadsheets".*

5.42 Dr Worden does not explain what he means by his phrase "Many pairs of eyes" and provides no analysis of the effectiveness of any such processes which he is intending to refer to. Within the PEAK analysis above there is reference to Fujitsu reminding Post Office that they should be looking more carefully at the daily reports being provided to them as bugs/errors and defects which should have been spotted in the reports, were missed by the Post Office (please refer to paragraph 3.191 earlier in this report). Further, any handling or manipulation of

[224] {Witness Statement of Torstein Olav Godeseth, 27 September 2018}
[225] {Witness Statement of Paul Ian Michael Smith, 16 November 2018}
[226] {Witness Statement of Trace Jane Wendy Mather, 16 November 2018}
[227] {Second Witness Statement of Angela Margaret Van Den Bogerd, 16 November 2018}

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spreadsheets may potentially be subject to manual error the likelihood of which increases the more they are handled.

5.43 Whilst I agree with Dr Worden's findings at paragraphs 166 and 167 in respect that reconciliation allows for the detection and correction of errors made at the counter (or elsewhere in the processing of data within further transmission and Horizon processing systems) where Dr Worden states: "*If there were any such software error, it would probably occur with such high frequency, and occur uniformly across all branches, giving rise to so many TC's, that Post Office would soon suspect a software error*". I fundamentally disagree, the documentary evidence does not support such a statement.

5.44 Whilst it is true that simple errors may impact Subpostmasters universally and these may be high frequency and occur uniformly, other bugs/errors and defects impact a few branches on multiple occasions. My analysis and review of the PEAKs has identified that many of the bugs/errors and defects recorded in Horizon were initially investigated because the impacted Subpostmaster who suspected a Horizon generated error made a support call. I do not believe that Post Office or Fujitsu compile any kind of statistics measuring whether Horizon generated errors were first initially identified and/or investigated by themselves, or the Fujitsu support team or Subpostmasters.

5.45 Dr Worden opines broadly at paragraph 169 of his report that Post Office would have checked that it was paying external clients the correct amounts of money for services conducted. There is contrary evidence in the witness statement of Mr Paul Smith that Santander, one of Post Office's external clients reported 19,491 "Errors" to Post Office in 2016/17.

5.46 2,222 of these "errors" Post Office initially claimed were due to Subpostmaster mistakes and therefore issued TCs, but when disputed, Post Office appeared to accept that these were not Subpostmaster mistakes. It is not clear where Post Office ultimately determined the

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mistake had been made, or if similar mistakes had been seen as TC dispute records only started to be kept from 2016.

5.47 Further, there are several instances where other external clients have raised issues over discrepancies and where such have been identified due to Horizon defects and issues, or misinterpretation of reports and values by Post Office staff. This is exampled in relation to KEL acha4745R[228] (referred to by Mr Parker in Appendix 2 of his witness statement [229]and Dr Worden within table D5 of Appendix D to his first report, in which client reconciliation reports were not being manually processed correctly.

Audit Information

5.48 At Paragraph 173 of his report. Dr Worden refers to the audit database. It is not the case that this is a record of "*any activity which can affect branch accounts*". Branch accounts can be affected by Fujitsu, Post Office and reconciliation data not entered at the counter but inbound from external clients.

5.49 The audit database is only a record of "*what was entered at the counter*"[230] with the exception of certain counter entries which are not committed to audit logs because of known failure conditions.[231]

5.50 After consideration of the above reduction in scope of what is recorded in the audit data, the record of when it is recorded is important. All of the data is written to the audit database once a day, in the early hours of the morning.

5.51 Whilst I have not found any evidence to suggest this occurs in Horizon it is technically possible that after the transaction is completed at the Branch counter the record could be tampered with prior to its commitment to the audit database some hours later. I believe that is

[228] KEL acha4745R, 30 July 2012 last updated 15 May 2017 {POL-0040845}
[229] {Witness Statement of Stephen Paul Parker, 16 November 2018}
[230] Outreach BLE Extract Findings v6 091215.pptx, *Branch Outreach Issue (Initial Findings)*, 10 December 2015 {POL-0220141}
[231] HorizonOnlineDataIntegrity_POL.doc, *Horizon Online Data Integrity for Post Office Ltd,* 2 April 2012 {POL-0021989}

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what Mr Richard Roll refers to in his second Witness statement at paragraph 18. I have seen this first hand in a banking investigation where banking staff had changed the sort code, account number and, on occasion, the monetary amount figure on transactions whilst transactions were in this "pre-committed" state between submission from the counter and processing (in this particular scenario to another branch) and later into the banks audit logs.

5.52 With regard to how useful the Audit database might be as a countermeasure, I do not disagree that it is possible for Fujitsu to review this audit database to enable a comparison to be made to other records in the event of a discrepancy, but largely the requirement for such would have to be initiated by Post Office or a Subposmaster raising a query and insisting that the full audit are examined. The First witness statement of Torstein Godseth (paragraph 31) shows that that on relatively few occasions was the full audit data requested from Fujitsu.

5.53 It is not clear at which point in the discrepancy investigation process any of the audit data is consulted, in consideration of the Dalmellington / Branch Outreach Issues dealt with in relation to the responsive witness statement of Mr Godeseth that details two specific Horizon defects had 112 occurrences which impacted 88 different branches since 2010. The findings were discovered by retrospective analysis of the historic audit data, suggesting that it was not spotted at the time. The same document records that whilst the audit data has been consulted there are years (2012, 2013 and 2014) where the audit data has been unable to assist and that "unknown outcomes" are noted for a number of specific branches.

5.54 It is also appears to me that (based upon my own investigations and from review of the responsive witness statement of Mr Paul Smith and the table of ARQ's actually requested from Fujitsu) that Post Office would not typically check the Audit database before raising a TC in relation to external client transactions, electing instead to rely on third party client reconciliation data brought in from outside of Horizon in the

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first instance, before performing their own analysis on Credence which previous evidence has illustrated, did not provide the full picture of the Horizon situation.

Auditability

5.55 I note that Dr Worden at section 4.4 paragraph 173 of his report states:

> *"The Horizon system includes an audit database (Technical Environment Description, 22 October 2002, {POL-0444096}), which is an accurate and immutable record of any activity which can affect the branch accounts."*

5.56 It is my opinion that this statement is incorrect. As is explained above, the audit database does not record ALL activities that can affect the branch accounts. Dr Worden does not consider the wider elements of Horizon processing. Not all elements of operations, or transaction modifications were recorded via the audit server. Where modification to transactions conducted by Fujitsu support teams were carried out, there becomes additional elements to the data that would not have been captured in the initial audit log sent to the audit server. i.e., where transaction correction tools have been used or direct SQL scripts executed on the branch account database. The auditability of any corrective amendments/operations or deletions once the daily transaction data was committed to the relevant database tables and the audit store would need to be identified elsewhere within the Horizon system.

5.57 Further, it should be noted that the audit log reflects branch counter data, therefore, if a counter error caused a transaction item to be duplicated prior to its submission to the database, then the audit log would contain a replication of this recording, it is not to say that the audit log could therefore not hold erroneous data in itself.

5.58 Utilising the same images as Dr Worden references at Figure 4.3 of his report[232] I illustrate the auditability constraints from the initial Branch

[232] Horizon Core Audit Process - v1 0.ppt, *Horizon Core Audit Process*, 30 January 2014 {POL-0218333}

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Database / Counter Audit File capture in Legacy and Online versions of Horizon, where complex processing systems handling the data AFTER the initial Audit File capture would not be reflected in the Counter Audit File.

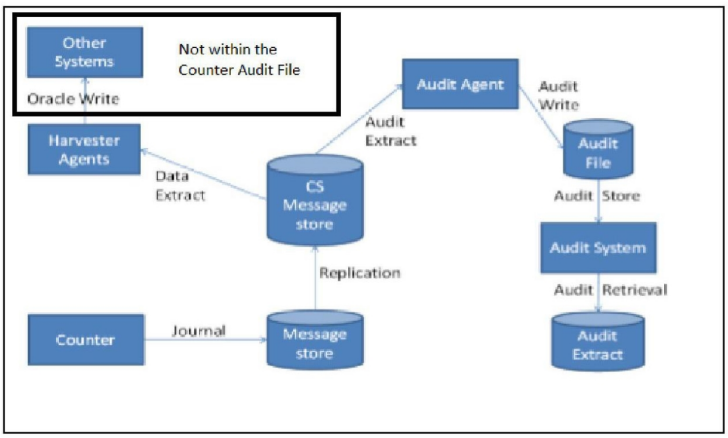


Figure 3 Legacy Horizon and further Auditable Activities

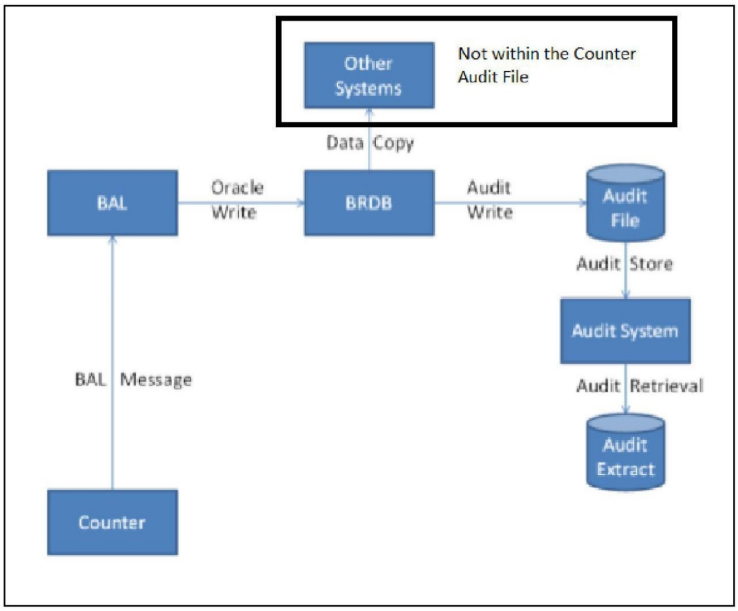


Figure 4 HNG-X and further Auditable Activities

5.59 At paragraph 178.3 to 179 Dr Worden states that the integrity measures with regards to recovery and audit information are well designed. As aforementioned in this report, design is not always an accurate

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representation of actual build or operation. Whilst from a design perspective the principles are theoretically sound, in operation, there is evidence that both (i) recovery and (ii) journal sequencing (*designed* to increment sequentially to ensure integrity of audit files) were susceptible to error as detailed in my first report at paragraph 18.8 Page 214 which references KEL MithyanthaJ1937S[233] (in relation to journal sequencing) documenting that a fix was not released for approximately six years.

5.60 Further evidence is documented within KEL Maxwellg5213L[234] and PEAKs PC0240992[235] and PC0253096[236] and in respect of recovery in Section 3 'Recovery Failures' of this report.

5.61 It should be noted that the above references are not fully exhaustive evidence of issues in relation to audit and recovery processes but a sample of instances in addition to the PEAK referenced within Section 3 'Recovery Issues' in which the recovery issue was identified as impacting branch accounts subsequently causing financial discrepancy.

Section 5 – Horizon Online (2010 – Present)

5.62 Within Section 5 of his report, Dr Worden simplifies the Horizon Online architecture for readability, which I am largely in agreement with and have done similarly in my first report from paragraph 4.35 (Page 26) onwards.

5.63 However, whereas Dr Worden focuses on the replaced elements of the branch software, my first report notes the reuse of legacy hardware (at paragraph 4.37; Page 27).

5.64 At Paragraph 202 Dr Worden refers to his defined countermeasures, I explain my summary position in relation to these above and in more detail below at 5.65.

[233] KEL MithyanthaJ1937S, 06 May 2010 last updated 09 August 2016 {POL- 0040508}
[234] KEL Maxwellg5213L, 30 June 2010 last updated 21 March 2011 {POL-0038402}
[235] PEAK PC0240992, 15 February 2015 {POL-0410189}
[236] PEAK PC0253096, 8 August 2016 {POL-0421502}

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Section 6: Countermeasures

5.65 Within Section 6 and Section 7 of his report Dr Worden refers to 18 countermeasures which he has described and relies upon as part of the robustness of Horizon. I respond to what Dr Worden says in relation to the individual countermeasures in this part of my report.

5.66 I have explained from paragraph 5.17 above, my views generally on Dr Worden's self-defined countermeasures in relation to Horizon. Namely that what Dr Worden describes are generally basic elements of practical system design, that these design aspirations in themselves do not show that Horizon was particularly "robust", and certainly not that it was free from error or prevented errors from going undetected in branch accounts.

5.67 Whilst Dr Worden acknowledges these acronyms are mostly not used in Industry, he has used them throughout his report which gives the impression they have a standard meaning and scope. However, as an example, "Later correction of user errors" ("UEC") is so very widely defined to include any check carried out by any person (e.g. a Subpostmaster's own checks when balancing, or a Post Office or Fujitsu automated or manual process at any time) that the use of an acronym to group together all of these different factual scenarios is in my view not very helpful.

5.68 I deal with each of the countermeasures individually from paragraph 5.69 below, but for convenience, I have set out a table which identifies each of Dr Worden's countermeasures and the explanation as provided by him, and recording:

a. in the third column, my views as to whether the countermeasure is an industry accepted acronym and whether what is described feature in general IT industry design; and

b. in the fourth column, identified the paragraphs of this report where I comment on the countermeasure including examples where I am

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aware of failures or limitations in respect of the operation of that countermeasure in Horizon.

Countermeasure as described by Dr Worden	**Explanation as provided by Dr Worden**	**Industry Accepted Acronym, or Typical standard feature in IT System Design?**	**General Observations or Evidence of failure within Horizon.**
Reliable and Redundant Hardware (RHW)	Redundancy guards against many types of hardware failure. Examples: RAID discs, disaster recovery sites. Software is designed in many ways to be robust against hardware failures	Acronym No, Standard, Yes.	Paragraph 5.152 to 5.108 of this report
Robust data communication and replication (ROC)	Communication systems and protocols are designed to recover from and protect against many kinds of communication failure. Examples: TCP/IP, Riposte	Acronym No, Standard, Yes.	Paragraph 5.28 onwards of this report.
Transactional Integrity and database recovery (TIN)	Database management systems provide many facilities so that numerous kinds of failure cannot leave the data in an inconsistent, unusable state, or lose any data that have been previously stored	Acronym No, Standard, Yes.	Paragraph 5.104 of this report
Defensive Programming (DEP)	Software is divided into small self-contained modules, which do not assume that other modules are correct, but defend themselves by checking	Acronym No, Standard, Yes.	Paragraph 5.112 of this report

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	their inputs and raising alerts early		
Generic, data driven software (DDS)	Different use cases for software often have much in common. Software is written generically to be able to handle the different cases, using reference data to define which use case is to be handled. Example: variations in Post Office client products handled by reference data.	Acronym No, Standard, Yes.	Paragraph 5.140 of this report
Secure kernel hardware and software (SEK)	When a large complex IT system is subject to threats, the design may include a small, well tested and secure kernel which is proof against those threats. Examples: secure kernels of operating systems, Horizon core audit process	Acronym - SEK typically applies to "Security Enforcement Kernel" and is intrinsic to system resources and technical components of a system. The Horizon Core Audit process is not an instance of a secure kernel. Standard - Yes.	Paragraph 5.135 of this report.
Redundant data storage and computing, with cross-checks (RDS)	In large IT systems and sets of systems, data are stored redundantly in several places, and routine operations check automatically that the different copies of the data remain consistent	Acronym No, Standard, Yes.	Paragraph 5.118 of this report

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Double-entry accounting (DEA)	Accounting systems operate by the principles of double entry book keeping, so that any change to the accounts must be made in a transaction whose summed effect on all accounts is zero. Transactions which do not obey this constraint are rejected.	Acronym No, Standard, Yes.	Paragraph 5.100 of this report
Early detection of user errors (DUE)	At the point of user input, as many checks as possible are made of the correctness of the input - so that the system will not accept erroneous input and may warn the user of errors.	Acronym No, Standard, Yes.	5.69 of this report.
Later correction of user errors (UEC)	In accounting systems, the system's version of reality is periodically checked against external versions of reality and corrected if wrong. Examples: cash balancing and rollover, reconciliation and TCs.	Acronym No, Standard, Yes.	5.89 of this report.
Manual workarounds (WOR)	Whenever any part of Horizon does not work as required, there may be potential to define and apply manual workarounds	Acronym No, Standard, No. Whilst manual work arounds are often required where system functionality is deficient, good industry practice determines that manual workarounds are usually the parts of the system that	Paragraph 5.170 of this report

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		need attention to avoid.	
Testing good practice (TGP)	The purpose of system testing is not to prove that the system is correct, but to prove that it is incorrect in any way possible. Examples: regression testing, user testing, testing edge cases.	Acronym No, Standard, Yes.	Paragraph 5.180 of this report
Manual Inspection of data (MID)	Any large business IT system is used by many people, who view its outputs and check them against each other for consistency, and against their own knowledge of the business. Subpostmasters, watching their branch accounts, were a key component of this.	Acronym No, Standard, Yes.	Paragraph 5.124 of this report
Bug Finding and Correction (BFC)	Whenever the system shows any anomalous behaviour, that is investigated, its causes found and corrected. Interim workarounds are deployed. Extra checks may be added to ensure that other similar threats are handled correctly.	Acronym No, Standard, Yes.	Paragraph 5.175 & 5.170
Large Scale IT architecture (ARC)	In any large IT estate, principles of IT architecture are used to achieve robustness - such as using a distributed network of loosely coupled sub-systems with clearly distinguished functions. The sub-systems	Acronym No, Standard, Yes.	5.145 of this report.

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	are built to well-defined standards with clear interfaces.		
Quality and Change Control (QCC)	Systems are more robust if quality is inherent. This is achieved by organising properly the people who build, maintain and operate the system, by managing them well and by governing what they do through rigorous but effective processes. A system will only continue to be robust if changes are controlled in a way that enhances quality without unnecessary administration	Acronym No, Standard, Yes.	5.195 of this report
Managing non-functional requirements (NFR)	Robustness is improved by paying close attention to non-functional requirements and the associated 'ilities' such as manageability, supportability, maintainability and adaptability	Acronym Yes (NFR = Non-Functional Requirements), Standard, Yes.	5.199 of this report.
Security (SEC)	Any system that could be easily subverted would not be robust. Horizon is secured mainly through 'separation of duties', user authentication, access control and audit.	Acronym Yes (SEC is often an abbreviation of Security), Standard, Yes.	Paragraph 5.154 & 5.154 of this report

5.69 As above, Dr Worden seeks to rely on the 18 countermeasures he has identified (in Section 2, 6 and 7 of his report) as evidence of the robustness built into Horizon. It is my view that these countermeasures

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represent a framework of principles and each rely on the presence and suitability of other core elements such as systems, processes and human interaction and only provide a view on robustness when all of these features are considered as a whole. For example, identifying a countermeasure "Bug Finding and Correction (BFC)" is itself not particularly informative.

5.70 The important questions are:

a. which bugs arose, how were they identified and how were they corrected?

b. what can we tell about the way the system worked and was managed from the way in which those bugs arose? and

c. how effective was the PEAK and KEL process for identifying trends, and also correcting and preventing repeats of events which had previously given rise to bugs?

5.71 Horizon has changed an immeasurable amount over its lifetime. Dr Worden has not considered at what appropriate points in time, certain countermeasures might have been in place or if such Countermeasures where correctly positioned. Instead Dr Worden applies them generically over its whole lifespan, and the entire estate, without consideration of the potential inadequacies in relation to each specific piece of architecture or configuration in place at its relevant time. For example, any countermeasures for detecting an issue with the branch database in relation to Legacy Horizon (where the database itself was in position in the branch) would be different to any countermeasure for detecting an issue with the branch database (BRDB) for Horizon Online, where it was one central database for all branches, situated in a data centre.

5.72 Dr Worden performs analysis in relation to the KELs at 7.5 within his report and opines on what countermeasures were at play in the identification of it, or which failed. In my opinion, the reasons why bugs/errors and defects occurred (as identified within the KELs) is because; the countermeasures referred to by Worden were not

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appropriately configured for that point in time and therefore did not apply, or were not positioned correctly within the Horizon system, or if they were, they were flawed in some respect.

5.73 In the main Dr Worden's countermeasures are little different than the design aspirations for a motor car, each of which are welcomed and go some way to reduce certain types of failures that lead to accidents. Motor cars now might have Adaptive Cruise Control, Emergency Braking, Blind spot Detection, Parking sensors, Lane assist, Electronic Stability control and such like. Each of which will seek to reduce certain types of failure. As such systems mature over time, typically from an iterative process of failure and learning, they will indeed reduce the types of accidents to which they were designed. They will not remove accidents because new and previously not considered situations arise over time, certainly as new features/functions are added.

5.74 With the knowledge of the motor cars "countermeasures" and the fact that some accidents have already occurred, it would be unsafe to declare that accidents would be unlikely.

5.75 I have responded below to each of the countermeasures introduced by Dr Worden in the order they appear at Section 6 of his report.

User Error Detection and Prevention (Dr Worden's "Detection of User Errors" ("DUE")

5.76 I would expect to see facilities for "Detection of User Errors" in any IT system. Such elements typically consist of the implementation of good design and tight configuration features to prevent either entry of erroneous data or warnings at the point of data entry.

5.77 I agree that a large number of measures were implemented within Horizon to prevent user error as stated by Dr Worden at paragraph 222 of his report, where he displays a generic list of interface design aspirations.

5.78 I agree with Dr Worden's paragraph 230 that *requirements* for detection of user errors would have been a priority for Post Office. But from my

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review of the disclosure the indications are that Post Office were primarily focussed on minimising any potential loss it might incur and Subpostmaster error was a secondary concern. The example of not implementing the double entry and cross check principle in 2008 (as referenced below with the Peter Laycock report paragraph 5.80 below) displays one such scenario.

5.79 As identified in my first report at paragraphs 5.129 to 5.132, pages 75 and 76 (in relation to errors arising from data entry), there are various KELs demonstrating counter level system controls that should prevent user input error that failed or did not exist in the system in the first place. Moreover, an external information security review document referenced in my previous report (paragraph 5.126, page 74) attributed the high level of transaction disputes due to a lack of source data integrity i.e. values entered once without validation. This failure in data validation in my opinion exacerbates the potential for human error. Dr Worden makes the case for the need for Horizon to have this countermeasure built into its user interface and I fully agree with this view. However, in my opinion and for the reasons outlined, I do not feel this was necessarily reflected in how Horizon had been configured. Moreover, the configuration of Horizon changed many times during its lifetime.

5.80 In 2008, a report and series of recommendations was provided by Peter Laycock.[237] This report specifically records the issue of "*mis-keying*" by Horizon users at branches. This is evidence that the particular countermeasure suggested by Dr Worden was clearly not in place or was not providing sufficient coverage at this point in time. The recommendation suggested in the report that the level of improvement could lead to an "*80% reduction in disputes and claims- saving £800k per annum*". The business benefits are said to be a "*Major improvement of point of transaction data integrity*". The recommendations appear to be simple, that the Subpostmaster is asked to retype the monetary

[237] Summary of IS Review.doc, *Summary of IS Review, 2008* {POL-0219516}

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value of cheques and that the two values should be equal. This appears to be reasonable and I can see how this would dramatically reduce mis-keying where the impact of the error could certainly be significant.

5.81 "Mis-Keyed Project – Feasibility Study" dated 15 May 2012[238], (as referred to in my first report at 5.123 and by Dr Worden at 226) – noted that *"mis-keyed Banking Deposit transactions amount to over 60 PER WEEK".* The same report further states, *"A very large value mis-keyed transaction will put the viability of a branch in doubt*". The 'HighLevel Business Requirement' (section 3.2.1 of that report) is documented as, *"to devise a way which will prevent counter colleagues in Branches from Mis-keying stock and financial transactions. Many counter colleagues are not aware of the ramifications of mis-keying transactions".*

5.82 The recommendations which were made in the above report display that the type of countermeasure suggested by Dr Worden was clearly not in place or was not providing sufficient coverage across all required aspects of the Horizon system by 2012.

5.83 Further, as these 2012 report recommendations are similar to the 2008 recommendations (paragraph 5.80 above) it does suggest that Post Office either a) did not implement the 2008 recommendations or b) did not implement them widely enough to provide the protection that Dr Worden suggests was in place.

5.84 Mr Smith's witness statement[239], at paragraphs 30-31 also supports my opinion. A Subpostmaster recorded a deposit of £900,000 (rather than £90,000) causing an £810,000 shortfall in his branch. In my opinion, this could have been prevented if the recommendations suggested in the 2008 report had been implemented by Post Office.

5.85 In paragraph 251 of his report Dr Worden concludes that *"Horizon incorporated accepted industry practices for detection of user errors, and in my opinion did so effectively."* I agree that in a number of *areas*

[238] Feasibility Study - Mis-Keyed v0 1.doc, *G-231 Mis-Keyed Project Feasibility Study*, 15 May 2012 {POL-0217750}
[239] Witness Statement of Paul Ian Michael Smith dated 16 November 2018

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Horizon did attempt the detection of user errors and did detect *some* user errors, but in other areas it clearly failed to detect them, even in specific areas where studies (as far back as 2008) had previously been conducted and where suggestions had been set out which additional areas of detection required attention but had not been implemented.

5.86 Dr Worden explains at 472 that requiring the user to enter the same data twice may not be a good choice. I agree, the design of such a validation should be triggered only when the monetary value exceed a certain amount (perhaps £1000.00) or if the monetary amount displays repeated digits (consistent with 'keyboard bounce' where the user adds a mistaken extra digit) so that validation would not be required for £123.45 but would be required for £1233.45 as it is possible the 3rd key bounced and was pressed twice. Such an improvement to the Horizon system would have reduced user error and continued to deliver an efficient process. This would have removed the error that was reported in Mr Smith's witness statement (at 5.84 above).

5.87 Dr Worden's opinion at 476, is that Horizon was *"well designed in respect of detecting user errors, and there is no sound basis for thinking it could easily have been improved."* I have not had sight of the testing carried out against the detailed designs, Dr Worden does not make it clear if he has. I have not had sight of the detailed user interface designs, I'm not sure that Dr Worden has, but if not, then the best that one could possibly say is, *"If the user input capabilities shown on the design are implemented in the Horizon build, provided they were designed appropriately, then a good detection of user errors would be seen".*

5.88 Whilst restrictive input in user interface design could be considered a robustness countermeasure through the use of menus and buttons as opposed to free text input (it is a common practical design element in most applications), I disagree with Dr Worden that this ensures "Detection of User Errors". Restrictive input certainly assists in reducing user errors but the facility of such (i.e., selecting an item from a menu

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as opposed to typing in a specific value) does not functionally **detect** possible error. There is no intuitive functionality built into Horizon that ensures a Subpostmaster selects the right menu or button or identifies and detects where they might not have done. This appears to be later agreed by Dr Worden at paragraph 231 of his report where he states *"There is in principle no way in which Horizon could detect or prevent many of these user errors."*

Dr Worden's - User Error Correction ("UEC")

5.89 At section 6.1.2 of his report, Dr Worden states his opinions on "User Error Correction" as a robustness countermeasure. Whilst I agree shortfalls and discrepancies have occurred through user error, I am unclear how Dr Worden can then state as he does at paragraph 232:

> *"As I have seen, there are probably several thousand such errors made at the counter everyday."*

5.90 Dr Worden does not explain where he might have "seen" thousands of such user errors occurring at the counter.

5.91 I note that at paragraph 236 of his report and in relation to the complexities of the Horizon recovery procedure, Dr Worden states that *"typically the error is trapped later in reconciliation with the external party and is corrected by a TC."*

5.92 I agree with Dr Worden that this process is less familiar for the users who will often be faced with a high-pressure situation, without a working Horizon system, and therefore user errors might occur.

5.93 However, the witness statement of Mrs Angela Burke[240] demonstrates that when the Horizon system is suffering wider problems, recovery processes can lead to losses being suffered by Subpostmasters which were incorrect and arose only because of a Horizon bug,error or defect

5.94 Errors appropriately diagnosed as "user error" should be singular in instance and would only be seen within the branch in which they occur.

[240] Witness Statement of Angela Burke, 28 September 2018, Paragraph: 20

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Large number of Subpostmasters (and their employees) could not all make the exact same error across many branches within Horizon.

5.95 Therefore, the risk in mis-diagnosing a wider Horizon system error as a singular user error has significant implications. It is extremely important to ensure investigations into wider system errors are adequately performed to rule out implications for branches.

5.96 Corrections following an earlier failure of Horizon should not be considered to be a user error correction countermeasure.

5.97 Corrections by Post Office to user errors are also part of the Transaction Correction process (as Dr Worden identifies at paragraph 477.1), so assessing Horizon robustness in this area requires consideration of Post Office back office process in which Transaction Corrections are issued, I do not believe that Dr Worden has considered the adequacy of such processes in his analysis.

5.98 I do not believe either expert has been provided a complete audit that identifies in each individual circumstance of error the investigation performed in relation to the discrepancy and the decision/conclusive evidence that a Transaction Correction ought to be issued and the evidence of the subsequent Transaction Correction being accepted by the branch. The whole process of correcting user errors is wholly reliant on:

a. The discrepancy being appropriately identified in the first instance;

b. The investigation of the discrepancy being wholly adequate and sufficient;

c. Communication channels between all investigating parties being completely aligned so that information is not lost between;

d. The Subpostmaster being satisfied that the evidence concludes an appropriate diagnosis and resolution.

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Intrinsic Error Prevention

5.99 The "Intrinsic Error Prevention" techniques discussed at Section 6.2 of Dr Worden's report are in my opinion, all common elements of standard large-scale IT system design. Design is often not fully reflective of operation, and whilst the robustness measures Dr Worden refers to did protect Horizon processing to a certain extent, he himself acknowledges failures of them in his KEL analysis (Appendix D of his report).

Double Entry Accounting ("DEA")

5.100 "Double Entry Accounting" is an industry standard incorporated in most if not all enterprise software packages. However, the implementation of double entry or its principle alone does not prevent errors or ensure robustness as a countermeasure entirely since it is largely reliant upon the person creating the accounting system ensuring the appropriate configurations to ensure adherence to double entry principles are applied correctly. Dr Worden acknowledges at paragraph 467 of his report (in reference to the Payments Mismatch bug) that not all operations in Horizon adhere to the double-entry constraint. Without understanding, in full, where within Horizon each of the specific operations covered by the Double Entry principles actually is, one cannot have confidence that this is an appropriate countermeasure. It is also likely (as with all such Dr Worden countermeasures) that the position has changed many times over the life of Horizon. One such example of these inconsistencies between the various aspects of double entry can be seen in a Fujitsu document "Correcting Accounts for 'lost' Discrepancies"[241] authored by Gareth Jenkins notes the following:

> *"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 Receipts and Payment mismatch is found on the Final balance (the User is only prompted when one is detected during Trial balance) The Local Suspense will have no knowledge of this specific Discrepancy"*

[241] Common Issues Documents G_9

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5.101 As acknowledged by Post Office in their letter of response,[242] it has previously had to sanction a balancing transaction in order to rectify failure of this countermeasure.

5.102 Further, in consideration that in legacy Horizon, all SSC users could use escalated privileges to carry out modifications there have been potentially many more fixes applied due to the failure of the double entry principle that Post Office may not even be aware of.

5.103 I have also identified further evidence of encountered one-sided transactions which I have documented within Section 3, *'Counter Replacement Causing One Sided Transactions'* and further within *'Evidence of Insertions/Deletions within Branch Accounts (Horizon Issue 10)'*, in which one sided transactions were written to accounts, a further example of a failure of double entry accounting.

Transactional Integrity and Recovery ("TIN")

5.104 At paragraphs 246 to 247 of his report Dr Worden provides an account of "Transactional Integrity and Recovery" which he describes as a core element of Horizon and therefore adding to a systems robustness by providing an effective robustness countermeasure. He states:

> *"Because transactional integrity is a fundamental facility built into all database management software…and it is necessary, for any relational database, to describe in its schema the integrity constraints which it must obey at all times, transactional integrity was applied to all of the many databases of financial information in the Horizon system - including the BRDB, the POL FS database, and many others (Technical Environment Description, 22 October 2002, {POL- 0444096}; Horizon Solution Architecture Outline, 7 April 2016, {POL-0444099}).*
>
> *This means that any compound package of updates, applied to any of these databases would have been applied as a single transaction or 'success unit' which would either completely succeed, or completely failed*

[242] {Letter of Response to Freeths, 28 July 2016 (Paragraph 5.16.3)}

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leaving no race. It would be impossible to leave any of these databases in an inconsistent state, not satisfying its integrity constraints"

5.105 Dr Worden's views as recorded above are expressed by reference to high level design documents but this does not mean that these design aspirations were always effectively implemented in practice. Database integrity requirements and validation rules are ultimately tailored and implemented in accordance with defined business process rules by the system designer and database administrator.

5.106 It appears that much of the transaction integrity is applied at Database Level, ensuring that database records are committed appropriately. Transactional integrity does not provide full coverage at the logic level within Horizon as is evidenced with certain transactions being classified as 'recoverable' and 'non-recoverable' when Horizon suffers from a system fault and tries to re-process or rollback transactions. Some of the transactions are inconsistent or incomplete and therefore careful action needs to be taken by the Subpostmaster to understand these transaction inconsistencies. As was evident in the witness statement of Mrs Burke, Horizon itself misrepresented the correct state of the transactions when recovery was invoked.

5.107 Whereas Dr Worden says (at paragraph 250 of his report) that he has seen evidence of the pervasive presence of transactional integrity in all Horizon subsystems he has examined, he gives no information as to which subsystems he is referring to here, or which examinations he has carried out. I note he does not acknowledge any of the instances of failures which are apparent in the documents, as I have identified above.

<u>Measures to Correct User Errors – Which also Cancel the Effects of Software Errors ("DUE" "UEC")</u>

5.108 At paragraphs 251 to 257 of his report, Dr Worden refers to the concept of "User Error Correction" enabling the facility of correcting many software errors. It should be noted that this would not apply to any bugs

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/errors and defects unbeknownst to Fujitsu or the Subposmaster. It is evident from the PEAK analysis that often bugs lay undetected for weeks, months or years. Where a Subpostmaster might have unduly "put the funds in" to balance a cash shortage (believing an error to be their mistake rather than Horizon) incidents that caused these discrepancies and bypassed alerts or were unnoticed events would not be detected as everything would effectively "balance" and therefore "User Error Correction" would not capture all software errors where they might necessarily be.

5.109 Further, in relation to the *"many software errors resembling user errors were also corrected"* Dr Worden does not evidence which software errors were resolved correct user errors. Dr Worden provides the view that a proactive approach to correcting user errors by Post Office/Fujistu is effectively the countermeasure here. However, the evidence illustrates to me (by review of the PEAKs) that it is more often than not, the Subpostmaster reporting the error in the first instance, which prompts investigation, and ultimately resolution of what is incidentally, fundamentally a software bug. Therefore, it is largely user dispute/investigation, that prompts this error correction. Where the error is not effectively known, no correction could occur. This is evident from the analysis of the "acknowledged" bugs within Section 3 where bugs, errors and/or defects were reported by a Subpostmaser, and retrospective analysis ultimately uncovered more incidents over varying years prior to the Subpostmaster raised incident that led to the actual full discovery.

5.110 Aside from the above limitations in respect of identifying software bugs through correction of user errors, I do not dispute that Horizon integrity measures and processes did exist and capture, identify and enable the rectification of many occurrences of bugs/errors and defects, whether due to user or software/hardware fault. However, in my opinion it is important to consider that these are not always effective, and it is difficult to quantify how many errors are not corrected when the system

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operates as it does, where Subpostmasters may have put the funds in to correct user or software errors which had not been identified as such.

Defensive Programming ("DEP")

5.111 Dr Worden identifies "Defensive Programming" as a modern countermeasure programming technique for checking and validating data sent between different modules to prevent and detect bugs and errors. I concur that this is an accepted typical modern industry aspiration for enterprise software packages, but this does not in itself eliminate or assist with the detection and prevention of all errors and bugs, and it is wholly reliant upon the adequate constraints being applied at the user interface of the application/platform.

5.112 At paragraph 262 Dr Worden references specific design documents of which he opines satisfies evidentially that Horizon was defensively programmed. The document[243] has a paragraph of defensive aspirations: *"Database applications should be designed and built defensively, so that they can handle any type of unexpected conditions in a controlled manner…"*. The statement is generic and aspirational but does not audit the actual Horizon systems built.

5.113 The second document referenced by Dr Worden in this paragraph[244] is the design overview for Horizon Online but it does not explicitly reference any "Defensive" aspirations in its programming.

5.114 The third document referenced by Dr Worden[245] is a further design overview for the next generation of Horizon Online ("HNG-A"), the document does not expressly reference any defensive programming but does include (at 7.1.1.2) an express warning that the Java programming languages defences would be ineffectual in certain "Code Injection" circumstances:

[243] TDARC001_4.8.doc, *Technical Environment Description*, 22 October 2002 {POL-0444096}
[244] ARCSOLARC0001.pdf, *Horizon Solution Architecture Outline*, 7 April 2016 {POL-0444099}
[245] ARCAPPARC0009_5.doc, *HNG-X Architecture - Counter Business Application*, 4 August 2017 {POL-0444098}

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"…there is still the possibility of code being compiled on another machine and be injected in the event of a counter being compromised…one has to assume that if the JAR files can be compromised, that the policy file can also be comprised (sic) making this defence ineffectual."

5.115 As the next generation Horizon Online (HNG-A) is built on the same technology as its predecessor (HNG-X) it is therefore likely that this risk of a lack of defence from "Code injection" was also apparent in all versions of Horizon Online, but perhaps was not discovered at the time of its design and therefore the earlier design documents do not have the same express warnings as the more recent ones.

5.116 After seeing the express warning about the risks of a lack of defence and the lack of any real detail in the design or evidence of where this defensive programming is actually used within Horizon I am surprised that Dr Worden is satisfied that Horizon is actually defensively programmed.

5.117 Dr Worden explains at 443 and 444 of his report that some of the KELs show that Defensive programming was used. The opposite position to this, which must be considered is where defensive programming was not used, the bug/error or defect likely slipped though undetected and was not caught.

<u>Redundant Storage of Data ("RDS" "MID")</u>

5.118 Dr Worden describes general principles of "Redundant Storage of Data" at paragraphs 263 to 266 of his report, and the fact that there were multiple redundant copies of the same data within the architecture of Horizon. I agree that redundant copies of data are a robustness countermeasure and this provides a means of integrity checking data at various points in the system.

5.119 However, for the countermeasure to be fully effective, it requires all of the varying data sets consulted to contain complete and fully accurate data. I have previously stated my opinions in respect of errors potentially introduced from consulting only a subset of the available

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data when dealing with branch discrepancies in relation to the Helen Rose report at paragraphs 5.174 to 5.181 (Pages 88 to 90) of my first report, and the limitations of the Credence Management Information System.

5.120 Post Office, when investigating issues reported by Subpostmasters have a number of different systems in which they can access data. The systems I have identified as most regularly consulted are: Credence, HORice and POLSAP. These systems have different data (a subset) from those which Fujitsu has access to.

5.121 Fujitsu has access to the data that Post Office does, but with additional data at a lower level. This will include (but is not limited to) system audit logs, database monitoring information, user access logs, PEAKs and KEL databases, plus the ability to investigate and identify the possible impact of work that they have performed whilst supporting the Horizon systems. Post Office only has access to this data if it expressly requests it from Fujitsu, which it appears it rarely does according to Mr Godeseth's witness statement (see paragraph 5.127 above).

5.122 It is only when all data is considered (not the subset accessible by Post Office) that redundant data storage can truly be of the value Dr Worden suggests.

5.123 Dr Worden explains at paragraph 456 of his report that "KELs provide many examples of where RDS was used", KELs are Fujitsu documents, not Post Office documents. Consequently, Post Office would not typically view KELs, and therefore it is not a countermeasure that would apply for them in understanding reported issues. Further, KELs typically do not reference the findings from correlations of redundant data storage inspection, so in my opinion, do not evidence such a countermeasure.

5.124 Dr Worden refers to "Manual Inspection of Data" (paragraph 463) as being:

> *"……one of the most important countermeasures in Horizon."*

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Whilst I agree in principle that the scrutiny of data has an important role to play in any commercial IT system; it is my opinion that its importance as a countermeasure is overstated in Dr Worden's report.

5.125 It assumes that the person scrutinising the data is able to identify the correct source of data to be relied upon, in order to rule out what may or may not be erroneous in the first instance. Additionally, its utility as a countermeasure is heavily reliant upon the person scrutinising the data already knowing there is an issue that requires data inspection. Finally, it relies upon a human element/input which is difficult to measure i.e. does that person have sufficient skills or knowledge to identify issues when scrutinising data and is also prone to a degree of mistakes.

5.126 I have also commented earlier in this report (Paragraph 5.40) on the limitations of utilising some of Post Office's Management Information Systems as an error proof source of determining financial integrity.

The Audit System ("SEK" "RDS")

5.127 Auditability limitations have previously been dealt with within this report from paragraph 5.55. What is fundamental to measuring whether this was an effective robustness countermeasure is not whether audit facilities existed, but, how effectively they operated, and how often they were consulted to investigate and assess the events of bugs/errors and defects in measurement of Horizon's robustness.

5.128 At paragraph 270, Dr Worden states that the evidence he has seen in the KELs indicates that the use of the audit database was a backstop, and rarely used – because other comparisons of data were usually enough to diagnose the problem. He also says at paragraph 452 that the comparative lack of KELs using the audit system provides confirmatory evidence that the other countermeasures were effective

5.129 I would therefore say it is possible that in some cases, consulting data other than the ARQ resulted in problems being diagnosed / resolved

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accurately. I don't think it is possible to say however that because the ARQ was not consulted it did not need to be.

5.130 In the first Witness Statement of Mr Godeseth[246] dated 29 September 2018, he explains (at paragraph 31) how rarely used it actually was. He displays how many requests for data from the audit store Post Office has made of Fujitsu since 2014 (which I believe is the first time that these records were kept. Therefore, from Horizon inception, to 2014, it is not possible to identify how often Post Office made such requests.

Year	**Number of ARQ months requested. (the numbers represent 1 months' worth of data per branch), i.e., if Post Office request Blackpool data for June and July 2016 that would be two ARQ Months.**
2014/15	729
2015/16	103
2016/17	323
2017/18	364

5.131 At paragraph 32 he explains that he is not aware of any instances where data retrieved from the Audit Store differs from other sources. Whilst that may be correct, it is the case that the data available to Post Office via Credence and other management information systems (including basic ARQ logs) is only a subset of the complete data set and may indicate a different outcome to that when viewing the more complete audit data only available to Fujitsu. This is set out in the Helen Rose report.[247]

5.132 In that report, the author explains that audit data available to Post Office appeared to show (or was interpreted as) being a reversal

[246] {Witness Statement of Torstein Olav Godeseth, 27 September 2018}
[247] Horizon data Lepton SPSO 191320 CONFIDENTIAL.DOCX, *Horizon data - Lepton SPSO 191320*, 12 June 2013 {POL-0221677}

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initiated by the Subpostmaster. This position changed after Post Office requested that Gareth Jenkins of Fujitsu should look at audit data and system logs, which he did and explained that he could see that the reversal was in fact conducted by the Horizon system, not the Subpostmaster. This demonstrates two positions, firstly that the data most commonly used by Post Office for their investigations is either wrong or does not provide sufficient information to complete the full picture. Secondly, it was only after the Subpostmaster sought the advice of a forensic accountant that the full audit data was requested, indicating that disputes had to be upheld by Subpostmasters to get to the correct identification and resolution.

5.133 The conclusion of the report suggests the possibility of losses occurring because of such issues, and that Subpostmasters might be considered liable for a loss that ultimately arose from a Horizon generated event.

5.134 For any part of the audit system to be of proper use, the position presented must be consistent, if the position differs depending upon which audit file you view, then the audit process is unsuitable.

5.135 Dr Worden includes "Secure Kernel Hardware and Software" as a countermeasure and references this in various points in his report.

5.136 The term 'Secure Kernel' in industry, is typically associated with software/hardware components that enforce basic security procedures for controlling access to system resources. 'Kernels' implement access provisions based on resource/functional capacity. They do not comprise (as suggested in Dr Worden's use of the phrase or acronym) an entire security policy or safe guard against a lack of process control in respect of access rights.

5.137 Dr Worden states at paragraph 452:

> *"Because the core audit system was a backstop countermeasure, which was only used when other ways of investigating any anomaly had not given an unambiguous result, it was only rarely used, and the KELs provide little evidence of its use. This comparative lack of KELs using the*

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audit system provides confirmatory evidence that the other countermeasures were effective"

5.138 It is important to note that there are several limitations to the above statement. Namely:

a. The KELs alone cannot be relied upon for a complete view of the complete investigation of a bug/error or defect nor for drawing inference as to how often audit data was requested as that was not their purpose;

b. PEAK records illustrate that consultation of ARQ data was commented on internally by Fujitsu support staff in some cases, although it should be further noted that it was not always provided and in some cases it was either:

i. lengthy in the time taken to provide it for analysis (delay cited as due to prosecution evidence backlogs, (See PC0070364[248] and PC0073492[249]);

ii. not available or not documented as being provided or findings concluded and the PEAK ticket subsequently closed (PC0220532[250] above, PC0228049,[251] PC0198838[252] and PC0120511[253]); or

iii. did not contain fully accurate data (PC0211833[254] and PC0206932[255]).

c. Post Office themselves would not consult KELs or PEAKS when taking decisions on Subpostmaster branch accounts.

5.139 Auditability has been dealt with further in this report (see Paragraph commencing 5.55).

[248] PEAK PC0070364, 2 October 2001 {POL-0440173}
[249] PEAK PC0073492, 29 January 2002 {POL-0440178}
[250] PEAK PC0220532, 5 September 2012 {POL-0441342}
[251] PEAK PC0228049, 30 August 2013 {POL-0397525}
[252] PEAK PC0198838, 11 May 2010 {POL-0368687}
[253] PEAK PC0120511, 5 May 2005 {POL-0440395}
[254] PEAK PC0211833, 5 August 2011 {POL-0441214}
[255] PEAK PC0206932, 6 December 2010 {POL-0376676}

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Data Driven Software ("DDS")

5.140 Whilst I agree with the general principles behind the concept of "Data Driven Software" that Dr Worden discusses at paragraph 272 of his report, data driven software contains many disadvantages as well as advantages in the respect of how it is applied within Horizon.

5.141 Reference Data is critical for the correct operation of a large variety of elements within the Horizon architecture as outlined at paragraphs 4.19 to 4.20 of my first report. Whilst Dr Worden implies that the implementation of data driven software is in itself an effective robustness countermeasure, the management of the essential reference data has proved to be the cause of bugs/errors and defects within Horizon. As commented on by Mr Parker in his second Witness Statement (paragraphs 11 and 12).[256]

5.142 An inherent limitation of data driven software is that it is reliant upon the reference data itself being correct and controls and procedures for ensuring it is effectively managed and maintained must be stringently controlled. Often, reference data, and the fact that it can be so frequently manipulated, enhances more risk within a system due to its frequency of change.

5.143 As I identified in my first report at paragraphs (4.21, page 24 and 5.33 to 5.34, page 50) errors with Reference Data could and did impact on branch accounts.

5.144 Dr Worden at paragraph 448 of his report recognises that *"KELs show a significant number of faults arising from faulty reference data"*, but downplays the possibility of them affecting branch accounts, and suggests they were always easy to diagnose and fix, concluding overall that "*the countermeasure DDS has been highly effective*". I agree, they typically are easier to fix as only partial data needs to be changed but the initial identification and impact of such faults on the operation of Horizon, including the possible impact on branch accounts is no different

[256] {Second Witness Statement of Stephen Paul Parker, 29 January 2019}

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from standard software. An example from the 'Atos / Fujitsu Problem Review Tracker'[257] {POL-0449089} explains an issue first identified in September 2010 was brought to Post Offices attention on 18th December 2012 where it was identified as being a Reference Data bug. Post Office closed the call on 27th November 2013 over three years later. It is not clear from the tracker if this impacted branch accounts.

Software Coding Standards and IT Architecture ("ARC")

5.145 Dr Worden in his report relies on software coding standards during the development and testing of Horizon (see 6.2.8 Software Coding Standards (ARC), paragraph: 278 - 281) as a countermeasure.

5.146 The software code of Horizon has not been provided to the Experts, so it is not clear to me how Dr Worden would know if it is coded to any standard. I perceive that Dr Worden is basing his opinion on the design aspirations for Horizon.

5.147 Dr Worden makes a generalised comment at Paragraph: 281 that *"Informally, compared with many other large IT estates I have seen, Horizon appears to have been a tightly-run ship."* It is not clear what information Dr Worden is basing this opinion on.

5.148 Whilst I do acknowledge the importance of system architecture in the design of any IT system it is my opinion that this cannot and does not in itself prevent the occurrence of bugs/errors & defects and issues in any IT system and is a design aspiration with no guarantee of an infallible system.

Reconciliation, Transaction Corrections and Acknowledgements

5.149 Dr Worden deals with reconciliation, transaction corrections (TC) and acknowledgements (TA) at paragraphs 282 to 294 of his report and he concludes that they are *"a very important part of the robustness countermeasures built into Horizon, particularly for UEC"*. I have

[257] Weekly Update 26062018 - FJ.XLSX, Atos / Fujitsu Problem Review Tracker, 26 June 2018 {POL-0449089}

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addressed user error corrections (Dr Worden's "UEC") at paragraph 5.89 above**Error! Reference source not found.**, and deal more fully with reconciliation and related topics in sub section 9 below.

5.150 In my opinion consideration of the robustness of the Transaction Correction (TC) process as a countermeasure to correct user error requires consideration of how mismatched data is investigated and corrected before a TC is issued, the information available to a Subpostmaster before accepting a TC, and the way in which disputes can be raised and are resolved. The fact of there being a TC process is not in itself evidence that it performs as a robust countermeasure against error. I have seen evidence indicating that the TC process is itself prone to error, which introduces the risk that rather than acting as a countermeasure, the process of issuing TCs could itself introduce errors into branch accounts. The process of investigation before issuing a TC and when a dispute is raised is not made clear in the Defendant's witness evidence and I do not know how extensive or thorough this process has been. It is also the case that the TC investigation is completed by Post Office on the subset of data available to it and would exclude the audit data available to Fujitsu. I have commented on this further in section 9.

5.151 Similarly, the robustness of the TA process requires consideration of the processes by which TAs are issued, the information available to a Subpostmaster before accepting a TA, and the way in which disputes can be raised and resolved. Again, I do not have full information about the internal Post Office processes to know how carefully these steps are managed to avoid the risk of Subpostmasters being incorrectly issued with TAs, or disputes about TAs being resolved incorrectly.

Hardware and Software Resilience ("RHW")

5.152 Dr Worden defines "Reliable and Redundant Hardware" as a robustness countermeasure against a fault or malfunction which causes an entire system to stop operating. He relies generally on hardware, software,

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infrastructure and networks, in addition to qualities of recovery from failure, transactional integrity and security. The topics which Dr Worden deals with here are highly generalised, and I have addressed them elsewhere in my first report or within this report.

5.153 I do agree that generally, the Horizon hardware appears to be adequate (although Subpostmasters have reported many problems with branch counter equipment). However, I do not believe the software to be 'resilient'. There are thousands of references to bugs and defects in the software code and reference data and high numbers of release notes, whilst the detail has not yet been disclosed it is suggested that 19,842 changes have been required through Horizon's lifetime – some of which will be to include new functionality, others of which will be to fix bugs/errors and defects (see Annex A).

Security and User Authentications ("SEC")

5.154 Dr Worden has identified a range of design principles and policies in relation to security, and identifies general points about the importance of user authentication, data integrity and audit, which in principle I agree are important aspects of the security of a system.

5.155 However, Dr Worden has not considered in this section the adverse documentation which indicates that these controls were not well implemented and there were risks in the way the system was operated.

5.156 I identified in my first report at paragraphs 5.179 to 5.181 (page 89 to 90) and 9.65 to 9.67 (page 149) that in 2011 Ernst & Young had identified in a letter to Post Office[258] the lack of internal control with third-party providers adding to the risk of unauthorised and inappropriate changes being deployed. I note that Dr Worden mentions this letter in his report (at paragraph 503), where he says that he has not seen evidence of whether Fujitsu and Post Office implemented the corrective actions which were recommended.

[258] POL Management Letter FINAL.docx, *Management letter for the year ended 27 March 2011*, August 2011 {POL-0219218}

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5.157 At section 9 of my first report, in respect of remote access, I identified that whilst this is an important tool in supporting large enterprise systems it also represents a potential security risk and weakness with any type of security set up. I deal with remote access and the relative absence of controls in relation to remote access further in subsection 11 below.

5.158 I also explain the auditability limitations earlier in my report (see paragraph commencing 5.55) to demonstrate that the audit database does NOT record all activities and therefore from a security perspective cannot be fully relied on to provide a complete picture when auditing transactions.

5.159 And finally, Post Office did not make good use of the audit data logs, either for Subpostmaster activity, neither did they enforce or seek to validate the actions of its contractors Fujitsu, Atos or others.

Development and Testing of Horizon

5.160 Within section 6.6 paragraphs 310 – 311 of his report, Dr Worden comments positively on Post Office's organisation and governance and within Appendix C.6 (paragraph 325 to 329). His views are largely based on organisational charts, and high-level aspirational documentation.

5.161 As to quality in the development, testing and support (addressed by Dr Worden at paragraphs 312 to 318 of his main report), Dr Worden relies on the 2005 Business Management Policy and 2006 Programme Assurance Management Plan. These are very high level, generalised management documents, and are the type of policy documents which I would expect any large organisation to have. I do not consider them to be particularly helpful in considering the Horizon issues over the whole lifespan of Horizon.

5.162 I am in agreement with the general statements made about the importance of testing in principle, as set out in within Dr Worden's report (paragraphs 320 to 329). It must be acknowledged that however good the development and testing was, bug/errors and defects made it

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through to the live Horizon system. I deal further with Testing Good Practice as a specific countermeasure identified by Dr Worden below.

Horizon in Service

5.163 Dr Worden comments on a number of high-level issues in section 6.7 of his report. My overall view is that Dr Worden's approach is simplified and overly optimistic, based upon there being defined documentation (paragraph 338) in addition to containing very generalised comments about the skill sets of support teams (paragraphs 340-341). I have not found the Horizon documentation to be well maintained and have had to rely upon many 'draft' versions of documents provided within this disclosure. Often there are inconsistent naming conventions across documents that are documenting the same thing.

5.164 I do consider the process by which PEAKs and KELs were managed to be important, and whereas Dr Worden gives a very positive account of this process, I have addressed what I consider to be important limitations in respect of them from paragraph 3.277 above. I have also noted the limitations which appear from Mr Parker's description of the process, at paragraph 4.88 above which in my view are significant

Robust Data Communication and Replications ("ROC")

5.165 There are a number of separate transport networks for data communication within the Horizon system. The branch counters communicated with the data centres over telephone and broadband networks. Then, within Fujitsu's data centres, the data travels between the various servers using local area networks. If appropriate, the data would travel to the various external clients, such as banks, Camelot, DVLA, etc via wide area networks. Dr Worden has focused on Riposte, which provided the messages which travelled across the networks between the branch Counter and Fujitsu data centre. The scope for communication errors in Horizon is far wider than Riposte alone.

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5.166 I have challenged Dr Worden's view on Riposte's reliability earlier in my report (see paragraph 5.29) which covers the period up to 2010 (Legacy Horizon) One example is PEAK PC0027581[259] which documents a specific Riposte fault observed by a branch in July 1999 where the Subpostmaster was found to be logged on to two counters at the same time, logging on and off was controlled by Riposte. This was thought to be impossible but was tested and later confirmed to be fault allowing it to be possible. The 'fault' was reported to Escher (the authors of Riposte) in February 2000. It appears that in September 2000 Escher confirmed that a fix would be forthcoming. By July 2001 it was recorded that Escher had not provided any fix. The PEAK concluded without the fault ever being recorded as being fixed (certainly not in the PEAK).

5.167 Post 2010, Horizon Online used a different data communication method (web service interface) to Riposte but on the evidence of the PEAKS identified in my first report (paragraph 5.46, page 53) there continued to be communication issues with Horizon.

5.168 Mr Stephen Paul Parker does not identify a specific point in time but explains in his witness statement (paragraph 36) that poor data communications kept Fujitsu support busy;

> *"There were times when the SSC was very busy, for example, networking problems causing application issues across the whole estate and data centre outages."*

Manual Workarounds ("WOR")

5.169 At section 7.7.12 of his report Dr Worden discusses the manual workarounds applied within Horizon. Dr Worden claims that the Manual Workarounds were effective as a countermeasure.

5.170 A manual workaround is ultimately a set of steps adopted to circumvent a process that is not currently supported within the system. Use of any sort of workarounds should be a temporary measure and reliance on

[259] PEAK PC0027581, 9 July 1999 {POL-0221763}

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workarounds for critical system processes does suggests that Horizon is less robust than it should have been. Manual workarounds typically are less precise and often it is the manual workarounds that include a greater risk of human error from mis-keying or failure to follow the correct steps.

5.171 As opined in my first report (paragraph 5.97, page 66) reliance on many workarounds are indicative of a lack of robustness. In addition, I have also previously identified in my first report (paragraph 5.10, page 44) a KEL[260] which records *"Office has a Non-Zero Trading Position (Receipts/Payments mismatch)"* a workaround is suggested but it is recorded that *"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."* This creates further complexity and additional risk of error arising from out of process activities that may not be adequately audited.

5.172 Also see 5.256 below where Post Office workarounds are highlighted as a concern and a risk by Post Office's external auditors, with the comment *"Widespread non-conformance to Post Office policy and processes by branches, with an institutionalised acceptance that errors, workarounds and non-conformance exists."*[261]

5.173 Richard Roll in his second witness statement[262] at paragraph 18 explains the problems with workarounds used by Fujitsu not being considered when Horizon updates where applied and caused previous functionality to stop working.

5.174 In my opinion it is very difficult to view manual workarounds as positive countermeasures and that their existence actually reduces robustness.

[260] KEL wrightm33145J, 23 September 2010 last updated 1 April 2016 {POL-0040409}
[261] NRRA1207 10D007-0 50 Draft.doc.docx, Fraud and Non-conformance in the Post Office; Challenges and Recommendations, 1 October 2013 {POL-0216106}
[262] {Second Witness Statement of Richard Roll, 16 January 2019}

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Bug Finding and Correction ("BFC")

5.175 Bug Finding and Correction is identified by Dr Worden as a specific countermeasure, but the definition of this countermeasure is very broad. For example, it encompasses manual workarounds above, this is an example of the loose and overlapping nature of the countermeasures which Dr Worden has identified.

5.176 Dr Worden's analysis of this countermeasure at section 7.7.14 is based on his examination of KELs and reference to Mr Parker's witness statement that incidents with known financial impact are treated with high priority. I have provided my comments in relation to this analysis, and my own analysis of the PEAKs and KELs in this report at in section 3 above also commenting on the evidence in relation to the bugs as dealt with in Mr Parker's first witness statement at paragraphs 4.79 4.88 and refer to those sections of my report.

5.177 The vast majority of the evidence considered by Dr Worden presents only the Fujitsu process and that is only the later element of bug finding and correction. A Subpostmaster reporting a problem first needs to convince the Post Office helpdesk that a bug existed before it is passed to Fujitsu for further examination. Evidence is available that shows that Post Office did not always proactively seek out fault resolution with regard to bug finding and correction. In a weekly ATOS/Fujitsu Problem Review Tracker[263] one defect is identified that causes a direct impact on branch accounts by way of a receipts and payments mismatch. Rather than seeking to understand the full impact of the bug, the document displays *"Post Office are currently not actively investigating as no branches have reported any losses"*. This is consistent with a reactive rather than proactive approach to bug finding and correction by Post Office. The earlier bug analysis suggested that branch accounts would be impacted, and Transaction Corrections would be required.

[263] Weekly Update 26062018 - FJ.XLSX, Atos / Fujitsu Problem Review Tracker, 26 June 2018 {POL-0449089}

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5.178 Richard Roll in his second statement explains (at paragraph 14):

> *"I believe there were likely many cases where subpostmasters would have been held responsible for problems which had not at the time been identified as software errors, either because they could not identify the problem and did not pursue these with Post Office or Fujitsu, or because when they were raised we (Fujitsu) were ultimately unable to identify the problem at the time"*

5.179 The above accords with my own understanding of instances where a Subpostmaster may have improperly been liable for discrepancies arising from a Horizon generated error.

Testing Good Practice ("TGP")

5.180 At 487 of his report, Dr Worden refers to his review of Fujitsu's testing practices. I have considered Dr Worden's Section 6.6.4 'Testing' review and note that Dr Worden comments on the *"evidence I have seen on Fujitsu's testing processes indicates it was well managed and effective…".* Dr Worden does not explicitly reference any specific documents here and further refers to Appendix C of his report. Within this Section C6 'Testing' I note that Dr Worden appears to be referring to generic aspirational lifecycle phases with regards to testing. I agree that these are typical lifecycle stages and components that, if followed iteratively, should reduce the number of development faults within Horizon prior to it going live. Since Dr Worden does not provide any specific Horizon document references, I am unclear on how Dr Worden has seen and can verify such test scripts, or to which aspect of Horizon they apply.

5.181 I have separately seen evidence that Fujitsu did apply Integration and Testing Strategies within various changes to the Horizon landscape[264] } and agree that these appear to be in line with standard industry process. However, the low-level results of tests, how any failures were managed and re-tested, test pass percentages have not been easy to identify. In

[264] DESAPPDPR2374_0.3.DOC , *DCS changes to take on AMEX*, 14 March 2014 {POL-0135502}

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consideration of the size of the Horizon landscape and the amount of changes applied over its lifecycle, in my opinion, Dr Worden's assessment is largely generic and assumptive.

5.182 Computer systems of this scope are never totally bug free, no matter how rigorous the testing regime. This is in line with opinions expressed in my original report (paragraph 5.83, page 63). Testing in my experience tends to centre around key milestones. For example, rigorous testing will take place as part of any system implementation (e.g. the first roll out of Horizon) and any subsequent releases or upgrades (e.g. Horizon online).

5.183 Similarly, any bug fixes should also be rigorously tested; both of the fix itself and then to guard against regression (testing to ensure previously developed and tested software still performs after the change/fix). Outside of these milestones I would not expect much, if any, testing to take place and therefore the development of test scripts is effectively stagnant during these non-active periods. It is therefore possible for bugs to remain dormant for long periods either because they have not yet been identified or no test scripts have yet been created that test the scenarios leading to the bug presenting itself in the first place.

5.184 An example of this can be seen in the Branch Outreach Issue[265] which highlighted a specific combination of events impacting on code produced for HNGX (Horizon online) that went live in 2010. The combination of events was not picked up as part of any of the testing phases by the time multiple fixes were applied in January 2011.

5.185 Other examples are an occurrence of the Suspense Account Bug (detailed at 4.37 and 3.43 of this report) – which was first logged in 2011 but the bug was not located and fixed until 2013.

5.186 At Dr Worden's paragraph 488 he suggests that serious bugs are rare in the KEL and PEAK records. I agree, they are rare in the KEL records

[265] Outreach BLE Extract Findings v6 091215.pptx, *Branch Outreach Issue (Initial Findings)*, 10 December 2015 {POL-0220141}

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because the purpose of KEL's are to inform support personnel how to deal with historic problems, the PEAK's however do show many serious bugs as I have set out in Section 3 above. Where Dr Worden states at paragraph 489 that I have not identified any bugs, this is untrue.

5.187 As aforementioned, KELs cannot be relied upon solely to identify a bug or its impact. I only obtained the PEAK disclosure within short proximity of serving my first report. That said, there were clearly bugs/errors and defects identified within my first report..

5.188 I have dealt with a sample of Dr Worden's and Mr Parker's responses with regards to certain identified KELs within Section 3 of this report 'Dr Worden KELs with further PEAK Analysis.' I do not believe neither Dr Worden or Mr Parker have considered the full appropriate set of documentation surrounding any bug/error or defect but rather exampled instances where they both claim no financial impact has occurred.

5.189 The second statement of Richard Roll dated 16 January 2019 indicates at paragraph 15 budget pressures and redundancies impacted on system development and testing. He states:

> *"The test team felt they were under enormous pressure to complete testing within certain timescales which negatively affected the test regime".*

5.190 Mr Roll continues to highlight further pressures in relation balancing the amount of time spent on the various streams of work (testing fixes/new features and development). At paragraph 18 he also highlights a common issue which should ideally be picked up as part of any regression testing. This was where updates released to fix specific issues caused other functionality to cease working. An example of this is documented by Gareth Jenkins[266] which identified the local suspense

[266] DOC_152849967(1)_GJ Local Suspense note.DOCX, *Local Suspense Problem*, 16 November 2018 {POL-0444082}

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bug as being an unintended consequence to changes made in respect of archiving strategy changes.

5.191 I have not had sight of testing documentation covering the entirety of the Horizon estate through its development, so it is difficult to offer any firm views on this. Dr Worden outlines in his report appendix at C6 paragraphs 341 - 344 the various industry standard testing phases but it is not known the extent of Fujitsu testing documentation he has reviewed to form his opinion.

Quality and Change Control ("QCC")

5.192 Dr Worden explains his quality and change control countermeasure at section 7.7.16, where he identifies quality control techniques employed in Horizon as *"producing documents in accordance with standards and templates"; "reviews of specifications, designs and other significant documents"; and "testing of software, including changes".* Again, Dr Worden has identified and relies upon a countermeasure which is assessed by him at a very high level.

5.193 At paragraph 498 of his report Dr Worden maintains that he is satisfied Fujitsu appropriately assured the quality of Horizon, claiming to have reviewed many of the thousands of documents produced during the lifetime of Horizon. I have not had sufficient time to carry out a review of documentation against the standards as referred to by Dr Worden. However, from the documents I have reviewed, I have had to rely upon draft versions, often the latest issue of the particular document not being formally disclosed until provided as part of responsive witness evidence or Dr Worden's report. Where this has been the case I have set it out in this report.

5.194 In relation to the Managed Service Change (MSC) process (referred to by Dr Worden at paragraph 502), I have set out my conclusions in respect of the process at Section 3 and Section 5, subsection 11 of this report.

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5.195 In my opinion Dr Worden's approach in this section of his report does not demonstrate that the issue of quality surrounding Horizon has been effectively managed. It appears to me that he has largely relied on high level documents recording intended processes rather than analysing the specific operation of those processes in practice.

5.196 There is evidence of deficiencies in change management, as recorded in the 2011 E&Y Letter (referred to at paragraph 5.162 of my first report). This executive summary of this letter states:

> *"Within the IT environment our audit work has again identified weaknesses mainly relating to the control environment operated by Post Office's third party IT suppliers. Our key recommendations can be summarised into the following four areas:*
>
> *Improve governance of outsourcing application management*
>
> *Improve segregation of duties within the manage change process*
>
> *Strengthen the change management process*
>
> *Strengthen the review of privileged access"*

5.197 I note the detailed information which is set out in the table at section 2, at points 12 to 15 concerning points made in the previous year, and in section 4, the IT specific points made for the current year, in particular point 3, where the recommendation is made to strengthen the change management based on the testing which had been carried out (the rating for this was "high"). I do not know the terms of reference for Ernst & Young in the conduct of this audit, but I envision they will have looked at the IT environment and processes in greater detail than I (or Dr Worden) could have done given the access provided.

5.198 Also, as I identified in my first report, Post Office apparently chose not to implement recommended mitigation of risks identified by Ernst & Young relating to "the communication by Fujitsu of changes made to the Horizon system" (Risk and Compliance Committee minutes dated

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18 September 2013, as referred to in my first report at paragraph 5.161[267]).

Managing Non-Functional Requirements ("NFR")

5.199 At section 7.7.17 (paragraph 505), Dr Worden identifies "*Managing Non-Functional requirements*" as a countermeasure, encompassing resilience "RHW" and security "SEC" and he relies on KELs as indirect evidence of successful NFR management.

5.200 It is difficult to understand Dr Worden's reliance on this as a countermeasure. A non-functional requirement is a qualitative requirement in this case for a system. Where functional requirements specify what something should do, a non-functional requirement specifies its qualities, and *how* it should be achieved. Consideration of the system's non-functional requirements (system throughput requirements, platform capabilities, security elements etc.) are crucial design elements to be considered in creating the system as per the specifications set out by the designer.

5.201 In Dr Worden's countermeasure table (paragraph 391 of his report) he refers to the "ilities" such as manageability, supportability, maintainability and adaptability when explaining this countermeasure.

5.202 I agree with Dr Worden that direct evidence for management of non-functional requirements "*is unlikely to be seen in working documents such as KELs (unless some NFRs are insufficient, and problems arise from that)".* Although, many of the KELs do indeed illustrate where technical failures have occurred.

Effect of Multiple Countermeasures

5.203 At section 7.7.19 Dr Worden expresses his opinion on the effect of multiple countermeasures, which he says is his most important conclusion on the robustness of Horizon.

[267] R&CC Minutes 18th September 2013.docx, Risk and Compliance Committee (R&CC) Reference: R&CC/MIN/SEP13, 18 September 2013 {POL-0217378}

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5.204 I do not consider his statistical approach at paragraphs 515 to 516 to be helpful at all, as it is the facts of individual bugs or errors which will determine whether one or more countermeasures are likely to prevent impact. In my opinion the evidence of the individual countermeasures is not as strong as Dr Worden suggests (as I have dealt with above). The information which is available, particularly from the PEAKs, indicates that there were bugs/errors and defects affecting branch accounts The way in which these arose and the systems for detecting and correcting these did have deficiencies, and Horizon should not be described as "a highly robust system" as Dr Worden concludes.

Section 7: Robustness of Horizon

Overview

5.205 After considering the additional PEAK disclosure documents and responsive witness evidence, my opinion as to the robustness of Horizon has changed since my first report.

5.206 I have reached the conclusion that Horizon is less robust than I initially considered for the following main reasons:

a. Access to modify the Horizon branch database was not as restricted as it should have been;

b. Whilst said to be governed by a documented policy, it was actually unaudited as to what actions where be taken whilst the access was provided;

c. Post Office do not consult the full audit data before ruling on a discrepancy, instead using third party client reconciliation data or subsections of the audit data from within Credence or HORice;

d. The PEAKS are consistent with many more bugs/errors and defects shown to impact branch accounts than the initial three acknowledged by Post Office;

e. Some PEAKS show defects have lain undetected in Horizon for extended periods without detection;

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f. The PEAKS confirm Post Office often only becoming aware of bug/errors and defects when Subpostmasters report problems, suggesting that Post Office detection methods are not as good as initially suggested;

g. PEAKs confirm that Post Office suspend active investigations into known discrepancy causing bugs due to a Subpostmaster not reporting shortfalls.

5.207 Dr Worden and I have taken differing approaches in relation to Horizon Issue 3 with regards to the measurement of the extent of Horizon robustness. In summary, Dr Worden has (1) identified robustness countermeasures and assessed how well he considers they have applied (I have responded to this earlier in my report), and (2) performed a statistical analysis based upon figures and percentages which he suggests can be derived from the evidence I do not think it is possible to carry out the type of statistical, theoretical approach which Dr Worden has carried out, and I do not believe I have the information or expertise to assume e.g the percentage chance a Subpostmaster will report a particular discrepancy which is what Dr Worden has done.

5.208 I have not carried out a financial analysis, as I did not interpret my instructions as requiring me to do so. Instead, in order to gain an understanding of the extent of Horizon robustness, I have taken a "bottom up" approach, identifying sources of evidence where robustness (or Dr Worden's countermeasures) have evidently failed. This differs from the "top down" approach of Dr Worden.

Robustness of Horizon: Dr Worden's Opinion – Horizon Issue 3

5.209 In this section I set out my opinion in respect of Sections 7.2 to 7.8 of Dr Worden's report and subsequently addresses Issue 3 of the Horizon Issues.

5.210 I disagree that Dr Worden has performed sufficient analysis utilising a sample of the KEL disclosure alone due to their limitations, which I have set out at paragraph 3.2 of this report.

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5.211 I have set out my opinions in relation to Dr Worden's countermeasures within Section 6: Countermeasures. In summary, it is my belief that Dr Worden has applied broad, design aspirations and generic principles, defining them as robustness countermeasures and applied them in relation to Horizon as a whole, not considering or measuring their adequacy or suitability throughout the varying changes within Horizon's lifetime.

5.212 I dispute the validity of retrospective risk assessment Dr Worden has applied (paragraph 362 of his report) in relation to assessing the risk of bugs in Horizon introducing errors in branch accounts for the reasons I have set out at 5.16 of this report. In summary, risk analysis is a forward-looking technique, for an uncertain event or condition that could impact the project. Looking back using this methodology is largely meaningless as the risk has either triggered or has not.

5.213 Dr Worden states at paragraph 366 that Horizon was a "'green fields'" development, "essentially unencumbered" by any IT legacy. As I understand it, the initial project commenced in 1995 and was initially going to be the benefits agency system, when this failed the software was re-purposed for the post office counters. Further, Horizon Online inherited many legacy components. Hardware was re-used, processing systems were re-configured to fit in with Horizon Online, and many more adaptations were applied. This is illustrated in my first report (Appendix B- Figure 3 – Page 180 – Horizon and HNG-X System Overview).

5.214 In relation to paragraph 375 of Dr Worden's report, I note that Dr Worden appears to relate robustness to risk management from a software engineering perspective. He states that there is a well-established practice for "discussing" robustness under the heading of 'risk management'. This is inadequate. Robustness mechanisms need to consider the technical foundations, the business processes in use, amongst many other aspects and physical components of the system. One should not limit the measurement of robustness to software

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engineering practices alone. Nor does risk assessment validate any robustness measures.

5.215 In respect of Dr Worden's interpretation of robustness at paragraph 381 of his report; he takes the term to mean "manage the risks of imperfection so they are acceptable". In then trying to define what constitutes "acceptable" Dr Worden suggests the possible use of applying simple probability theory which in the context of Horizon he states might be "the probability of a software bug causing a significant shortfall in any branch accounts in any month". I have not seen evidence of any numerical risk analysis of probabilities like this being carried out by Post Office of Fujitsu. I do not agree with Dr Worden's suggested possible approach to this in the context of Horizon. It is in my opinion unsuitable to use this approach to quantify a "significant" shortfall as any approach ought to take other factors into account. For example, a shortfall of £5 affecting several hundred branches is no less significant in my opinion than a shortfall of £1000 affecting a single branch.

5.216 Dr Worden and I agree that robustness does not mean perfection, and therefore, the key is to determine whether when Horizon fails, it fails safely. From my review it is clear that bugs/errors and defects which are located in the PEAK logs show that Horizon has failed in an unsafe manner and has impacted branch accounts.

5.217 I have not been able to sufficiently identify the full impact of all bugs/errors and defects, due to the limitations in the disclosure as set out within Section 3. However, I have identified a number of "not acknowledged" bugs/errors and defects where Post Office appears to have not considered the impact of a number of issues. Further, where Post Office/Fujitsu have attempted to state the impact of acknowledged (and other) bugs, I have found flaws and insufficiencies in their analysis.

5.218 Section 3 PEAK, MSC and Privileged User Log Analysis of this report documents instances of Horizon generated shortfalls, outside of the

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bugs/errors and defects acknowledged by Post Office (that also resulted in Horizon generated shortfalls).

5.219 , I disagree with Dr Worden's assertion that bugs can be classified into the groups he identifies at paragraph 405. Dr Worden bases his classification upon the visibility (or invisibility) of the effects of the bug to Subpostmasters, but in my opinion this is fundamentally flawed. Subpostmasters would often not be equipped to know that an error message or a discrepancy in their accounts was in fact a bug and may not know that this was a possibility. Also, the information needed to identify that any particular discrepancy which had been identified by the Subpostmaster was in fact caused by a bug would only be available to Fujitsu. Finally identifying the discrepancy as having been caused by a bug/error or defect and resolving it depends upon Post Office / Fujitsu carrying out a full investigation, making all necessary enquiries, including consultation of the ARQ data which Dr Worden relies upon (paragraph 408).

5.220 Dr Worden's analysis from paragraph 406 is dependent on his classification which I do not agree with as above. Further, Dr Worden's focus is on the *possible* evidentiary data available for investigating bugs/errors and defects but does not consider what actually happened in practice. The human elements of the processes which Dr Worden relies upon are fundamental in any assessment of whether the system worked to appropriately identify and correct bugs/errors and defects and their impact. These human elements may include for example, what Subpostmasters were told by the Post Office helpline if they identified a discrepancy in their accounts, if and when calls were escalated by them for investigation by Fujitsu, the degree of investigation then carried out by Fujitsu which data sources were consulted, and the process for issuing and disputing Transaction Corrections and Transaction Acknowledgments.

5.221 Although Dr Worden relies upon the Core Audit Database (paragraph 408), he considers that Post Office did not consult audit (or ARQ) data

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because there was lack of a need to (i.e., resolution through other data), but this was insufficient in my opinion.

5.222 The Core Audit Database was stored at Fujitsu and required Post Office to make a formal ARQ request for data to be exported. Something that Post Office has done very few times since records were kept (See the numbers of ARQ requests taken from Mr Godeseth's statement at 5.130 above). From my review of the evidence it seems that without reference to the core audit data, Post Office will revert to other sources of reference, typically third party client reconciliation data or that stored within Credence or HORice. I have set out the limitations of such data sets previously in this report.

5.223 Dr Worden discusses at 411 the issue faced when bugs/errors and defects impact Subpostmaster branch accounts, but this fact is not often evident until monthly balancing. KEL's are not designed for the capture of such enquires. However, I have found that some PEAKs do record such discrepancies if the Subpostmaster has managed to convince the Post Office helpdesk that Horizon is, or may be at fault. Again, I would emphasise the human processes are important to consider with regards to how bugs would be detected and corrected in practice.

5.224 Dr Worden (at paragraph 412) refers to the local suspense account bug, and the document produced by Gareth Jenkins [268] in relation to it, which I also address earlier in this report at paragraph 4.35 onwards.

5.225 Dr Worden goes to some length in attempting to extrapolate and make inferences based upon the number of reported branches affected by this bug and the discrepancy amounts in the individual case. I do not think that this is a useful exercise or that any meaningful probabilities can be derived from this example, particularly since I am not confident the full extent of this issue was ever truly captured by Fujitsu or Post Office.

[268] _DOC_152849967(1) _GJ Local Suspense note.DOCX, Local Suspense Problem, 16 November 2018 {POL-0444082}

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5.226 I do not think that I have sufficient information or that it is within my expertise to make the type of assumptions which Dr Worden makes about Subpostmaster behaviour in reporting anomalies in their monthly balancing, which Dr Worden does at paragraph 415.

5.227 In my opinion multiple unreported occurrences of a bug where the discrepancy is e.g. less than £50 may be no less significant than a single reported occurrence involving £3000, especially considering that individual branches may well be affected by the same bug on multiple occasions.

5.228 Paragraphs 417 to 421 supports my opinion that bugs/errors and defects which manifest with low financial impact to the Subpostmaster may therefore be left resident within Horizon unidentified. I have not seen evidence of Post Office noticing the effects of bugs in their own accounts and this leading to the correction of errors in branch accounts, which Dr Worden seems to suggest might happen at the end of his paragraph 417.

5.229 Furthermore, even where issues (identified by Subpostmasters) may have been given an initial high priority, high priority does not necessarily dictate that full and proper thorough analysis was conducted or if it was not later downgraded in order to prioritise other issues.

5.230 In relation to the KEL sampling performed by Dr Worden and his observations at paragraph 425, I dispute all points he makes (with exception of 425.5), as in my opinion, it is not possible to provide such opinions or inferences based upon KEL sampling alone. I do however, agree with Dr Worden at 425.5 that there were other cases of regression of fixes aside from the one or two cases as set out by Mr Parker in his Witness Statement as I have seen this within the PEAKs I have reviewed (Section 3 above).

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5.231 In relation to Dr Worden's assessment of how well countermeasures were applied, I have provided my detailed response to this in Sections 5 and 6 'Countermeasures'.

5.232 Further, I have provided my observations on Dr Worden's analysis in relation to certain bugs we have both analysed in Section 3 'PEAK Disclosure', specifically above at paragraphs 3.22 onwards.

5.233 In relation to the variability of Horizon over time, at paragraphs 528-529, Dr Worden states that *"Horizon's requirements, design and architecture have been very stable over its lifetime. This in itself implies that the robustness countermeasures have been similarly stable."* I do not agree with Dr Worden's analysis because the introduction of Horizon Online and network banking accommodations both forced significant requirement, design and architectural changes across practically the entire Horizon estate. Mr Godeseth supports this in his witness statement in which he states: *"...Horizon has constantly evolved and changed since its rollout in 1999..."* I also think the implication that countermeasures have been stable therefore is incorrect. For example, Dr Worden relies upon "manual inspection of data" as a countermeasure, but facilities and processes for that have changed over time. There have been other significant process changes such as in relation to remote access and auditing of it, which is set out at subsection 11 of this report.

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

5.234 In relation to Issue 4, in section 7.9 of his report Dr Worden sets out his difficulties in interpretation of this Issue and concludes that Issue 4 is all a subset of Issue 3, which he refers to and essentially repeats. The points I have made above in response to Dr Worden's assessment of Issue 3 therefore apply equally to Dr Worden's assessment of this issue.

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5.235 However, in my view I do think that different issues arise in relation to Issue 4, from paragraph 3.148, I have sought to evidence specific PEAKs outside of those analysed in relation to Issue 1. In summary, I have identified further instances of bugs/errors and defects that in some instances may not necessarily have caused financial impact to a Subpostmasters branch accounts, but further demonstrate that bugs/errors and defects evident within Horizon indicate a lack of system robustness. I.e., Horizon functionality was operating outside of its expected behaviour (e.g., report sets used for financial consultation were erroneous or defective.

5.236 It should be noted however that those PEAKs referenced in relation to Issue 1 do still apply under Issue 4 definition as they relate to errors in data recorded and processed within Horizon. Dr Worden has not considered that bugs/errors and defects that did not primarily cause financial impact in a Subpostmasters branch accounts, might ultimately have done so in a secondary capacity, in that they affected Post Office's view of accounts and ultimately the human elements of decision making in respect of Transaction Corrections.

5.237 My conclusion in relation to Issue 4 is set out at paragraphs 5.153 to 5.154 (page 82) of my first report, where I identified that whereas it has not been possible to measure the full extent of errors in data recorded within Horizon, it was however, clear that significant errors have occurred. The additional analysis I have carried out provides further evidence of the extent of such errors, contained within Section 3 'PEAKs that relate to errors in data recorded within Horizon'.

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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 transmission, replication and storage of transaction record data; (e) the data stored in the central data centre not being an accurate record of transactions entered on branch terminals?

5.238 At section 7.10 of his report, in relation to Issue 6, Dr Worden sets out the difficulties he has in interpretation of this issue and relies upon subsets of his conclusions in relation to Issue 3. I have responded to what Dr Worden states in relation to Issue 3 above.

5.239 My conclusion in relation to Issue 6 was set out at paragraph 5.199 (page 95) of my first report where I concluded that due to limitations found within the Horizon disclosure it had not been possible to establish the full extent of measures and controls within Horizon to ensure system integrity, however, of those identified, there were many instances of failure. Since the evidence suggested that bugs/errors and defects were often dealt with on a cost/benefit basis, risks of errors arising was not reduced as far as possible. I remain of this view and have found further supporting evidence of such in the further analysis I have conducted in relation to the PEAKs contained at Section 3 of this report.

5.240 To the extent Dr Worden relies upon his inherited opinion from Issue 3, that Horizon did have countermeasures and controls that were *designed* to ultimately reduce risk and the impact of errors, I agree, such countermeasures if implemented and positioned correctly across the relevant aspects of Horizon should reduce the risks that the design identified. Risks that were not identified by the designs were unlikely to be reduced and Dr Worden does not appear to consider if the countermeasures were in fact implemented and positioned correctly. Dr Worden does not propose that any further countermeasures might have been designed for Horizon. Countermeasures in existence for legacy Horizon which had completely different non-functional requirements than Horizon Online are treated the same under Dr Worden's view.

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Fundamentally, robustness countermeasures have to be designed in accordance with the specific architecture and processing rules in operation at the time. Any change in architecture or processing rules can render specific countermeasures ineffective.

5.241 Overall, Dr Worden appears to take the view that countermeasures have been successful with a few limited exceptions. Although, Dr Worden accepts the fact that Horizon was subject to a large amount of system change throughout its lifetime and that this may have impacted the robustness level (Joint Statement paragraph 2.3, page 8). In my opinion, the two are inconsistent as I do not consider that a single set of generic countermeasures applied across a large, changing estate can accurately demonstrate that it was therefore robust.

Appendix H to Dr Worden's report (responding to my first report)

5.242 In Appendix H of Dr Worden's report he responds to a selection of documents or points made in my original report. I provide my comments on this Appendix H here, because Dr Worden relies on his section H analysis at the end of Section 7 of his report (paragraph 568). I respond below by reference to the sections of Dr Worden's Appendix H.

5.243 Firstly, in relation to KELs, and section H.2 of Dr Worden's report, I wish to identify the following points:

5.244 At paragraph 485 – KEL dsed4733R[269] (regarding mis-named recovery scripts) there are seven associated PEAKs. Referenced in this KEL is PC0272963,[270] raised 13 August 2018 with the original KEL raised 25 July 2013. Clearly the occurrence of "bad" recovery scripts was an ongoing issue and has happened on more than one occasion. In my first report this was provided as one example of many to demonstrate the possible impact of failed recoveries on transaction data integrity. Once a recovery fails it is usually no longer in the hands of the Subpostmaster

[269] KEL dsed4733R, 25 July 2013 {POL-0039482}
[270] PEAK PC0272963, 13 August 2018 {POL-0443958}

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to rectify and the Subpostmaster is reliant on other countermeasures to pick this up.

5.245 At paragraph 486 – KEL obengc5933K (regarding communication failures),[271] similarly to the example in the preceding paragraph, has seven PEAKs associated, with the latest PEAK (PC0272175[272]) being raised on 16 July 2018 after the KEL was raised 12 May 2010. In this case only partial recovery of the transaction was achieved. I disagree with Dr Worden and do not believe in these circumstances that communication failure is rare. Further, consistent recovery failure is symptomatic of a lack of robustness in not being able to address the underlying issue and is also indicative of a failure of the "Robust data communication and replication" countermeasure.

5.246 Dr Worden at paragraph 487 states that Horizon has robust mechanisms to detect and correct these errors in transaction recovery. However as highlighted in my first report at paragraph 5.98 Post Office acknowledges in 2012 under the heading of "process and system gaps" that there existed a lack of automated controls and significant amount of manual intervention which in my opinion goes to the heart of the question of whether Horizon could be considered robust.

5.247 In relation to PEAKs, and Appendix H.3 of Dr Worden's report,

5.248 At Paragraph 489 – PEAK PC0063227[273] - this appeared in my report at paragraph 5.143 (page 79) and Appendix A (Page 160) regarding Horizon robustness in relation to transfers of data. The PEAK indicates a Riposte data transfer failure affecting 401 transactions valued at £11,708.08. Fortunately, in this instance, the bug was fixed before any branch accounts were impacted but in my opinion is still relevant when

[271] KEL obengc5933K, 12 May 2010 last updated 29 December 2010 {POL-0038204}
[272] PEAK PC0272175, 16 July 2018 {POL-0439168}
[273] Peak PC0063227, 28 February 2018, {POL-0237798}

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analysing robustness and is indicative of a failure of the "Robust data communication and replication" countermeasure.

5.249 At paragraph 489 – PEAK PC0063723[274]- this appears in my first report at paragraph 5.57 (page 56) under regarding "Uncategorised Bugs/Errors/Defects". I covered this in some detail and the PEAK record is associated with KEL DRowe1625k[275] and has 51 other associated PEAK records. Reading the PEAK record PC0084115[276] raised 23 November 2002 indicates the Subpostmaster was angry and frustrated that no explanation could be given for his trial balance discrepancy. The final entry on the log dated 20 March 2003 states that Development have been unable to determine the root cause of this problem. Whilst a workaround was used to remove any impact on the branch account; both the frequency and the fact that the cause of this issue was and remains undetermined challenges Horizon's data integrity.

5.250 Art paragraph 489 – PEAK PC0098844[277] - this appears in my first report at paragraph 5.28 (page 49) and Appendix A under Errors with Financial Impact. This PEAK deals with currency exchange discrepancies arising when carrying out reversals. Contrary to Dr Worden's assertion I do not believe this was a rare occurrence and on the contrary, an associated PEAK (PC0102484[278]) involving a discrepancy of £200,000 recommended a fix for the underlying cause of these currency exchange differences as part of S70 release. This PEAK may not have been considered by Dr Worden who claims this was a rare circumstance and not a fault in Horizon with serious impact, which on the evidence of the latest PEAK I strongly disagree with.

5.251 At paragraph 489 – PEAK PC0203131[279] - this appears in my first report at paragraph 5.59 (page 30) and Appendix A under Errors with Financial Impact. As stated in my report this was a pre-migration bug (Legacy

[274] Peak PC0063723, 10 March 2001, {POL-0238257}
[275] Not disclosed at the time of submitting this report.
[276] Peak PC0084115, 23 November 2002, {POL-0256969}
[277] Peak PC0098844, 06 February 2004, {POL-0270879}
[278] Peak PC0102484, 23 April 2004, {POL-0274132}
[279] Peak PC02003131, 18 August 2010, {POL-0372925}

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Horizon) and a failure of the system to correctly calculate volumes. In the absence of further PEAK records this does appear to be correct and the bug no longer presented itself in the Horizon online (HNGX) confirming the incident occurred with migrated data and new data/transactions would not be affected by the bug

5.252 At paragraph 489 – PEAK PC0203676[280], PC0263451[281], PC0266575[282] and PC0273046[283] all appear in my first report at paragraph 5.46 (page 53) and Appendix A under Errors with Financial Impact. Viewed in isolation these PEAKs could be considered minor however, they form part of the recurring failed communication issue which impacted on recoveries and branch accounts which is indicative of a failure of the "Robust data communication and replication" countermeasure.

5.253 At Appendix H.4 of Dr Worden's report:

5.254 Dr Worden addresses the issue of "Mis-keying" at paragraph 490 but he does not deal with the points I outlined in paragraphs 5.125 – 5.127 (page 74) of my first report. These focus on internal and external reports highlighting the extent and cost of dealing with data entry errors. It is again worth noting the Infosec comment following their 2008 review and shown at paragraph 5.126 (page 74) of my first report:

> *"The Post Office, its agent, 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"*

5.255 This is clearly at odds with Dr Worden's opinion that the Horizon user interface had all the usual measures built in to identify mis-keying. It also supports my opinion that "Early Detection of User Errors" as a countermeasure did not necessarily support Horizon's robustness.

[280] Peak PC0203676, 31 August 2010, {POL-0373467}
[281] PC0263451, 19 October 2017, {POL-0430967}
[282] PC0266575, 26 January 2018, {POL-0433904}
[283] PC0273046, 15 August 2018, {POL-0439981}

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5.256 At paragraph 491 Dr Worden opines that the use of workarounds are evidence of three countermeasures (Redundant data storage and computing, with cross checks, Manual Inspection of Data and Manual Workarounds). In my first report I offer my opinion on the use and implications of the use of workarounds at paragraphs 5.97 (page 66) and 5.171 (page 87). Dr Worden claims no evidence has been cited in respect of the opinions given in my first report. This fails to take account of the independent report cited in my first report at paragraph 5.171 (Detica NetReveal[284]) which highlighted amongst other things Post Office's:

> *"institutional acceptance that errors, workarounds and non-conformance exists"*

5.257 This suggests that workarounds were an accepted business process with the Post Office rather than an infrequent and temporary solution to a bug or process failure as suggested by Dr Worden.

5.258 At Appendix H.5 of Dr Worden's report,

5.259 At paragraph 492 - 496 Dr Worden addresses my interpretation of the response by Post Office (refer to my RFI; Annex A) to the number of reconciliation exceptions which they confirmed as being 10,000+ transactions per week that had to be "F99'd". In my first report at paragraphs 6.33 – 6.40 (pages 104 – 106) I highlighted the Data Reconciliation Service (DRS) and the components required for transactions to be automatically reconciled and moved to a "complete" status in addition to the F99 process which processes the "resolved" unreconciled records and moves these to a "complete" state.

5.260 In order to address Dr Worden's opinion that it is misleading to portray the 10,000 events per week as error-prone interventions I need to clarify that these events represent transactions that could not be auto

[284] NRRA1207 10D007-0 50 Draft.doc.docx, *Fraud and Non-conformance in the Post Office; Challenges and Recommendations*, 1 October 2013 {POL-0216106}

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reconciled and therefore appear as an exception on the NB102 report requiring either a corrective action or a TC. Each of these exceptions will have an associated state which is outlined in the Network Banking Reconciliation and Incident Management Process document.[285] In almost every case each of these states will require investigation and analysis by the MSU followed by either of the following actions by Post Office:

i. If it is a "value" transaction it will require a financial adjustment (a TC); or

ii. If is "non-value" transaction Confirm F99 authorisation via BIMS return

5.261 It is therefore my opinion having read the process document there is always a manual "human" element (MSU and/or Post Office) in deciding the corrective action in order to resolve these exceptions. This human determination on such a large volume of data per week represents a significant risk and potential impact on branch accounts.

5.262 At Appendix H.7 of Dr Worden's report,

5.263 At paragraph 500 – 506 Dr Worden addresses the Ernst & Young report[286] which I identified at paragraph 5.162 in my first report. Whilst I accept that the 2011 Ernst & Young Management letter contains recommendations and not obligations; in the opening line of the executive summary they acknowledge that the Post Office had addressed many of the issues raised in the previous year's audit.

5.264 Regarding the specific recommendations in the 2011 audit it is my opinion that the key recommendations directly impact on some of the 18 countermeasures outlined in Dr Worden's report and therefore are relevant to the question of robustness of Horizon since they offer an opportunity to improve these countermeasures which it appears Post

[285] Network Banking Reconciliation and Incident Management Processes, 26 February 2003 {POL-0032841}
[286] POL Management Letter FINAL.docx, Management letter for the year ended 27 March 2011, August 2011 {POL-0219218}

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Office chose not to take.. I have listed below the four key recommendations and in brackets which countermeasure(s) these could impact:

a. Improve outsourcing application management; (Quality and Change Control, Managing non-functional requirements, Testing good practice)

b. Improve segregation of duties within the manage change process; (Quality and Change Control, Security)

c. Strengthen the change management process; (Quality and Change Control)

d. Strengthen the review of privileged access. (Security)

5.265 At paragraph 507 Dr Worden challenges the relevance of the POLSAP System Controls document[287] referenced at paragraph 5.170 (page 87) of my first report but I disagree with his position. The fact that the report references the Ernst & Young audit and access controls within Horizon makes it a relevant document.

5.266 At paragraph 508 Dr Worden questions the relevance of not following the recommendations of the 2013 Ernst & Young audit[288] identified at paragraph at 5.161 (page 84). I accept that audit findings are usually recommendations as opposed to obligations however as the Risk and Compliance Committee meeting minutes is a redacted document, I am unable to comment further on the reasons and analysis behind their decision. However, in my opinion since the issue (communication by Fujitsu of changes made to the Horizon system) is relevant to the Quality and Change Control countermeasure, it could therefore impact on the issue of Horizon's robustness.

[287] AR12.037.ppt, *Review of Key System Controls in POLSAP*, November 2012 {POL-0217341}
[288] R&CC Minutes 18th September 2013.docx, *Risk and Compliance Committee (R&CC) Reference: R&CC/MIN/SEP13*, 18 September 2013 {POL-0217378}

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Conclusions – initial thoughts

5.267 Dr Worden bases his opinion on statements regarding generic IT Risk reduction counter measures and where such generic counter measures have been observed in the Horizon designs. In my opinion that fails to consider:

a. Was the design implemented?

b. If so, did the counter measure provide adequate coverage across the whole of Horizon?

c. The Horizon system changed frequently, there is no way to ascertain retrospectively that the designed counter measures (even if implemented initially) continued appropriately following each and every change to the Horizon system.

d. Evidence from PEAKs and KELs show that bugs/errors and defects within Horizon were not always prevented by the counter measures.

e. Evidence from PEAKS and KEL show that bugs/errors and defects that were not prevented by counter measures were not detected until years after the events.

f. Evidence from audits that weaknesses existed in Horizon and related processes.

Section 8: Effect on Horizon Bugs on Branch Accounts

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?

5.268 Dr Worden and I have approached Horizon Issue 1 in different ways. Dr Worden has primarily set out a financial analysis, focusing on the financial impact of bugs, errors and defects based on a small sample KELs, Claimant data and values from Post Office acknowledged bugs.

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He relies on statistical analysis from section 7 (by reference to e.g. percentage of Subpostmasters who would likely report a discrepancy). He uses his analysis to conclude that "Horizon cannot account for even a small part of the Claimants' shortfalls – either for all Claimants taken together, or for any individual Claimant" (paragraph 573).

5.269 I did not consider financial impact in detail, because I addressed the question literally My analysis aims to address it is "*likely*" or "*possible*" that bugs in Horizon could have caused the apparent or alleged discrepancies (as opposed to their financial impact). I have used a "bottom up" approach by identifying sources of evidence where actual bugs, errors and defects are recorded Dr Worden's approach is based on assumptions which, in my opinion, are technically flawed.

5.270 I have set out the basis for these opinions in the following sections.

Unknown Bugs in Horizon

5.271 Dr Worden's overarching opinion in section 8.2 of his report is that the likelihood of there being any unknown bugs in Horizon was "*very small indeed*", and that the associated impact of those bugs could not have been large "*…because of the robustness countermeasures built into Horizon*."

5.272 At paragraph 579 Dr Worden states:

> *"579. Part of the purpose of robustness in any financial system is to ensure that far-reaching errors in accounts do not occur. An important part of this is to ensure that if errors should occur, they are rapidly detected - and do not persist, unknown, for long periods. Horizon was a typical financial system in this respect. In my opinion its robustness countermeasures worked well."*

5.273 As a general principle I agree that systems are built to be robust to prevent errors in accounts. However, as a matter of technical principle, it is also true that bugs in a live system are typically discovered because of a set of circumstances that was not foreseen during the various test phases. Therefore, it is very unlikely that a system as large and complex

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as Horizon would contain robustness measures that allowed one to assume that significant errors could not occur because they have not been discovered.

5.274 I have noted that Dr Worden appears to agree with this, as he states in paragraph 650 that the Receipts/Payments Mismatch Issue was a bug that was:

> *"…triggered by a rare circumstance (which one would not expect to be exercised in testing) and which had an effect on branch accounts."*

5.275 Additionally, Dr Worden and I have agreed in the Joint Statement that:

> *"Each time any IT system (including Horizon) is changed there is the potential to introduce new bugs/errors/defects."*

5.276 Further, the second witness statement of Mr Stephen Parker, at paragraph 17 discusses that testing did not result in the identification of all errors and his opinion that:

> *"The same could be said of every computer system in the world"*

5.277 It is also a matter of fact in this case that certain bugs did persist, remaining undetected for long periods of time.

5.278 Each bug was initially unknown in the live system and was then discovered later. Therefore, in my opinion, the most likely scenario is that there are (and have always been) bugs that have not yet been discovered. Whether or not those bugs will have a significant financial impact is not known, so it would be incorrect to assume that would be insignificant.

5.279 Additionally, the PEAKs I have been able to review suggest that the root cause of an issue was not always correctly determined when initially identified. Where this is the case, it is not accurate to assume that the issues were or was not the result of a bug – we know that there was a problem.

5.280 In paragraphs 580-589, Dr Worden sets out his opinions about the likelihood of a discrepancy being reported by a Subpostmaster based on

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the value of its impact. I do not believe that there is any significant value in these assumptions because (a) as I have previously explained, I do not believe there is sufficient evidence for either me or Dr Worden to make these sort of assumptions and I do not think they are within my area of expertise ., (b) two discrepancies may appear in the same trading period, i.e., the first of £850.99 the second of £-868.13 whilst both are significant, the net impact on branch accounts (£-17.14) may be judged as insignificant (c) Dr Worden himself refers to these as "weak inferences" in paragraph 582.

5.281 Additionally, the "Problem Review Tracker"[289] shows a defect opened on 18 January 2017 titled "*Products ended retrospectively leading to Receipt & Payment mismatch*". This defect impacted branch accounts and "transaction corrections" was the recommended remedy. The tracker further states (24 February 2017):

> *"Post Office are currently not actively investigating as no branches have reported any losses".*

5.282 This indicates that, whilst Post Office was aware of an impact on branch accounts, it was awaiting the branches to report a loss before it investigated whether the cause was as result of a bug, error or defect.

Impact of Bugs on Branch Accounts

5.283 At section 8.3, Dr Worden's overarching opinion in relation to the potential impact of bugs on branch accounts, is that this is to be assessed by reference to countermeasures only. He says (at paragraph 593):

> *"Following my analysis of robustness in section 7, it will now be clear that the answer to this question depends on the robustness of Horizon - not on how many bugs there were, but on how well the effects of these bugs were countered and mitigated by the robustness Countermeasures, to prevent them from creating discrepancies or shortfalls in branch accounts."*

[289] Weekly Update 26062018 -FJ {POL-0449089}

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5.284 If Dr Worden is suggesting that there should be no consideration of the number of bugs, then I disagree with this position.

5.285 Dr Worden describes my approach as "*a simple counting or cataloguing of bugs*" (paragraph 594). I do not agree with this description of my approach, because I have analysed the evidence relating to bugs which reveals information about the system and the potential for other similar bugs to arise. This in my opinion is an appropriate way to assessing the answer to Issue 1. I have provided my detailed comments in relation to Dr Worden's reliance on countermeasures earlier in this report. Dr Worden's overarching opinion in relation to this point is that assessing the financial impact of bugs:

> *"…depends on the robustness of Horizon - not on how many bugs there were, but on how well the effects of these bugs were countered and mitigated by the robustness Countermeasures, to prevent them from creating discrepancies or shortfalls in branch accounts."*

5.286 Dr Worden sets out a summary of the picture which he says emerges from the KELS (paragraph 596), and conclusions as to the robustness of countermeasures (paragraph 597). I do not agree with either of these positions for reasons I have explained earlier in this report.

5.287 In paragraphs 599 & 600, Dr Worden states:

> *"599. Therefore in my opinion, because the robustness countermeasures worked very well, there were very few bugs which introduced inaccuracies in branch accounts, and their financial impact across Post Office branch network was very small.*
>
> *600. Mr Coyne's report appeared to imply otherwise. But he had not analysed the KELs or Peaks to sufficient depth to consider the effects of robustness countermeasures. Therefore, his report contained little or no analysis to contradict my opinion. I have examined 62 of the KELs he relied upon, and they confirm my opinion. This analysis is shown in a table in Appendix C. My conclusions on robustness, as demonstrated by those KELS, are contained in section 7.6"*

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5.288 During my investigation, when more than 5100 KELs were reviewed, the focus was on understanding whether there was evidence of bugs, errors or defects in Horizon which could have been the cause of discrepancies and shortfalls in branch accounts. In my opinion, there is significant evidence to show that they were the cause.

5.289 I disagree with Dr Worden's opinion that my first report did not sufficiently consider the effect of robustness countermeasures (a term which is introduced by Dr Worden in his report). The bugs, errors and defects I focused on are the ones which were, by definition, not adequately prevented by countermeasures.

Measures of Extent

5.290 Section 8.4 is focused on Dr Worden's explanation of his interpretation of Issue 1. I have noted that in paragraph 604, Dr Worden states:

> *"If time is spent considering these bugs with non-zero but trivial financial impact, it might divert attention from considering the smaller number of bugs with significant financial impact, which could have made a more important difference to Claimants' branch accounts. Focus on the financial impact of bugs will help in narrowing the scope of enquiries"*

5.291 I do not agree that disregarding bugs, errors and defects on the basis of their net financial impact is the correct approach to understanding the extent to which bugs could have caused discrepancies. This is because, assessing how bugs have arisen and how they were resolved, whatever their value, is informative about the risks of other bugs arising. Additionally, for example:

a. The fact that a bug has a small impact in one case does mean it cannot have a large impact in another case.

b. A bug could have a small impact in many different cases.

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Scaling of Financial Impacts of Bugs

5.292 The statistical analysis as carried out by Dr Worden in this section of his report is not within my expertise. However, I do not agree with it in principle because (1) it relies on assumptions / approaches which I have explained above I do not agree with and (2) it relies on further assumptions introduced by Dr Worden in this section.

5.293 At 622, Dr Worden states:

> *"It seems implausible to me that there is some special factor about Claimants' branches, which makes them much more prone to bugs in Horizon - bugs which one would expect to strike any branch at random. Nevertheless, I have considered the possibility carefully in Appendix F. I have shown there that there is no significant difference between Claimants' branches and other branches, in proneness to bugs in Horizon."*

5.294 I have noted the following observations in relation to this:

a. Dr Worden has based his analysis on the assumption that bugs would affect all branches equally. However, as explained below (see my Response to Dr Worden's "Qualitative Analysis", starting at paragraph 5.319), this is not correct. As a matter of technical principle, bugs do not affect all users equally and, as a matter of fact in this case, bugs have had significantly different effects for different users (see paragraph 5.322).

b. Dr Worden's calculations in his Appendix F are based on numerous assumptions about matters for which there is no evidence, such as:

   i. Claimants are more likely than non-claimants to make errors (paragraph 435 in the Appendices document).

   ii. Estimating probability of bugs occurring in a transaction with human error against the probability of bugs occurring in normal transactions (Paragraph 437). He assumes that, because the system was tested, the probability of bugs occurring in a

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transaction with human error could not be more than 4 times the probability of bugs occurring in a normal transaction.

c. Dr Worden has not considered any factors which could increase the likelihood of a bug's occurrence other than human error. For example, he has not considered the following (non-exhaustive) list of criteria:

i. On any given day, all Subpostmasters were not always on the same version of the Horizon software.

ii. Not all Subpostmasters dealt with the same distribution of transaction types (e.g. Subpostmaster A might sell many lottery tickets and Subpostmaster B might sell only a few, Subpostmaster C might not have any lottery terminal in the branch).

iii. Certain Subpostmasters may have busy periods (even if their overall number of transactions is smaller) or may deal with a larger volume of very low value transactions.

iv. Internet connectivity varies wildly depending on things like geographical location, local service providers and more. It is a matter of fact that this has caused issues with Riposte (see paragraph 5.165 in this report).

5.295 Additionally, Dr Worden assumes that, because a branch carries out fewer transactions in a day, it must be less likely to suffer from bugs than another "larger" branch. In my opinion, this is not a technically sound assumption. As above, there are many other factors which can increase or decrease the likelihood of a bug's occurrence.

5.296 As an example, if there was a bug, error or defect which was triggered as part of a transaction associated with selling a stamp then, unless Subpostmaster A sells a stamp, the chance of that bug occurring is 0%. If Subpostmaster B sells a stamp, then the chance of triggering a that bug is higher than Subpostmaster A, even if Subpostmaster A carries out 1000 times more transactions per day, Subpostmaster B still has a

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higher chance of triggering that bug, because the bug is associated with selling a stamp.

Three Errors Cited by The Claimants

5.297 In this section, Dr Worden sets out his review of the Receipts / Payments Mismatch Issue, the Callendar Square/Falkirk Issue and the Suspense Account Bug. I have noted that he has not given any consideration to other bugs, errors or defects which have not been formally acknowledged by Post Office (e.g. he does not give consideration to the Dalmellington / Branch Outreach Issue (see paragraph 4.44) or the many others that I have set out at Section 3).

Receipts / Payments Mismatch Issue

5.298 I have set out my views in relation to the Receipts / Payments Mismatch Issue in the subsection headed "Receipts and Payments Mismatch Bug" above, starting at paragraph 3.27, and also when commenting on Mr Godeseth's second witness statement.

Callendar Square / Falkirk Bug

5.299 I have set out my opinions in relation to this bug in the subsection headed "Callendar Square / Falkirk" starting at paragraphs 3.34 and 4.2 above, and in relation to Mr Godeseth's second witness statement.

5.300 At paragraph 668, Dr Worden states:

> *"Because Fujitsu had designed the counter software assuming that Riposte replication worked correctly, and could not anticipate in what ways it might not work, in my opinion it would have been very difficult for Fujitsu to fix the problem or correct it. Fujitsu were reliant on Escher to fix the problem; and apparently Escher did not do this for years."*

5.301 It is a concern if Escher did not act for years and Post Office and Fujitsu were unable to do anything about it. I also note that Horizon is made up of many more 3rd party components, outside of Riposte that failed in this particular occasion..

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5.302 In paragraph 669, Dr Worden summarises his conclusions on the significance of the Callendar Square bug:

a. In 669.1, he notes that this bug was not detected immediately by "countermeasure DEA", but sets out that (669.2) that it was eventually detected by "countermeasure RDS and MID". He concludes that Horizon's robustness worked well. I disagree with this position. From the period of at least 2000-2006, the bug was not detected by *any* countermeasure.

b. In 669.3, Dr Worden concludes that the possible financial impact on claimants' branch accounts was *"very small indeed"*. This appears to be based on his views explained earlier at paragraph 667 that: *"I would expect the Subpostmaster to be left with a shortfall (i.e. not compensated) in only a small minority of cases, if any cases. In my opinion the net shortfall caused by all its occurrences would be possibly zero, and in any event at most a few thousand pounds."* Again Dr Worden is making a number of assumptions for which there is not sufficient evidence..

Suspense Account Bug

5.303 I have set out my opinions in relation to the Suspense Account Bug above (see the sections starting at paragraphs 3.43 and 4.35). The facts are as follows:

a. The bug caused historic suspense account figures from 2010 to be transposed into branches' suspense accounts for trading periods in 2011 and 2012.

b. When Subpostmasters discovered errors in their accounts they first queried it in 2012.

c. The cause of issue was not identified by Post Office until 2013.

5.304 In addition, I have noted that Dr Worden focuses on those instances of the Suspense account bug which had a large financial impact on claimant branches. In my opinion, this will not provide an accurate

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result when trying to understand the extent to which it was likely or possible that bugs in Horizon could have cause the alleged or apparent issues.

5.305 I do not comment on Dr Worden's statistical analysis by reference to a scaling factor at paragraph 686, because again, this is outside my expertise.

Dr Worden's Opinion on the Three Identified Bugs

5.306 At paragraph 688, Dr Worden states:

> *"The experts have not had the time to do this deep analysis for more than a few errors, including these, and it would be unrealistic to expect the reader to understand these to the same depth."*

5.307 I agree in that it is very unlikely that either I or Dr Worden have found all the relevant bugs, errors or defects that exist in Horizon which could have potentially caused the alleged or apparent shortfalls. However, I have noted that Dr Worden has not attempted to consider any bugs other than those that were acknowledged by Post Office (for example, he has not done any analysis in relation to Dalmellington). Since my initial report, I have located several others which have impacted branch accounts, these can be reviewed in the table at 3.21 above.

5.308 At paragraph 689.1, Dr Worden concludes:

> *"[The conclusions I draw from analysing these three bugs are:] There are extensive robustness countermeasures in Horizon, of many types – so that even in the rare case of bugs like these which are not handled by the fully automatic countermeasures, manual countermeasures enable the bugs to be rapidly diagnosed and corrected, as soon as they are known about."*

5.309 It is not clear how Dr Worden has come to this conclusion. He states the previous sections that Callendar Square was active from 2000-2006 and that the Suspense Account Bug was not detected by automatic countermeasure at all and that there was a delay of a year in manually

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finding the bug (684.4). In my opinion that could not be diagnosed as: "rapidly diagnosed and corrected".

5.310 I have not seen evidence which is sufficient for me to conclude whether all Subpostmasters were compensated for their losses, which Dr Worden says "*the evidence appears to imply'* (paragraph 689.4).

Financial Impact of All Bugs – Main Analysis

5.311 In section 8.7, Dr Worden a mathematical approach by which he estimates the what he says is the maximum financial impact of all known bugs on Claimants' branch accounts. I disagree with the approach taken by Dr Worden, which rests on many assumptions I do not agree with, as I have explained above.

5.312 Dr Worden's approach also relies very heavily on KELs which are not a complete source of information.

5.313 Many of the KELs did not contain enough information to determine whether the root cause of an issue was a bug/error or defect or otherwise, or what it's financial impact was or could have been. I have previously explained the limitations of KELS in section 3 of my report.

5.314 Whilst I do not comment on the actual statistical analysis which Dr Worden has carried out, in summary, my opinion is that the analysis in this section (amongst others) of Dr Worden's report is unlikely to yield an accurate result because it is based on numerous assumptions and inferences which often have no technical foundation and which in some cases are factually inaccurate.

5.315 The correct answer to Issue 1 is that it is absolutely possible that bugs, errors and defects in Horizon caused discrepancies and shortfalls. This is known because, as a matter of fact, I have identified a number of bugs, errors or defects which have caused financial discrepancies, and it is extremely likely that there are (and have always been) unknown bugs. I do not know the exact financial impact of all of those bugs, errors and defects. However, I do not agree with Dr Worden that this is

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something which can be inferred through unsupported assumptions and an extrapolation of a very limited sample of the available evidence.

Alternative Approaches

5.316 In 8.8.1 of Dr Worden's report, he sets out a summary of his conclusion in his section 8.5. I have set out my responses to this section above (see "Scaling of Financial Impacts of Bugs" starting at 5.292 above. I do not agree with his conclusions because they are based on a number of assumptions which are neither technically sound nor factually correct.

5.317 In the remainder of his section 8.8, Dr Worden sets out his review of several alternative sources of information to use as a basis for estimating the financial loss incurred by Subpostmasters as a result of bugs, errors and defects in Horizon. I do not comment further on these sections which are variations of Dr Worden's previous statistical approaches, again based on numerous assumptions which I do not believe provide a good foundation for the calculations he then carries out.

Impact of Bugs on Individual Claimants

5.318 Section 8.9 in Dr Worden's report is an extension of his statistical analysis in relation to the financial impact of all bugs, errors and defects, to apply this to a single Claimant. This analysis is not within my expertise, but it is based on the same assumptions I have previously explained I consider to be flawed.

Dr Worden's "Qualitative Analysis"

5.319 In this section 8.10, Dr Worden provides further statistical analysis of the Claimants' claims and shortfalls. All of the points I have made above apply. I do not think this is the right approach. I provide further comments on this section to the extent it may be helpful, but make

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clear these comments are all subject to my general objection to this approach and its underlying assumptions.

5.320 At paragraph 804, Dr Worden states::

> *"The total claim is like a field, divided into 52,000 'plots' (monthly branch accounts) of approximately equal area. Bugs in Horizon are like raindrops, falling randomly and uniformly across the field. One would expect approximately the same number of raindrops to fall on each plot (each set of monthly branch accounts), apart from random fluctuations."*

5.321 In my opinion, this is not a technically accurate representation of how bugs affect an IT system. Bugs, errors and defects typically arise in a live environment as the result of a specific set of factors which were not considered (usually due to being unforeseen) when testing the system. These factors could relate to anything, but it is very unlikely that a bug would arise as a result of some combination of factors that would be utilised by all Subpostmasters as this would likely have been foreseen and fixed during testing (prior to go-live of the system or shortly afterwards).

5.322 Therefore, it would be very surprising for bugs that arise in a live system to affect all users in a uniform way (Dr Worden's "Raindrops Analogy"). Additionally, there is evidence which shows that this was not the case in relation to Horizon. For example, the "Branch Outreach Issue (Initial Findings)" document[290] dated 10 December 2015 states on page 10:

> *"88 different Branches had duplicate pouches over the past 5 years*
>
> *2 branches have had 5 occurrences*
>
> *1 branch has had 4 occurrences*
>
> *2 branches have had 3 occurrences*
>
> *9 branches have had 2 occurrences*
>
> *74 branches have had 1 occurrence"*

[290] Outreach BLE Extract Findings v6 091215.pptx, Branch Outreach Issue (Initial Findings), 10 December 2015 {POL-0220141}

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5.323 This document discusses two "potential separate issues" within the Horizon source code which appeared to start in 2010 and were scheduled to be fixed in January 2016 and reviews the branch impact over five years. Dr Worden's assumption is inconsistent with the fact that these bugs only affected 88 of the possible 11,000+ branches, with 14 of the branches suffering multiple occurrences of the issue and 74 branches only being affected once.

5.324 The same document also illustrates that there was a range of possible financial branch impacts, from £1 for some branches to £25,000 for others. Again, this is not consistent with Dr Worden's opinion that bugs affect all users in a uniform way.

5.325 As was set out in my first report at Paragraph 5.6 (Page 44), the Receipts and Payment Mismatch bug impacted 62 branches with the majority of incidents being recorded as occurring between August and October 2010.

5.326 In summary, there is no technical basis to assume that bugs/errors or defects impact all users or branches equally either in frequency or quantum. Additionally, the evidence provided to me suggests that this was specifically not correct in relation to the Horizon system.

Dr Worden's "Evidence used for Analysis"

5.327 I comment in this section on some of the graphs and analysis which Dr Worden has included in his report in relation to Claimant losses, where I believe there is relevant opinion evidence I can provide. I make clear that I do not hold myself out as having expertise in statistical analysis, and do not suggest that my comments below are a comprehensive response to this section of Dr Worden's report.

5.328 At paragraph 812, Dr Worden sets out the following graph which details the average monthly value of a claimant's loss against the total number of claimants who lost a smaller average monthly amount.

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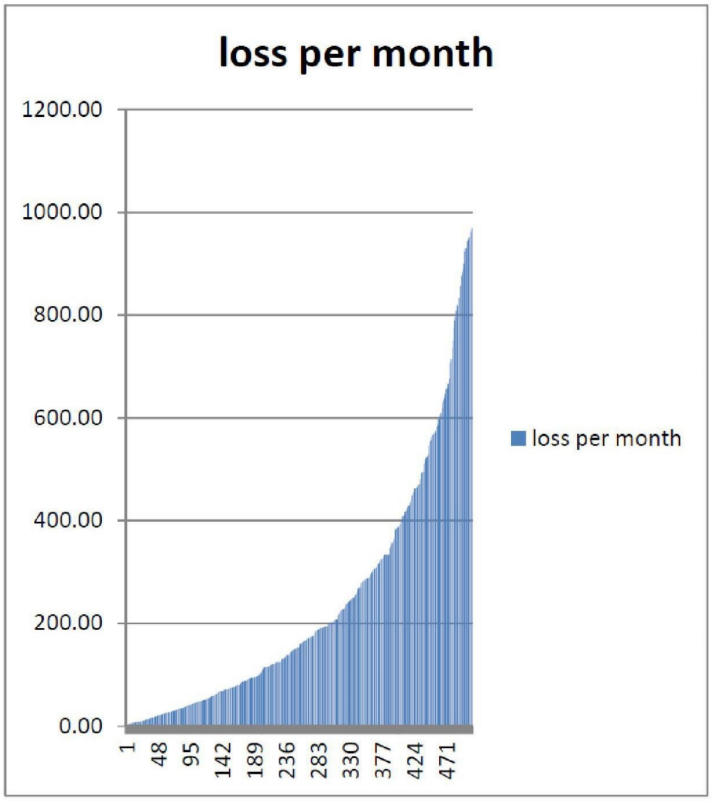


Figure 5 Graph of claimant's loss against the total number of claimants who lost a smaller average monthly amount (from Dr Worden's Expert Report)

5.329 At paragraph 815 Dr Worden states in relation to this graph:

> *"This graph on its own calls into question the idea that most of the Claimants' claimed losses were caused by bugs in Horizon - because one would expect bugs in Horizon to have affected all Claimants equally, apart from random fluctuations. This would have led to all Claimants suffering approximately equal losses per month - not to a 'low tail' of Claimants with very small losses per month, or a 'high tail' of Claimants with very high losses per month. Since the graph shows both a low tail and a high tail, it contradicts the hypothesis of random Horizon bugs impacting all Claimants. It is, however, consistent with the idea of losses being mainly caused by human error - with a wide range in the rates of human error in different branches."*

5.330 I disagree with Dr Worden in relation to this conclusion in three ways:

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a. "*This graph on its own calls into question the idea that most of the Claimants' claimed losses were caused by bugs in Horizon - because one would expect bugs in Horizon to have affected all Claimants equally, apart from random fluctuations…*" – There is no technical foundation for this assumption. An issue caused by a bug could arise from any number of factors and any combination of factors (technical or otherwise). It is therefore unlikely that bugs would affect all users in the same way, since all postmasters would not use the Horizon system in exactly the same way.

b. "*…This would have led to all Claimants suffering approximately equal losses per month…*" – Even if it was assumed that bugs affected all Subpostmasters equally, it is wrong to conclude that this would mean that the value of losses per month would be the same for all claimants. Bugs, errors and defects are, by definition, issues which cause unexpected results in software. Additionally, the impact of a bug, error or defect which affects (or arises as a result of) a transaction will likely depend on the value of that particular transaction at the time. Therefore, there is no technical reason to assume that there is any correlation between the likelihood of a bug's occurrence and the value of its effect. When Horizon fails due to a bug, error or defect it is typically the value of the transaction being processed at the time which determines the discrepancy. Furthermore, Dr Worden's assumption is inconsistent with what actually happened (see, for example, paragraph 5.324).

c. "*Since the graph shows both a low tail and a high tail, it contradicts the hypothesis of random Horizon bugs impacting all Claimants. It is, however, consistent with the idea of losses being mainly caused by human error - with a wide range in the rates of human error in different branches*." – As above, I don't agree with Dr Worden's position that bugs would affect all claimants equally. Additionally, it is not clear why Dr Worden has chosen these specific metrics for

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"equality". For example, because the evidence shows that it is possible for a bug to result in different values (e.g. paragraph 5.324), it would be more accurate to say that each claimant has an equal chance of a triggered bug that results in a small shortfall or large shortfall. If this were correct, then Dr Worden's graph at 813 would actually be consistent with the idea that bugs *were* the primary cause of issues since there is a consistent trendline from the "low tail" to the "high tail", which suggests that each claimant has an equal chance that a bug will result in a large or small shortfall, or somewhere in between. For the avoidance of doubt, I do not consider this measure definition of "equality" to be a good analytical method; it is a comment upon Dr Worden's analysis which, in my opinion, is flawed.

5.331 In paragraph 816, Dr Worden sets out the following graph which details the average loss per month of each claimant against the length of their tenure.

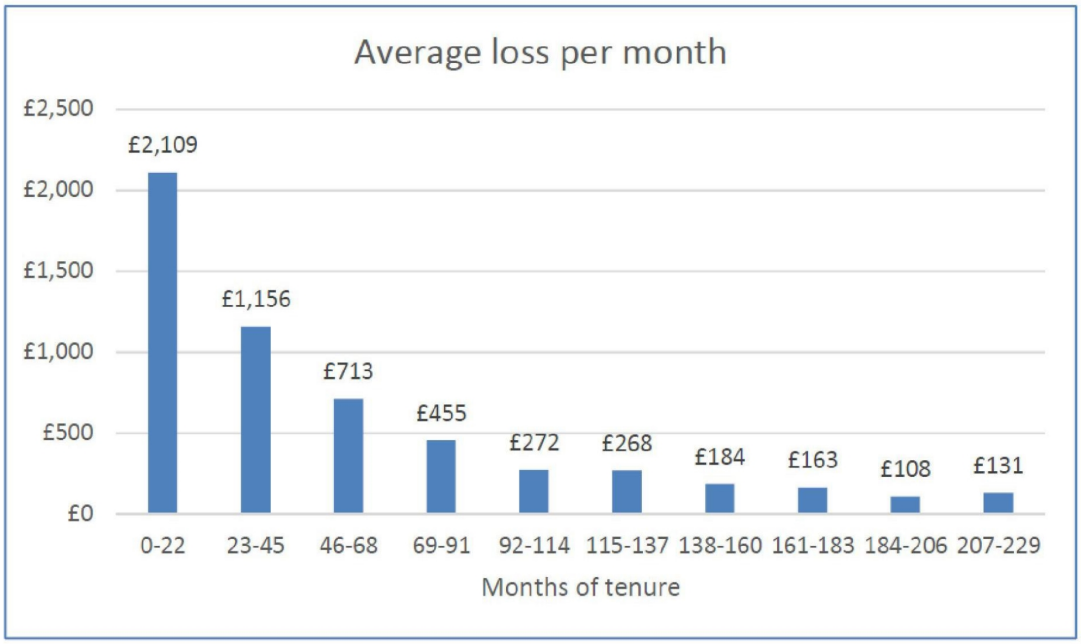


Figure 6 Graph detailing the average loss per month of each claimant against the length of their tenure (from Dr Worden's Expert Report)

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5.332 In isolation, this graph does show that there is a correlation between "average loss per month" and "months of tenure". On this basis, Dr Worden concludes:

> *"819. This chart is equally not consistent with a hypothesis that losses arose from bugs in Horizon. On that hypothesis, the mean loss per month would not vary with length of tenure, as it does in the chart.*
>
> *820. One possible interpretation of the chart is that Claimants with shorter tenures were less experienced, and so were more prone to make human errors which caused losses."*

5.333 I agree that "less experienced users" is one possible interpretation of the data within this chart. However, I would observe that another "possible interpretation" is that there is a correlation between the size of shortfalls which do not have a conclusively determined root cause and the likelihood that a Subpostmaster would remain in post (i.e. a Subpostmaster with a higher undetermined loss is more likely to leave or be removed) irrespective of whether the shortfall was caused by a bug, error or defect. For the avoidance of doubt, I am not suggesting that this is the correct interpretation; I am pointing out that this data does not necessarily imply that claimants with shorter tenures were causing shortfalls due to inexperience.

5.334 In paragraph 821, Dr Worden sets out the following graph which he states shows the number of claimants who were claiming losses per year.

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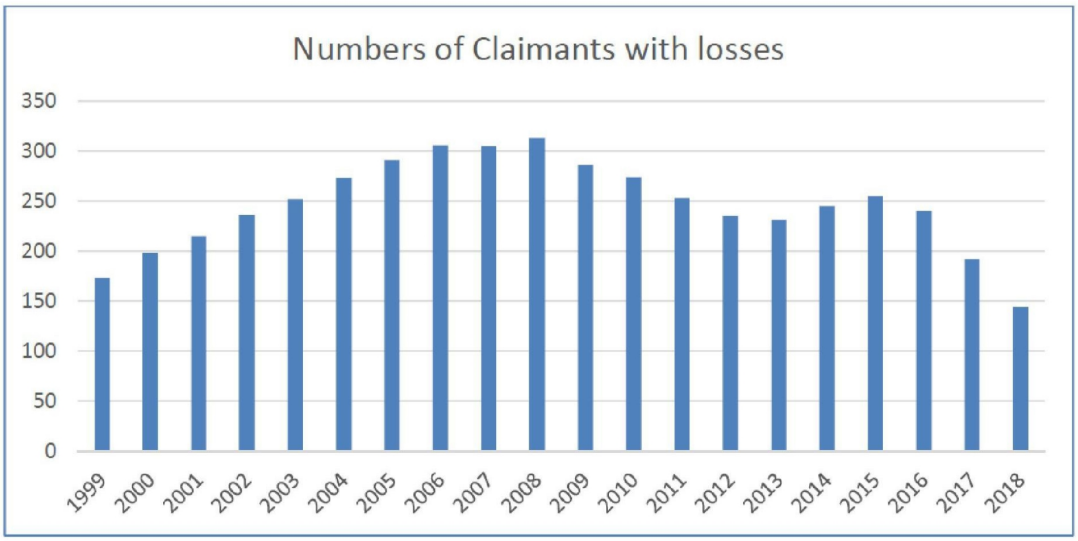


Figure 7 Graph detailing the number of claimants with losses per year (from Dr Worden's Expert Report)

5.335 If this data is correct, it appears that between 1999 and 2008, there is an upward trend which shows that more claimants were reporting losses over a period of 10 years. This is not consistent (from an IT systems perspective) with Dr Worden's conclusion that the vast majority of losses were caused by human error. As a general principle in IT systems implementations, you would expect to see more human errors when the system is first implemented (because it will be new to users), but for these to decrease over time as users become more accustomed to using the system.

5.336 It is unprecedented in my experience for user errors to increase over a period of 10 years.

5.337 It is also true that you would expect issues caused by bugs to decrease over time. However, this will not necessarily be the case if a system is subject to large amounts of change or if bugs, errors and defects are not dealt with effectively (if, for example, they remain undiscovered because the cause of an issue is incorrectly determined to be the result of a user error or if providing a fix in one part of the system creates an issue elsewhere). Where this is the case, it would not be surprising to

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find that more users are affected over time because they will gradually follow the series of steps necessary to trigger the bug.

5.338 Therefore, in my opinion, the numbers in this graph are inconsistent with Dr Worden's conclusion that claimed losses were much more likely to be caused by human errors than by bugs.

5.339 Further in paragraph 821, Dr Worden sets out the following graph which shows overall losses per year.

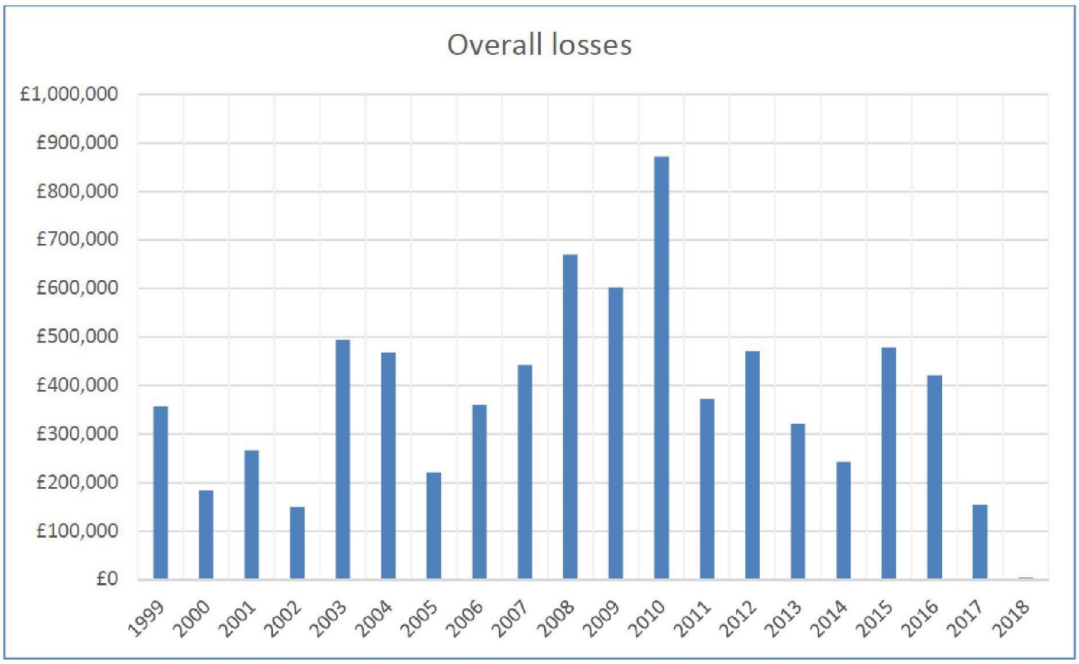


Figure 8 Graph showing overall losses per year (from Dr Worden's Expert Report)

5.340 Dr Worden states:

> *"I do not know the causes of variation in particular years, but it is clear that shortfalls were claimed to have been experienced from both Horizon and Horizon Online, in all years of their operation. Much of the variation may just arise from random fluctuations."*

5.341 I agree that the variations could theoretically have arisen as a result of "random fluctuations", but this could also be explained by the fact that bugs, errors and defects would not affect every claimant in the same way.

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5.342 Dr Worden further states:

> *"the broadly flat nature of this graph, with random-looking fluctuations for year to year, qualitatively contradicts the notion, as was put forward by Mr Coyne, that Horizon sometimes had 'bad periods' in which robustness countermeasures did not work well, and Claimants suffered large losses as a consequence. In my opinion, any such 'bad period' would extend over two or three years, while Fujitsu grappled with widespread problems. The graph does not show this pattern."*

5.343 I have three observations in relation to this position:

a. "*the broadly flat nature of this graph, with random-looking fluctuations*" – this graph is not flat, so I do not understand Dr Worden's reason for stating otherwise.

b. *"[this graph] contradicts the notion, as was put forward by Mr Coyne, that Horizon sometimes had 'bad periods' in which robustness countermeasures did not work well, and Claimants suffered large losses as a consequence*." – As above, this graph contains obvious fluctuations, from as low as ~£150k in 2002 and 2017 to as high as ~875k in 2010.

c. "*In my opinion, any such 'bad period' would extend over two or three years, while Fujitsu grappled with widespread problems. The graph does not show this pattern*" – there is no technical reason why a "bad period" would need to last 2-3 years. This is not consistent with my experience and I can think of no plausible explanation as to why Dr Worden would take this position as a general principle.

5.344 Dr Worden further states:

> *825. There was an obvious spike in Claimants' reported losses in 2010, which one might interpret as arising from the introduction of Horizon Online, and teething problems in the new system. In Angela Van Den Bogerd's Witness Statement at paragraph 183, she said that there was a mandatory cash check in all branches before the change to Horizon Online, which may have caused a temporary spike in declared losses. If*

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this is correct, it might account for the spike in 2010. Since many Claimants showed a pattern of not reporting losses for extended periods, followed by large 'lumps' of loss, this second account appears more likely."

5.345 In my experience, a major change to a platform will almost always lead to an increase in bugs, errors and other issues. Therefore, I do not agree that the mandatory cash check was "more likely" to be the cause of the spike in 2010. The most likely scenario is that both of these were factors.

Dr Worden's "Quantitative Analysis"

5.346 In Section 8.10.4, Dr Worden sets out his conclusions based on his analysis as set out in Appendix E. He states at paragraph 827:

5.347 I do not comment on the statistical calculations which Dr Worden has carried out, for reasons I have already explained. However as I have explained previously, I comment below on facts or assumptions where I believe this may assist the Court.

"If all the Claimants' claimed shortfalls arose from bugs in Horizon, or even if large part of them did, one would not expect to see a 'low tail' of many Claimants with small monthly shortfalls (as in the chart above), much less than the average shortfall of £359 per month, as claimed by all the Claimants."

5.348 From a technical perspective, there is no basis for the assumption that the likelihood of a bug's occurrence correlates with the value of a shortfall. By definition, a bug, error or defect is an issue which causes an invalid or unexpected result, so it is wrong to conclude that bugs will, on average, result in larger shortfalls. As set out in the example at paragraph 5.324 above, it is entirely possible for the same bug have a small impact on one branch and a large impact on another.

5.349 Within Appendix E, Dr Worden has made a lot of assumptions for which I believe there is no technical or factual basis, for example:

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a. At paragraph 379, Dr Worden assumes that bugs occur at random, and there is nothing about the behaviour or circumstances of any claimant which makes them more or less likely than any other claimant to suffer in any month from a Horizon bug which affects their accounts. I have set out my reasons for disagreeing with this assumption in the preceding sections.

b. At paragraph 380, Dr Worden assumes that, if it were claimed that some factor led to a higher incidence of bugs, then it would be necessary to show that claimants with high monthly losses were subject to that factor, and claimants with low monthly losses were not. However, as I have set out in previous sections, there is no technical basis for assuming that the likelihood of a bug's occurrence is proportional to the value of its effect. Bugs typically arise in live systems as a result of a specific set of circumstances which was not foreseen during testing. There is no reason that the effect of a bug needs to be large for it to be considered a bug, error or defect.

c. At paragraph 381, Dr Worden states that human errors would not affect all branches equally on average. I agree that this is likely to be the case.

d. At paragraph 383, Dr Worden assumes that bugs affect all branches equally in terms of "amount", except for small statistical fluctuations. As I have set out in previous sections, there is no technical reason to assume that bugs would have the same effect in all cases. In relation to Horizon, it is a matter of fact that this was not the case, as set out in paragraph 5.324 above.

e. At paragraphs 384 and 389, Dr Worden assumes that claimants with the smallest monthly average loss are the ones with the lowest level of human error (paras 384 & 389) and that, on this basis, these claimants give the "best" measure of the level of shortfall in their accounts per month from Horizon bugs. As above, there is no technical reason to make this assumption. A bug, error

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or defect could theoretically account for 100% of a claimant's claimed monthly loss (if, for example, they properly dealt with any human errors during their tenure).

f. At paragraphs 385 & 389, Dr Worden assumes that a sample of claimants with low monthly average losses can be scaled up to accurately represent the proportion of total losses caused by bugs across all claimants. As above, there is no reason to assume that bugs (or even any given bug) will affect all claimants equally.

g. At paragraph 385 Dr Worden assumed that losses from horizon bugs were never, or very rarely, cancelled out by gains from human error. No basis is given for this assumption.

h. At paragraph 387.5, Dr Worden assumes that bugs have an equal average effect on any given "claimant month". There is no technical foundation for this assumption, especially given that Horizon was continuously updated over the course of many years.

i. At paragraph 393 Dr Worden assumes that, by taking those claimants with the lowest monthly average loss, Dr Worden has selected those claimants who were "*luckiest in not suffering in bugs from Horizon*".

j. At paragraph 393, Dr Worden assumes that "good months" compensate for "bad months", so the amount of fluctuation between claimants is small. There is no technical foundation for this assumption as bugs could vary wildly in their effect. Additionally, this contradicts Dr Worden's graph (Figure 8.4) in his main report, which shows major fluctuations in overall losses from year to year.

k. At paragraphs 397 & 398 Dr Worden assumes that there is a "lucky claimant effect" which means that the fluctuations arising from the random nature of bugs cannot be more than a factor of 2. This is based on Dr Worden's assumption that bugs, errors and defects impact all claimants in the same way which, as I have set out

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above, is a position with no technical foundation and is factually incorrect in relation to Horizon.

l. In paragraph 401, Dr Worden assumes that the uncertainty caused by factors such as variation in the size of branches is small. Dr Worden gives no basis for this assumption.

5.350 In my opinion, it is very unlikely that an analysis which uses these assumptions as a basis will result in an accurate conclusion in relation to the percentage of losses that were likely to have been cause by bugs as opposed to human error.

Section 9: Reconciliation & Transaction Corrections

Overview

5.351 In my first report (at paragraph 6.38, page 105) I set out that Post Office had explained, in a response to my Request for Information, that 10,000+ transactions per week suffer from problems and are not automatically reconciled. I also explained that it was Post Office's view that these Reconciliation Errors were due to system faults (page 96 para 6.2) and that such system faults are corrected on a "cost benefit basis". When such reconciliation errors occur, Post Office utilise a largely manual process to resolve them.

5.352 Dr Worden and I both refer to one of the same documents in our respective reports.[291]

5.353 Dr Worden, at paragraphs 920 to 926, sets out a cost benefit process that Post Office might consider. His explanation involves considering administrative costs and balancing these with the reconciliation discrepancies. Whilst that might be one cost-benefit consideration for Post Office, I was instead making reference (paragraph 6.3, page 96) to Post Office's fix of Horizon system faults on a cost-benefit basis, then Post Office will need to consider its spend with Fujitsu, which I assume may be larger than administration costs. I have not had sight of any of

[291] SVMSDMPRO0012 - Reconciliation and Incident Management Joint Working Document.doc, *Reconciliation and incident Management Joint Working Document,* 18 March 2013 {POL-0219191}

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the contractual arrangements between Post Office and Fujitsu so I am unable to provide opinion as to what the costs of Fujitsu fixing faults might be. In my experience, fault determination and resolution costs can be many times that of administration and therefore the cost benefit analysis exercise could be different to that set out by Dr Worden.

5.354 Upon review of further material disclosed in relation to the responsive witness evidence I wish to make the following points:

5.355 It should be noted that Mr Paul Smith sets out in his 16 November 2018 witness statement[292] the percentage of transaction corrections that were successfully disputed. By successfully disputed I take this to mean that Post Office initially believed that the Subpostmaster was liable for the discrepancy but, when the Subpostmaster contested, Post Office investigated further and found this was not the case and therefore corrected the position.

5.356 I had originally considered that a Transaction Correction was only issued by Post Office after it had validated its liability assessment with all technical mechanisms and had examined data available in the Horizon audit logs. Only following these checks should Post Office believe that the Subpostmaster must have made a mistake.

5.357 However, on the contrary, 77% of 2,890 Transaction Correction disputes were upheld[293] in 2016/2017 in relation to Santander Manual Deposits.

5.358 Following this, it is difficult to conclude anything other than Post Office, after initially claiming that the Subpostmaster was liable for the loss, concluded that it had attributed liability incorrectly and that the loss was due to another undeclared reason (Post Office client mistaken, Horizon system fault or Post Office process failure, or others) – only after the

[292] {Witness Statement of Paul Ian Michael Smith, 16 November 2018}
[293] 10% of all Santander Transaction Corrections successfully disputed. As calculated by Dr Worden (1) at Para 993, taken from Mr Smith's witness statement

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discrepancy had been contested by a Subpostmaster prompting Post Office to investigate further.

5.359 Therefore, in summary, the above is evidence of Post Office assuming the Subpostmaster is liable and issuing a Transaction Correction before completing an examination of all data available in Horizon, including the Horizon Audit Logs.

5.360 Compounding this theme, data provided in Paragraph 31 of Mr Torstein Godeseth's 27 September 2018 witness statement[294] suggests the position that I set in 4.66 above, that only a fraction[295] of Transaction Corrections are validated using audit data.

5.361 Mr Paul Smith explains in his 16 November 2018[296] witness statement that:

> *"Post Office introduced a case management system that record each individual challenge to the TC in September 2018" and that; "individual challenges to TCs were not recording prior to this and therefore it is not possible to state what proportion of TCs have been challenged historically".*

5.362 The Transaction Correction dispute investigation process is set out in more detail in Ms Philips' witness statement of 28 September 2018.[297] She explains that the process of documenting information about the dispute by telephone, email or letter has only been in place since 2018 with the introduction of a "Branch Dispute Form". She explains, however, that the process had been in place since November 2016 but was undocumented. It is not stated what process was in place prior to November 2016.

[294] {Witness Statement of Torstein Olav Godeseth, 27 September 2018}
[295] Less than 0.67% of the total Transaction Corrections could have been investigated with Full Audit if less than 720 ARQs were requested by POL
[296] {Witness Statement of Paul Ian Michael Smith, 16 November 2018}
[297] {Witness Statement of Dawn Louise Phillips, 28 September 2018}

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5.363 Therefore, it is unknown if the appropriate information required to conduct a review of a disputed Transaction Correction was gathered prior to November 2016.

5.364 Similarly, it cannot be clear if the percentages of Transaction Corrections successfully disputed in recent years is the same for the earlier years of the Horizon lifetime.

Issue 5 – How, if at all, does Horizon system itself compare transaction data recorded by Horizon against transaction data from outside sources.

5.365 Reconciliation, the process by which the Horizon system itself compares transaction data recorded by Horizon against transaction data from sources outside of Horizon is dealt with in my first report at Section 6 (page 95).

5.366 In summary, reconciliation 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, or provide payments to external clients (where a negative discrepancy might occur).

5.367 Dr Worden and I agree on the basics of reconciliation with him stating:

> *For most of Post Office's clients (for whom Post Office branches carry out agency business) there is a regular automated process of comparing (reconciling) the transactions as recorded by Post Office, with the transactions as recorded by the client organisation.*
>
> *These comparisons might or might not be carried out within Horizon 'itself'; but in any event, because of the large volume of transactions, the comparison had to be automated.*

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Whenever the comparison revealed any discrepancy, there appeared to be a human process of deciding where to allocate responsibility for the discrepancy.

This had to be a human process and was therefore subject to errors.

If responsibility was allocated to a branch, it results in a TC, which the branch might accept or query before it entered the branch accounts.

There was also reconciliation of cash remmed from branches to Post Office cash management, or in the reverse direction

5.368 I find nothing contentious with what Dr Worden has stated, which accords with my understanding.

Issue 15 – How did Horizon process and/or record Transaction Corrections

5.369 Dr Worden accepts that the Transaction Correction process could lead to Transaction Corrections being issued in error and that, when disputed, some Transaction Corrections are retracted.

5.370 Dr Worden explains that in his view, Double Entry Accounting and Manual inspection of Data would provide some level of control of the Transaction Correction process, but as I have set out above at 4.94 and 5.357 in reference to the witness statement of Mr Paul Smith; if 77% of the Santander Transaction Correction disputes are upheld it does not appear that appropriate control is exercised by Post Office, or that such controls do not work.

5.371 Dr Worden explains at 924 and 925 that the administration costs of dealing with disputed Transaction Corrections would often exceed the amount of the Transaction Correction involved. I have not had sight of any Post Office administration costs for dealing with disputed Transaction Corrections and therefore cannot agree.

5.372 Dr Worden also sets out a number of different ways Post Office may choose to motivate Subpostmasters, this may not be as simple as Dr Worden suggests as the Post Office "outsources" a number of the central support costs, helpdesks as well as Horizon investigations to either

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ATOS or Fujitsu and therefore the costs and motivations will likely be more complex.

5.373 Dr Worden explains for his calculations in paragraph 931 that: *"...One may assume that any erroneous TC is likely to be disputed".* I do not agree with this assumption and this is at odds with that which Dr Worden expressed early in this same section (at paragraph 923) where he explains that Subpostmasters will take decisions *"on a cost-benefit basis designed to make best use of his own time"*. There are many other factual considerations which I think would need to be taken into account before deciding how likely it is that an erroneous TC would be disputed e.g. the evidence provided and how easy or difficult the dispute process is.

5.374 From paragraphs 935 in Dr Worden's report he calculates a value for the likely impact on Branch Accounts of incorrect Transaction Corrections and a number of assumptions are made which I believe are unsafe to make.

5.375 For example, at paragraph 936 whilst Santander may not account for a large proportion of the Transaction Corrections they may be relatively high value Transaction Corrections. Camelot does indeed account for a large number of the Transaction Corrections, but I could envisage that Camelot transactions may be relatively small (National Lottery tickets costing £1), when compared with Santander transactions.

5.376 Additionally, at paragraph 943 Dr Worden explains that the Claimants branches are on average three times smaller than the national average, based on number of transactions per day. It is my opinion however that the likely impact of incorrect Transaction Corrections on branch accounts would also be weighted by both the types of transactions and values of the transactions being processed when exposed to the bugs/errors and defects within Horizon and therefore must be taken into consideration.

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Conclusions

5.377 In my first report (at paragraph 6.38, page 105) I set out that Post Office had explained in a response to my Request for Information that 10,000+ transactions per week suffer from problems and are not automatically reconciled. I also explained that it was Post Office's view that these reconciliation errors were due to system faults and that such system faults are corrected on a "cost benefit basis". Since my first report, I have found in addition that it is also possible a number of these reconciliation errors might be caused by incorrect reconciliation data from external clients. It is also my opinion that Post Office are issuing transaction corrections to the Subpostmaster to attempt to modify branch accounts to correct these reconciliation errors before all of the possible checks are complete.

5.378 When such reconciliation errors occur, Post Office utilise a largely manual process to attempt to resolve them. Such manual checks would typically not include an Audit Request Query for Fujitsu to look at the audit logs and is subject to human error.

Section 10: Facilities available to Subpostmasters

Overview

5.379 My opinion in relation to this section is set out at paragraph 7.40 (page 125) of my first report and has not changed upon review of any further material provided in additional disclosure.

5.380 I have noted that at paragraph 954, Dr Worden has listed a number of assumptions he believes were made in my first report and then concludes that these rest on an unrealistic picture of how commercial IT systems are built, used and supported. Dr Worden does not set out where in my report these "assumptions" are made but, for the avoidance of doubt, they do not accurately represent my opinions. I have clarified my opinions in the table below:

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Dr Worden's Interpretation of My Opinion	**Dr Worden's Response**	**My Response**
954.1. It would have been a good thing to provide Subpostmasters with more information about the workings of Horizon than was given to them.	955.1. It is not a good thing to give the users information about parts of an IT system which they do not encounter in their daily work, and which they know very little about. They will be perplexed by it.	This is not an accurate representation of my opinion. At 8.11 in my first report, I state: "*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.*" This is restated in my conclusion at 8.20. There is no point in my report where I suggest that it would be a "good thing" to supply Subpostmasters with information about the inner workings of Horizon, and I have specifically set out that this is not the case (as above). My conclusion is that, as a matter of fact, Subpostmasters did not have access to the information that would have been required to identify the cause of a discrepancy if that discrepancy was caused by a system issue. This is part of my answer to Issue 9.
954.2. If there was a fault in Horizon, there should have been some	955.4. When the developers of an IT system discover some	This is not an accurate representation of my opinion.

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useful automatic way for Horizon to tell Subpostmasters what it was.	bug or defect in it, the best thing to do is to fix it, rather than to create some new error message to the users. 955.5. When an IT system gives results, which puzzle its users (for any cause), further automated messages from the system are only of limited help to users. They need support from a human being, who may need to take account of the circumstances and bring to bear a wide variety of knowledge.	There is no point in my report where I suggest that there should have been "some useful automatic way" for Horizon to alert Subpostmasters about Horizon faults, so it isn't clear to me where Dr Worden has taken this "assumption" from. At 7.15 in my first report, I stated: *"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."* This is reiterated at paragraph 3.4. As above, my report addresses the question about the extent to which Horizon itself alerted Subpostmasters of bugs, errors and defects (as I was instructed to do in Issue 2).
954.3. In the case of an anomaly, it was incumbent on the Subpostmaster to dispute the cause of the anomaly with Post Office.	955.6. Anomalous results may arise for a wide variety of reasons - from human error, to errors in processing at the back-end. Understanding the causes depends inevitably on cooperation between the user (who knows what he did) and support staff (who know much more about back-end systems). To portray this cooperation as a dispute is fundamentally misleading.	This is not an accurate representation of my opinion. There is nothing in my report which suggests anything like this so it is not clear to me how Dr Worden has come to this conclusion. At paragraphs 6.61-6.63 in my first report I have set out the process for disputing a Transaction Correction, but I have not suggested (and would not suggest) that it was "incumbent" on a Subpostmaster to raise dispute of the cause of an anomaly in all instances.

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954.4. In doing so, Subpostmasters could usefully use information about the back-end systems of Horizon to infer that some anomaly was caused by a bug in Horizon.	955.2. To anticipate the small proportion of cases where the IT system is in error, there is no point in trying to educate all the users in details and terminology of the system which will never concern them. 955.3. An IT system can give its users useful warnings and error messages in a variety of situations, but generally not in the case of previously undiscovered bugs in the system.	This is not an accurate representation of my opinion. See my response to 954.1.
954.5. Because Subpostmasters did not have all this information, but Post Office did, there was an asymmetry of information between Subpostmasters and Post Office - which Post Office used to unfairly attribute the effects of bugs in Horizon to human error by the Subpostmasters.	955.7. Staff and organisations who support an IT system have a strong incentive to understand bugs and to get them fixed, to reduce their future workload. They have no interest in leaving bugs unfixed, so the same problems keep recurring.	This is not an accurate representation of my opinion. As a matter of fact, there was an asymmetry of information. Dr Worden appears to agree with this given that, as above, he has stated: *"It is not a good thing to give the users information about parts of an IT system which they do not encounter in their daily work"* I have never suggested that Post Office used the asymmetry of information to "unfairly attribute bugs in Horizon to human error by the Subpostmasters" I have stated that Post Office had access to the information required to identify the existence and causes of bugs in Horizon and a Subpostmaster did not. This is matter of fact and it

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		is what I would expect the relationship to be between an IT systems supplier and a user. Therefore, Subpostmasters were reliant on Post Office to identify those issues that were caused by bugs. This is not a controversial position. It is a matter of fact based on the information that was available to each party. Furthermore, I did not suggest that staff and organisations have an interest in leaving bugs unfixed in my previous report. However, I agree that it is typically the case that organisation will look to resolve defects as soon as possible. However, Post Office outsourced the fixing of bugs to Fujitsu and the management of reference data to ATOS, which could mean there was a cost associated with certain activities related to bug-fixing. This could have led to the postponement of fixes in certain instances (e.g. if bugs would be fixed in an upcoming patch/release, or if a manual workaround was preferred).

5.381 Dr Worden reiterates these "assumptions" in paragraphs 961-979. My opinions remain as they are set out in the table above, and I have noted the following additional points.

5.382 In paragraph 968, Dr Worden states:

> *"Issue 2 appears to be asking - could Post Office have given its Subpostmasters automated support in Horizon, in the place of human support?"*

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5.383 This is not my understanding of Issue 2. For the avoidance of doubt, I have not interpreted the question in any similar way to Dr Worden. I have taken it literally and investigated whether the Horizon IT system itself alerted Subpostmasters of bugs, errors or defects as described in Issue 1.

5.384 At 969 Dr Worden has stated:

> *"Similarly, there seems to be an assumption behind Issues 9 and 14 that, given enough automated information, Subpostmasters could somehow identify the causes of shortfalls (deep inside Horizon), and might have the knowledge and persistence to 'dispute' them with Fujitsu support staff, whose job it is to look at such issues, and who would have a deep knowledge of Horizon internals."*

5.385 Again, I have not made any similar assumptions or interpretations. I have taken my instructions literally and answered the questions with a view that they do not need any changes based on my own interpretations.

5.386 At paragraph 973, Dr Worden states:

> *"A final assumption to be addressed here is that the support function would always start by assuming that any problem had arisen from an error in the branch and would not give sufficient credence to the possibility that it might have arisen from a software error."*

5.387 I have not made this assumption when answering issues 2, 9 and 14. Again, I have taken each question literally and answered it on that basis. I have not attempted to add any of my own interpretation to the meaning of the issues.

<u>Issue 2 – Did the Horizon IT System itself alert Subpostmasters of such bugs, errors or defects.</u>

5.388 Dr Worden's overarching conclusion in relation to Issue 2 is that "*Horizon did not, in general, alert Subpostmasters to any significant bugs or other defects in the system itself.*" I agree with this, as well as with the extract from the Joint Statement which states:

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> *"The extent to which any IT system can automatically alert its users to bugs within the system itself is necessarily limited. While Horizon has automated checks, which would detect certain bugs, there are types of bugs which would not be detected by such checks'."*

5.389 I have also noted that Dr Worden suggests at 89.7 & 955.7 that supporters of an IT system have a *"strong incentive to understand bugs and to get them fixed"* and then further at 974:

> *"In my experience any competent IT support operation is grateful to its users, when they draw its attention to any problem which can be fixed, to reduce the future costs of support"*

5.390 I agree with this as a general principle. However, Post Office outsourced the fixing of bugs to Fujitsu and the management of reference data to ATOS, who were likely to be operating under a Service Level Agreement ("SLA") which could result in a charge for Post Office whenever Fujitsu and ATOS needed to carry out certain activities. This could have led to fixes being postponed in certain instances (e.g. if bugs would be fixed in an upcoming patch/release, or if a manual workaround was preferred).

5.391 In the remainder of this section, Dr Worden reiterates his opinion that he would not expect Subpostmasters to have detailed knowledge of the system. I agree with this position.

Issue 9 – Subpostmaster Ability to Identify Existence & Cause of Discrepancies

5.392 The majority of this section reviews the information that was available to Subpostmasters which is not controversial.

5.393 Dr Worden's overarching view reiterates the position in the Joint Statements:

> *"The causes of some types of apparent or alleged discrepancies and shortfalls may be identified from reports or transaction data available to Subpostmasters. 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, because of their limited*

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knowledge of the complex back-end systems. Identification requires cooperation of Post Office staff and Subpostmasters."

5.394 I agree with this position.

5.395 In addition, I have made several other observations in relation to Dr Worden's conclusions.

5.396 At paragraph 958, Dr Worden concludes:

"In my opinion, from comparing human errors with software error rates in Horizon, most discrepancies are caused by human error. The functions available from Horizon, when used in accordance with Post Office guidance and procedures, enable Subpostmasters to identify the causes of such discrepancies…"

5.397 I do not agree that this conclusion is based on a solid technical foundation, as I consider Dr Worden's analysis in relation to software error rates to be flawed (see my response to Dr Worden's Section 8 above).

5.398 Furthermore, Dr Worden's analysis does not appear to account for issues caused by 3rd parties, which may well include human errors, that Subpostmasters would not be able to identify. Additionally, this conclusion does not consider issues such as the one highlighted in 5.23 (Page 47) of my first report which states:

"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). This would result in incorrect cash amounts being declared."

5.399 Where this is the case, even if a Subpostmaster followed the correct procedures, they would not (or at least not necessarily) be able to identify the cause of that discrepancy because the system would not be showing the correct information from which they could carry out that process.

5.400 I have noted that Dr Worden's conclusion is based on the calculations set out in his Appendix F. As I have set out at 5.349 above Dr Worden's

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calculations in Appendices E and F are based on an assumption that bugs affect all users equally (both in terms of frequency and impact). In my opinion there is no technical foundation for this assumption and, in this case, it is factually wrong.

5.401 Dr Worden further concludes at paragraph 92 (in relation to Issue 9):

> *"In my opinion, most discrepancies are caused by human error. The functions available from Horizon, when used in accordance with Post Office guidance and procedures, enable Subpostmasters to identify the causes of such discrepancies. Subpostmasters and their staff are the best placed to investigate such discrepancies, because they are the only people who have first-hand knowledge of what happens in their branches Post Office and Fujitsu support teams can only use their knowledge of systems and the data stored within them; whereas the Subpostmaster can use their knowledge of what happens in branch."*

5.402 In my opinion, this is not a complete picture. Although the support teams may not have been physically present when a discrepancy occurred, in practical terms they still have access to the same information as a Subpostmaster because that Subpostmaster could share the information with Post Office and additionally, Fujitsu has access to the full audit logs. With this shared knowledge, Post Office should then be in the best position to identify the causes of discrepancies (whether caused by software bugs or human error), and to advise on how to use the system to rectify the situation.

5.403 Additionally, it is noteworthy that Subpostmasters were not the only staff in branch, so it is also possible that they would not have been physically present when a discrepancy occurred.

<u>Issue 14 – Horizon Functionality</u>

5.404 Dr Worden's overarching opinion in relation to this issue is that it is a matter of fact because it addresses how Horizon dealt with certain issues, which Dr Worden has set out the specific subsections. My observations to each of these are:

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a. 10.5.1 in Dr Worden's Report (Comparing Stock and Cash) – Dr Worden's account of this is high-level but it is not controversial.

b. 10.5.2 in Dr Worden's Report (Resolve Discrepancy) – Again, Dr Worden's review in this subsection is high-level but, for the most part, it is not controversial. I have noted his position is that the process for disputing a discrepancy is said to be outside of scope, but in my view this process does have to be considered as part of an overall analysis of the facts. I have set out the process for disputing a Transaction Correction at paragraphs 6.61-6.63 in my first report.

c. 10.5.3 in Dr Worden's Report (Recording Disputes) – As above. In addition, I have noted that Dr Worden's statement that a discrepancy is not recorded as a debt or credit in Horizon contradicts the agreement document produced in the Common Issues Trial Flowchart 1 – Transaction Corrections which states that, following the issue of a Transaction Correction, opting to 'Settle Centrally' results in:

"A corresponding debit or credit is made in the SPM's customer account with Post Office. If a debit, this will be treated as a debt by Post Office unless the SPM contacts NBSC to lodge a dispute, which should suspend collection until the dispute is resolved."

d. 10.5.4 in Dr Worden's Report (Accounting Statements) – Dr Worden's review in relation to this point is not controversial.

e. 10.5.5 in Dr Worden's Report (Continuing to Trade) – I agree with Dr Worden's position in paragraph 1041 or his report (i.e. I have not seen any specific evidence that the Horizon system prevented Subpostmasters from trading until they produced a Branch Trading Statement). For clarity, the statement at 7.39 in my previous report relates to restrictions imposed by the business process rather than a technical constraint.

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5.405 In Section 10.6, Dr Worden comments on my report. There is nothing substantially different between his comments in this section and the above section, so my opinions are as set out above.

Section 11: Facilities available to Post Office & Fujitsu

Overview

5.406 In this section Dr Worden has grouped the Horizon Issues differently to the groupings I adopted in my first report. For the purposes of readability, I will respond as per Dr Worden's groupings with regards to dealing with Issue 8 in this section (I did not group Issue 8 with the remote access issues in my first report). However, Issues 7, 10, 11, 12 and 13 all relate to remote access elements and permissions and are interlinked and I shall therefore group those in my responsive analysis.

5.407 I feel it is important to note that in consideration of my opinion in this section:

a. Throughout my review of PEAK records within this dispute, I have noticed that the procedure for Fujitsu to perform modifications to branch data was often subject to an "OCP" request, sent to Post Office for approval. I have requested, several times (RFI Appendix A), the OCPs in relation to financial accounting corrective fixes applied within Horizon. This was provided 24 January 2019 but I have not had time to consider this.

b. In relation to the Transaction Correction tool Referred to within Issue 10 of this report. I have requested the audit file of its usage, in order to support or disprove my opinion that this tool has been used more than once. Note that even if has indeed only been used once, Balancing Transactions could still be conducted by Fujitsu SSC (in Legacy Horizon) and through Privileged User access in (Horizon Online).

5.408 I feel it is also important to note that in addition to the conclusions in my first report (paragraph 7.40, page 125) in respect of Issues 7,10, 11, 12 and 13, additional material disclosed, and review of the

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Responsive Witness Statements have furthered my understanding in respect of the following points:

a. Mr Godeseth (and subsequently Dr Worden) state that only one Balancing Transaction has been performed (using the Transaction Correction tool) by Fujitsu. However it is evident that more than one Balancing Transaction has been conducted by Fujitsu. More detail in relation to this is provided under Issue 11 in this report.

b. The PEAK and Responsive Witness Evidence has enabled me to conclude that there are gaps in the evidence of how those bugs acknowledged by Post Office were handled, and I cannot say with confidence that I believe they were investigated appropriately, or as efficiently as the Witness Statement of Mr Godeseth or the report of Dr Worden suggest.

Issue 8 – Post Office Ability to Identify the Existent & Cause of Discrepancies

5.409 Dr Worden has limited his review in relation to Issue 8 by interpreting the word "alleged" to mean that only shortfalls reported by Subpostmasters should be considered. I have not limited my analysis in this way.

5.410 Dr Worden's overarching opinion is that by virtue of its role in the end-to-end business, Post Office has access to information not available to Subpostmasters and vice versa.

5.411 I agree with Dr Worden's opinion that Post Office had access to branch transaction data and that Post Office had access to data which would not have been available to Subpostmasters. However, it is not clear what information Subpostmasters would have access to that could not be obtained by Post Office when trying to determine the existence and causes of shortfalls. If Dr Worden is referring to information obtained by Subpostmasters through their day-to-day responsibilities of running a branch, then he is correct in the sense that Post Office would not have

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the same first-hand knowledge of what happened in branch. However, in practical terms, Post Office would be able to access the information available to any Subpostmaster because they could communicate with that Subpostmaster. Additionally, it is possible that Subpostmasters would not have been physically present for a given transaction because they would not necessarily be the only staff member operating in branch, so they themselves could be missing that granular level detail.

5.412 In relation to Issue 8 overall, Dr Worden suggests that all events are accurately recorded and properly actioned. See, for example, paragraph 1087 the statement that Horizon "*generates events whenever something unexpected happens…and prompts actions, either automatically or manually by operations staff.*". Although this is the intended outcome of the Horizon system and is likely to have been correct in most instances, there is evidence that bugs, errors and defects have occurred which were not noticed until a Subpostmaster reported an issue, indicating that attention to events may not have been sufficiently paid. There is also evidence that reports were being issued with erroneous data due to software bugs. See, for example, KEL CCard2053P [298] where the totals on a Sales Report were reported to be higher than the number of transactions listed on the corresponding transaction log or office snapshot. This was due to recreated stock units doubling up on sales reports.

5.413 In the previous paragraph of his report, Dr Worden asserts that when investigating anomalies reported by Subpostmasters, Post Office use Credence and their other Management Information Systems in the first instance but when they need to confirm the transactions handled in a branch, they can also ask Fujitsu to retrieve the corresponding data from the audit.

5.414 As I have previously stated, there are limitations with this procedure. Post Office might be satisfied that Credence or their other Information

[298] CCard2053P, 21 December 2005, {POL-0035339}

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Systems reflect the true account of the data and subsequently advise or make a decision on a TC that the Subpostmaster is liable to settle, based on an incorrect decision as the underlying data set was not comprehensive enough in the first instance (Helen Rose Example)

Issues 7 – Were Post Office and/Or Fujitsu able to access transaction data recorded by Horizon remotely (i.e., not from within a branch)

5.415 Dr Worden limits his review of Issue 7 on the basis that his interpretation of Issue 7 defined "access" as "access to read". I have considered "access" in its technical sense (as in a computer system to "access" memory) to mean both read and write. However, I agree with Dr Worden's statement that both Fujitsu and Post Office were able to read data remotely. I also agree with Dr Worden in relation his consideration of what constitutes transaction data however I would also include any transactional products received from Post Office processing departments such as Cash Pouches (the value of which would have to be input to the branch system).

5.416 Additionally, (as set out in my first report), it was possible for Fujitsu to perform modifications and deletions as they could run commands on the counter machines in branches accessing and querying the hard disk, which they could do through remote *access*.

5.417 Fujitsu also had the capabilities of performing modifications and deletions within the branch's database (latterly the BRDB for Horizon Online). This is expanded further under Issue 11 commencing at page 249.

5.418 It is agreed that remote access and remote control facilities would be required for Fujitsu support purposes.

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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?

5.419 At paragraph 1091 of his report, Dr Worden states that he has examined the Second Witness Statement of Mr Godeseth and where it addresses Issue 10 finds it consistent with how Horizon works. I note however that the majority of Mr Godeseth's opinions that might relate to Issue 10 (inserting, injecting editing or deleting transaction data – Fujitsu) are actually contained within his first Witness Statement, in which, I have previously documented that I have found inconsistencies (see Section 4 Defendant's Responsive Witness Statements – Torstein Olav Godeseth[299]).

5.420 I agree with Dr Worden that 'inject' means the same as 'insert'.

TCs and TAs

5.421 Within this section (11.6.2) Dr Worden considers TCs and Transaction Acknowledgements and states that he does not class them as 'injected' transactions.

5.422 I disagree with Dr Worden that TCs are not inserted transactions, which I would categorise as follows:

a. Transactions inserted by Fujitsu NOT obviously visible to the Subpostmaster (i.e. balancing transactions inserted into the MessageStore / BRDB and at other points within Horizon processing systems past the Counter).

b. TCs – whilst these are visibly acknowledged and accepted by the Subspostmaster, they are still inserted into the branch accounts to correct errors. Although Subpostmasters may be able to dispute them and delay acceptance, this is ultimately in terms of liability for whether the Subpostmaster is responsible for the funds. Where

[299] {Second Witness Statement of Torstein Olav Godeseth, 16 November 2018}

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a dispute is accepted, a compensating Transaction Correction is issued, therefore, the Subpostmaster has no choice but to accept an insertion into their accounts.

c. Prior to TCs, I do not consider manual entry of error notice amounts to be inserted transactions, as the Subpostmaster is responsible for entering them on their system, which differs from TCs as they are resident within the accounts electronically.

d. TAs are considered to be acknowledged insertions. Since they are visible to the Subpostmaster, as with TCs, they are electronically received and inserted into the accounts upon acceptance.

5.423 Fundamentally, there are two principles to the above, Fujitsu have the ability to insert transactions to fix errors outside of the Subpostmaster's knowledge and without their permission which may not be visible to the Subpostmaster (see paragraph 3.235), and secondly, Post Office have the ability to electronically insert transactions that are acknowledged and visible to the Subpostmaster, in the form of TCs and TAs.

5.424 A few examples of Fujitsu editing and deleting records from the Horizon branch database are set out in 21 December 2018 disclosure of MSC records:

a. Contained within the MSC Documents provided[300] the lines serialised with the codes 043J0262492, 043J0264220 and 043J0265130 record the steps followed to resolve "The Business Problem: *To prevent us having to talk unhappy PMs through the complicated workaround described in KEL acha3347Q[301] we need to remove any declarations belonging to stock units deleted since 15th May".* These steps display the command *"delete from ops$brdb.brdb_branch_decl"* which I believe will delete records from the branch database. The document suggests that this will

[300] MSC_RTI_Answers_POA(1).csv, *MSC_RTI_Answers_POA* {POL-0444103}
[301] KEL acha3347Q, 5 February 2010 last updated 2 September 2010 {POL-0037767}

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address errors in the branch database caused by an early Horizon bug. These MSC records are also recorded in the PEAK reference PC0199654.[302]

b. Document 043J0265683 records the steps followed to resolve; *"Current Business Position: There are duplicate rows coming through from BRDB into BRSS.Exact cause is yet unknown.".* These steps display the command *"DELETE FROM ops$brdb.brdb_pouch_coll_details"* which I believe will delete records from the branch database. The document displays a question; *"Does this change need to be assessed by POL?:"* the answer in the document is shown as *"No.Involves BRSS only"*

c. MSC043J0355958 records the "SQL insertion" of "Dummy Transaction Acknowledgement" into the branch database to correct a fault within Horizon that was later fixed. This record suggests that the same process had been completed previously under record MSC043J0348236.

Global Users

5.425 Global Users are clarified further to my initial report at paragraph 4.11 to 4.19 of this report in response to points addressed by Mr Godeseth in his Responsive Witness Statement. In summary, Mr Godeseth states that a person must be physically present in a branch to enter a transaction for that branch. Dr Worden makes the same statement. However, I have reached a different understanding (as set out at 4.11 to 4.19 of this report).

5.426 Dr Worden implies at section 11.6.4 of his report that DBAs would not misuse their power in carrying out tasks they should not. The issue is whether Fujitsu COULD insert, edit and delete transaction data, to which the answer is yes, they could. I do not believe that Dr Worden has reviewed or observed Fujitsu's process compliance in the event of all such activities because to do so would be an extremely lengthy task.

[302] PEAK PC0199654, 28 May 2010 {POL-0369488}

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For example, it is stated that Fujitsu cannot alter any branch transaction data without permission from Post Office. From PEAK observations, it is clear that sometimes this is requested via an OCP which is approved yet other times it appears to be granted by a different method (such as textual agreement in the form of an email or a comment – see PC0256213[303]) and Fujitsu proceed upon that basis. I do not believe Dr Worden has audited every single transaction amendment to ensure that policy was followed in every instance.

5.427 Also, it is not (in my opinion) a question of whether DBAs misused their powers, it is more important to consider (in respect of their actions) whether they might have erroneously (without intent) modified data.

Balancing Transactions

5.428 Dr Worden and I agree that Fujitsu SSC had the ability to insert Balancing Transactions (BTs) using the 'Host BRDB Branch Correction Tool' into certain tables in the BRDB (Horizon Online Branch Database).

5.429 It is important to note however that SSC would also have the ability to perform balancing transactions via direct SQL operations (using a command line type interface) to perform corrective transactions on other database tables within the BRDB outside of the corrective tool usage, via the use of Privileged User access (Horizon Online).

5.430 Where Dr Worden proceeds to state "Branch Trading Statement" within this section, I have interpreted that it is typographical error and should read "BT" or Balancing Transaction.

5.431 At paragraph 1113, Dr Worden re-states Mr Godeseth's evidence that BT's are clearly visible in the transaction reports that are available to Subpostmasters.

5.432 It is important to note that in my opinion, it is not quite so simple or obvious as Dr Worden or indeed Mr Godeseth set it out to be.

[303] PEAK PC0256213, 29 December 2016 {POL-0424338}

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5.433 BTs entered directly into the Branch's Database would only be identifiable as a transaction on the day that the corrective action was performed. Therefore they would feature within a different Audit File than the original erroneous transaction.

5.434 Using the example of the one BT that is acknowledged by Post Office and in the Witness Statement of Mr Godeseth contained in PEAK PC0195561:[304]

5.435 On 02 March 2010 a Transfer Out of £4000.00 doubled up to £8000.00 due to a Horizon error, the suggested correction by Gareth Jenkins (Fujitsu) was for support to use the Transaction Correction Tool[305] to insert two records into the database to negate the duplicate Transfer Out. The PEAK record documents that support performed this corrective action on 11 March 2011. Therefore, it would not be until the 11 March 2011 that the additional inserted corrective transactions would be identifiable within audit records.

5.436 I have already set out my opinion on this point in response to Mrs Angela Van Den Bogerd 4.71 above. Further, aside from Subpostmasters allegedly being able to identify it as a transaction carried out from Counter 99; for it to be "clearly identifiable" to the Subpostmaster, or anyone inspecting the branch accounts it would require:

a. The Subpostmaster/inspector of the accounts knowing which particular transaction went awry in the first place (this might not be immediately visible in a branch processing many transactions per hour);

b. The implications of the incident and error fully known by both support and the Subpostmaster/inspector of the accounts in order to identify where any corrective action might be applicable or identifiable;

[304] PEAK PC0195561, 4 March 2010 {POL-0365465}
[305] DEVAPPLLD0142.doc, *Host BRDB Transaction Correction Tool Low Level Design*, 13 November 2007 {POL-0032866}

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c. Support and the Subpostmaster/ inspector of accounts knowing the specific date and timeframe that any corrective actions were performed, how they were performed, and their impact in order to redress the reports or logs in which it might be reflected as rectified. This would be largely dependent upon:

i. Support communicating to the Subpostmaster/inspector of the accounts how they were going to implement a fix and when (where the error was known by the Subpostmaster or if not known, informing the Subpostmaster in the first instance of the error);

ii. Support ensuring that the corrective fix was performed correctly;

iii. Subpostmasters indeed knowing what a Counter 99 transaction was.

d. Post Office being fully aware that the error was Horizon generated and therefore not the fault of the Subpostmaster or issuing a Transaction Correction to remedy the imbalance.

5.437 I note that the OCP (Operational Corrective Procedure) for the above corrective fix has been disclosed by Post Office[306] but contains limited information (in respect of the requirements I have listed above).

5.438 In summary, it is my opinion that more than one BT has been conducted by Fujitsu, for the following reasons:

i. PEAK PC0195962[307] created 12 March 2010 relates to the Transaction Correction tool and states:

"The Transaction Correction tool has now been used in live. The templates for use with this tool need to be updated to correct some details. Gareth Seemungal is aware of the corrections needed…

[306] OCP 25882, 10 March 2010 {POL-0440067}
[307] PEAK PC0195962, 12 March 2010 {POL-0365857}

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…The proposed fix would correct and update the BRDB transaction correction tool templates, making it less likely that mistakes will occur when SSC are trying to resolve problems with transactions in BRDB."

This suggests that the modifications and balancing transactions conducted by Fujitsu support staff within the BRDB is not unusual.

ii. Fujitsu were able to insert balancing transactions outside of utilising the Branch Correction tool referred to above. Balancing transactions were not limited to Horizon Online. The PEAKs detailed in the Horizon Issue 10 PEAKs at Section 3 above indicate which of those that relate to balancing transactions.

iii. One of the deleted KEL's, cardc262S[308] under the heading "Solution – ATOS" includes the rather matter of fact statement; *"The transaction Correction tool should be used to correct it (this will need an OCP and probably POL approval too)".* It is not clear if the suggestion is that ATOS should use the transaction correction tool, or if ATOS are suggesting to Fujitsu or Post Office that they should use the transaction correction tool.

Transaction Injection in Legacy Horizon

5.439 In relation to transaction injection in Legacy Horizon, Dr Worden relies further upon the first Witness Statement of Mr Godeseth. Dr Worden acknowledges that in Legacy Horizon, SSC could also inject transactions into branch accounts, which I agree.

5.440 In a similar vein to detecting balancing transactions in Horizon Online, Dr Worden therefore concludes that SSC users could update branch accounts without the consent of the Subpostmaster, but not without their knowledge, since the Counter ID would be greater than 32. For the reasons set out above, at paragraph 5.441 below, I disagree that the visibility of the modification would be so simple or obvious to the Subpostmaster.

[308] KEL cardc262S, 9 March 2010 last updated 4 May 2010 {POL-0448597}

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5.441 Further, Mr Roll in his second Witness Statement dated 06 January 2019 states at paragraph 20 that the method which would display a counter position greater than 32 could be circumvented. Mr Parker in his statement served in response has now said this is correct, and could be done, which in my opinion is significant. Where this was the case, any transactions inserted as though they came originally from the Counter would not be obvious to the Subpostmaster at all.

5.442 It is my belief, that in review of the PEAKs documented in Section 3 'Evidence of Insertions/Deletions within Branch Accounts (Horizon Issue 10) of this report, that SSC could not only inject/insert or edit transaction data but delete instances of it (and/or operations relating to it, which are of equal importance) also.

5.443 At paragraph 1117 I note that Dr Worden inherits his opinion from the evidence provided by Mr Godeseth that messages from the message store (in Legacy Horizon) could not be updated or deleted. However, in my analysis of the PEAK records at Section 3 ('Evidence of Insertions/Deletions within Branch Accounts (Horizon Issue 10)', I have demonstrated that this is not the case. One example of an update (of which further detail can be found in the aforementioned Section 3) is as follows:

5.444 PC0130275[309] created 21 December 2005 (further detail provided at 3.230 of this report). states:

> *"…This has resulted in a gain of approximately £18000.*
>
> *We are unable to correct the system figures safely. We can however provide accurate figures for what should have been in the Final Balance for BB, to enable POL to make the correction perhaps by using a Transaction Correction.*
>
> *POL need to make a decision on whether they are able to correct the problem in this way, however we do not see any other alternative.*

[309] PEAK PC0130275, 21 December 2005 {POL-0300707}

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Corrective action should be taken before 11th January when the branch is due to roll into TP10…

… If we get to the problem before the office is rolled we are able to change objects in the messagestore to reset the stockunit back to the CAP (TP) rollover trailer. The PM can then rollover. PM should get a large shortage which cancels out the large gain.

We don't want to be having to do this as making manual changes to the messagestore is open to error and each time we have to seek authorisation from POL to make the changes."

5.445 A further example of deletion (of which there are more at Section 3) is:

5.446 PEAK PC0057909[310] dated November 2000 (further detail provided in Section 3 at paragraph 3.249) refers to an issue occurring as a result of a branch's counter base unit replacement, and sets out:

"Can development please investigate on whether there is a deficiency in Riposte and what can be done to stop this happening again. Also, need advice on how to get the messagestores in sync and to include the missing transactions. I suspect we will need to trash the messagestores on counters 2 and 3 and insert the missing messages onto counter 1 (or can the PM get away with inputting the transactions). Some of the transactions are APS. Also how will this affect their balancing. They are currently in CAP 34."

5.447 I assume "trash the messagestores" to mean delete them and potentially rebuild them

5.448 In relation to Dr Worden's comments with regards to the second witness statement of Mr Roll[311]. I have provided comments on this at paragraph 5.482 in relation to Dr Worden's assertions regarding transaction injections and how and whether these could be identified by user. Mr Roll's witness statement disputes this view, and this is further evidenced at paragraph 4.83b and 5.441 of my report where he confirms that SSC

[310] PEAK PC0057909, 15 November 2000 {POL-0232732}
[311] {Second Witness Statement of Richard Roll, 16 January 2019}

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did inject transactions at the counter in such a way they would appear on the transaction log as if they had been inserted within the branch.

Privileged Users

5.449 In respect of paragraph 1122 of Dr Worden's report, I agree that it would be necessary for Fujitsu support staff to have access privileges used to edit or delete transaction data in the BRDB. Where Dr Worden states that there is little need to use privileged access to manipulate transaction data to resolve an error, I agree that in theory it SHOULD be this way. But evidence suggests that this was not the case in actuality.

5.450 Dr Worden states (at paragraph 1123) that any change to a transaction performed by a Privileged User would be visible to branch staff. However, in my opinion, there are several points to note in relation to such a statement:

a. Witness evidence suggests that whilst amended transactions would become visible within branch reports they would carry no indicator that they had been performed by a Privileged User. Therefore, in my opinion, Dr Worden is overstating the obviousness of their visibility;

b. It is unlikely that a Subpostmaster would know of the audit process within Horizon not least be informed to enquire or request that Post Office look to that to identify discrepancy;

c. As with the visibility of Balancing Transactions, identification of the modification would require:

i. The Subposmtmaster/inspector of the accounts knowing which particular transaction went awry in the first place (this might not be immediately visible in a branch processing many transactions per hour);

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ii. The implications of the incident and error fully known by both support and the Subpostmaster/inspector of the accounts in order to identify where any corrective action might be applicable or identifiable;

iii. Support and the Subpostmaster/ inspector of accounts knowing the specific date and timeframe that any corrective actions were performed, how they were performed, and their impact in order to redress the reports or logs in which it might be reflected as rectified. This would be largely dependent upon:

iv. Support communicating how they were going to implement a fix and when to the Subpostmaster/inspector of the accounts (where the error was known by the Subpostmaster) or if not known, informing the Subpostmaster in the first instance of the error;

v. Support ensuring that the corrective fix was performed correctly;

vi. Subpostmasters indeed knowing what a Counter 99 transaction was.

vii. Post Office being fully aware that the error was Horizon generated and therefore not the fault of the Subpostmaster or issuing a Transaction Correction to remedy the imbalance

5.451 All of the above is only relevant in the case of transactions that were investigated and modified due to a disputed transaction that the Subpostmaster was aware of.

5.452 Fujitsu has no policy, process, procedure or operational practice that calls for it to use its privileged access to edit or delete transaction data.[312] Therefore, if Privileged User access was being used (which I opine that it was) there is no clear process for it. This introduces a high

[312] {Witness Statement of Torstein Olav Godeseth, 27 September 2018}

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element of risk as users were not effectively governed or constrained by any form of compliance for its use.

5.453 I understand that prior to July 2015, only log on and log off activities for Privileged Users were recorded. It is stated in Mr Godeseth's first witness statement at paragraph 59.6) that such were recorded in a Master Service Change (MSC) document. Whilst Post Office have set out in their letter dated 21 December 2018 that Privileged User Logs can only be provided back to 2009, in my opinion this should still encompass approximately 2 years or so of Legacy Horizon Privileged User access. I have provided my analysis (and subsequent limitations of it) in relation to the MSC disclosure provided to me at Section 3 of this report. In summary, through the nature of the way the disclosure was provided, it has not been possible to determine where within it, or even if within it, Privileged User access is recorded for Legacy Horizon. This could be something perhaps further explored in mine and Dr Worden's next Joint Statement, seeking the assistance of Post Office/Fujitsu to interpret the complexities of the data, to derive a more succinct quantitative record of Privilege User access for Legacy Horizon in the form of simple numeric values per year. Whilst I appreciate that Post Office have set out some high-level guidelines in respect of how to interpret the data, I have faced difficulties with the instructions provided. That, and in combination of its delayed disclosure, I have therefore not had sufficient time in my reporting to effectively analyse the data information provided.

5.454 I understand that Post July 2015, all access and actions (not just log on and log off) was recorded to an Oracle audit table. As aforementioned, I have faced difficulty in interpreting the Privileged User disclosure, full details of which are set out at Section 3 'Privileged User Log Disclosure'. As previously stated, this could perhaps be further addressed in the second Joint Statement to be prepared by myself and Dr Worden.

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Implement fixes in Horizon that had the potential to affect transaction data or data in branch accounts

5.455 Dr Worden and I agree that fixes implemented by Fujitsu had the potential to affect transaction data or data in branch accounts.

5.456 I note that within this section Dr Worden diverges somewhat from assessing what corrective transactional fixes performed by Fujitsu might further affect transaction data or data in branch accounts and instead focusses on fixes to reference data and software.

5.457 I agree with Dr Worden that all of the above could be carried out without the consent or knowledge of the Subpostmaster. Whilst I agree that there would not typically be a need for standard changes in relation to software and reference data being communicated to Subpostmasters, I believe that in circumstances such as widespread system releases, major product changes and any other identified significant modification that could affect their financial position, in my opinion, it would not have been harmful to notify them. Typically, in industry, when major software releases are rolled out, end users are notified. For example, a Window's upgrade on a personal computer, the end user of that system is prompted to accept the upgrade.

5.458 Effects on transaction data should not only be considered in respect of balancing transactions or transaction data concerning monetary value. Financial account accuracy involves much more than just ensuring the double entry principle is applied. A Subpostmaster's branch account accuracy is dependent upon various other aspects. For example, stock unit records being appropriately measured, transaction dates being accurate, trading and cash account periods being accurate. Consider the scenario where an asset is purchased – whilst the double entry principle might have been applied correctly, if the year of the purchase was recorded incorrectly, the transaction would not feature in the relevant accounting period. Therefore, corrective actions performed by Fujitsu outside of balancing transactions are also vitally important to consider.

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As evidenced in Section 3 PEAK PC0197592,[313] Fujitsu could also "correctively" delete stock unit opening balances (which is used in the ultimate calculation of a Subpostmasters cash and stock declarations) in order to "reset" them. Whilst the opening balance would not be completely removed by deletion here (it is rolling back the trading period and it would be possible to recalculate the opening figure) since Post Office derived the accuracy of a Subpostmasters accounts from its various stock / cash declarations in their relevant periods, this alteration is significant in that it can change a period for which accounts have to align.

Rebuild transaction data

5.459 In relation to rebuilding branch transaction data, Dr Worden states that this part of the issue relates to a technical robustness countermeasure, rather than some discretionary change to transaction data. In my opinion, the issue to address here is could Fujitsu rebuild branch transaction data, with or without the consent of the Subpostmaster and in effect, is there direct evidence to illustrate that they did.

5.460 Previously within his report, (at paragraph 1059) Dr Worden states:

> *"Similarly, for part (iii) of Issue 10, Fujitsu had the ability to rebuild transaction data, because this was a very necessary part of the robustness countermeasures. It is important to understand that this rebuilding was an automated process, using a redundantly stored copy of the transaction data (RDS), and did not involve discretionary manual rebuilding."*

5.461 Dr Worden does not reference any documentation with regards to how he gained his understanding of the process of rebuilding branch transaction data, nor does he state 'branch' but merely 'transaction data'.

5.462 PEAKs identified within Section 3 'Data Rebuilding' identify to me, that manual rebuilding of data did indeed take place.

[313] PEAK PC0197592, 12 April 2010 {POL-0367467}

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5.463 At paragraph 1134 Dr Worden states that due to the nature of any BRDB rebuild that might take place:

> *"In principle, the data could be rebuilt without the knowledge of the Subpostmaster in question, but they would be informed or become aware that they could use Horizon normally again and so they would know that something had happened.*

5.464 Whilst I agree that data could be rebuilt without the knowledge or consent of the Subpostmaster in my opinion, it is too broad an assumption to state that a Subpostmaster being informed that they could use the system again implies that they would know anything had happened, not least an account rebuild.

5.465 In summary of this Issue I disagree with Dr Worden that in Legacy Horizon Fujitsu could not edit or delete transaction data.

5.466 I also disagree that they could not do it without the knowledge of the Subpostmaster.

<u>Issue 11 – If they did, did the Horizon system have any permission controls upon the use of such facility, and did the system maintain a log of such actions and such permission controls?</u>

5.467 Primarily at paragraph 1060 of his report, Dr Worden sets out that any alterations of branch transaction data carried out by any central user would leave many traces of their activity like footprints in fresh snow.

5.468 In my opinion Dr Worden largely oversimplifies the actuality of how obvious it would be to trace a central users' actions in relation to the alteration of branch transaction data. Primarily, branch transaction data is subject to an extremely high level of interaction within its processing and propagation to POLSAP. To identify and diagnose manual intervention within its entire journey; at what access level, by whom, and what activity they did actually undertake, is not as simple as observing "footprints in fresh snow" as there are many more than just one set of footprints. I have set out my observations in response to the auditability limitations above under Issue 10.

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5.469 Dr Worden states, (taken from the first Witness Statement of Mr Godeseth[314]) that there are 30 SSC users permitted to create a Balancing Transaction (in Horizon Online) and approximately 45 with Privileged User access (whom had more access capabilities than the 30 above and could not only modify data but delete also).

5.470 It is not clear from the witness evidence where those numbers of users above might overlap, and Dr Worden does not clarify.

5.471 Further, it is important to note that it is my belief that there is some confusion in Dr Worden's understanding. Where Mr Godeseth sets out that only 30 users can create Balancing Transactions, he is implying only those who conduct it through the use of the Transaction Correction Tool. He (nor Dr Worden) does not reflect the true number of users who could perform Balancing Transactions outside of the usage of such a tool (which was effectively for Legacy Horizon all of SSC support and for Horizon Online anyone with Privileged User access).

5.472 I have reviewed the Host BRDB Transaction Correction Tool Low Level Design[315] referred to by both Mr Godeseth and Dr Worden and I can see no indicator within it that only 30 users could access the tool. The document states, "the utility will allow SSC to correct transactions".

5.473 At paragraph 1141 of his report, Dr Worden quotes from the high-level design document for the BRDB[316] "Support teams will be restricted to accessing the BRDB only under an MSC". He further states that he has introduced the MSC process in Appendix C.

5.474 I have set out my observations in respect of the MSC disclosure above at Section 3. In summary, I have not been able to perform a full review of the data due to its complexities and time constraints. However, I have set out some preliminary observations and sought to clarify some

[314] {Witness Statement of Torstein Olav Godeseth, 27 September 2018}
[315] DEVAPPLLD0142.doc, *Host BRDB Transaction Correction Tool Low Level Design*, 13 November 2007 {POL-0032866}
[316] DESAPPHLD0020.doc, *Branch Database High Level Design*, 5 April 2018 {POL-0219310}

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queries in respect of further identified privileges not expressed in Post Office's letter dated 21 December 2018.

5.475 In continuation of the MSC process as set out by Dr Worden in his Appendix C:

a. At paragraph 364 and 365 of the Appendix, Dr Worden limits his opinion to stating what document the process has been defined in and that its predecessor was the "Operational Change Process" (OCP);

b. He does not set out what specific document the OCP process might be defined in. It could be that this is because Mr Godeseth does not reference any explicit document in relation to OCPs.

5.476 I have reviewed the 'MSC Managed Service Change Procedure' dated 2014[317] and note the following:

a. It is a high-level document, revised between 2010 and 2014, the last revision appearing as 14 July 2014;

b. The document largely appears more relative to large scale system changes, and does not clearly or specifically detail ad hoc changes adopted by Privileged Users or SSC relative to change of financial accounts;

c. The "Roles" that Dr Worden states (at paragraph 364 of his appendix) "contribute to operation of the process" are listed as:

- Change Initiator (CI)
- Change Sponsor (normally the service manager) (CS)
- Change Administrator (or Change Analyst) (CA)☐
- Impact Assessors (IA)
- Change Owner (CO)
- Task Owner

[317] SVMSDMPRO1184_1.DOC, *MSC Managed Service Change Procedure for Post Office Account*, 11 July 2014 {POL-0136725}

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- Change Manager (CM)
- Change Approval Board / Emergency Change Approval Board (CAB / ECAB)
- Service Manager
- Resolver G

5.477 At paragraph 1142 of his report Dr Worden then goes on to state that the Branch Database High Level Design[318] goes on to confirm:

> *"'There is a requirement that the SSC will have ability to insert balancing transactions into the persistent objects of the BRDB. 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.*
>
> *SSC will have privileges of only inserting balancing / correcting transactions to relevant tables in the database. SSC will not have any privileges to update or delete records in the database.*
>
> *Any writes by the SSC to BRDB must be audited.'"*

5.478 I feel it is important to note here that in my opinion, the scope of whom could insert balancing transactions into the branch database (Horizon Online) is here reflected as SSC. Not only those who were enabled access to the Transaction Correction Tool. This accords with my understanding as set out at paragraph 5.472 above. Also, I find the statement conflicting as it has previously been acknowledged (by Godeseth and Worden, and as I understand) that SSC (Privileged Users), could edit and **delete**.

5.479 In relation to Mr Parker's Witness Statement (20.2):

> *Some members of the SSC were (and some remain) able to insert transaction data. SSC access privilege gave the ability to inject transactions, but appropriate change controls were in place and no such insertion would have happened without complying with those controls."*

[318] DESAPPHLD0020.doc, *Branch Database High Level Design*, 5 April 2018 {POL-0219310}

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Dr Worden states (paragraph 1145 of his report) that this is consistent with his understanding of the role of the SSC. I disagree that it is consistent. In my opinion, if anything, the audit, processes and controls around balancing transactions and whom within SSC had exactly what privileges is ambiguous.

5.480 Dr Worden comments further on the Witness Statement of Mr Parker, stating how double entry accounting principles would enable identification of any inserted transactions within the branch accounts performed by SSC. I disagree with both Mr Parker and Dr Worden that any modifications would be so readily identifiable for reasons given within Issue 10 of this report and also, consideration of the following PEAK evidence.

5.481 PC0152014[319] (full PEAK details provided at paragraph 3.234) detail an instance where SSC have to perform a one-sided transaction that no settlement value was written for (therefore POLSAP did not receive its value):

> *"Worth noting that the branch did not have any issues with the mismatched transactions because this was fixed before they did the roll. The branch is not aware of this and it's best that the branch is not advised."*

5.482 Where Dr Worden states at paragraph 1151 that creation of transactions would be clearly associated by their user, I feel it is important to consider here, the Witness Statement of Richard Roll dated 6th January 2019 which disputes this.

5.483 In conclusion to this Issue Dr Worden sets out (at paragraph 1153) that in summary, he believes permissions to use the facilities described under Issue 10 were controlled. I disagree with Dr Worden, in conclusion, for the following reasons:

[319] PEAK PC0152014, 7 December 2007 {POL- 0322311}

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5.484 It is my opinion that SSC users (whether privileged user or not) were not as restricted as they should have been or as averred by Mr Godeseth and Dr Worden for the following reasons:

a. The activity identified from my analysis of the MSC records (as referred to above);

b. The PEAK evidence referenced in relation to Issue 10 (paragraph 3.220) which records (in contrast to Mr Godeseth's findings) that transaction data and related operational activities were edited and deleted within Horizon; and

c. External Audit reports (Ernst & Young 2011 referenced in my first report at paragraph: 9.65 and also referenced in this report at paragraph 5.154) and PEAK evidence (paragraph 3.283 of this report) stating insufficiencies and non-conformance to policy in respect of access rights and capabilities of resources. It is not clear if the number of users provided by Mr Godeseth at paragraph 59.1 of his witness statement having escalated access to data include or exclude the users who should not have had access but did until July 2015 when the auditing began.

5.485 Further, the fact that prior to July 2015, SSC privileged usage was only auditable by record of a log on and log off and contained no detail with regards to what actions were performed by them is to me, not controlled.

5.486 Further, Dr Worden has not reviewed the OCP process applicable to Legacy Horizon or performed any analysis of contemporaneous documentation to identify where there might have been failures in control.

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Issue 12 – If the Defendant and/or Fujitsu did have such ability, how often was that used if at all?

5.487 Dr Worden states at paragraph 1164 that "*Branch Trading Statement have only been used once*". I assume here that Dr Worden means actually to refer to the one acknowledged Balancing Transaction conducted using the Branch Correction Tool.

5.488 I disagree there has only ever been one balancing transaction performed (in consideration of PEAKs evidencing them outside of Correction Tool usage) which I have set out under Issues 10 and 11.

5.489 The following capabilities could have impacted branch accounts. I have been unable to confirm how often they were used:

i. Corrective transactional fixes including insertions, edits or deletions performed by SSC (by a privileged user or via the transaction correction tool) or Post Office (in the form of TCs issued as a result of identification of Horizon error);

ii. Transaction inserts carried out by Global Users;

iii. Messagestore or Branch Database rebuilds.

Issue 13 – To what extent did use of any such facility have the potential to affect the reliability of Branches' accounting positions?

5.490 As in Issue 1, I have interpreted 'extent' differently to Dr Worden and instead have considered to what extent was it technically feasible for affect to occur on a branch's accounting position rather than assessing extent in terms of the probability of financial impact.

5.491 I do not interpret this Issue to be solely in relation to causing financial impact. In my opinion, the Issue states "reliability of Branches' accounting positions".

5.492 Therefore, in my opinion I believe it is important to consider with regards to affecting the reliability of the branches' accounting position, not only instances where insertions, injections, edits, deletions or rebuilds might affect transaction data, but also "data in branch

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accounts". Such, in my opinion, would further include and comprise of data in relation to operational actions.

5.493 Financial account accuracy involves much more than just ensuring the double entry principle is applied in relation to a monetary transaction. A Subpostmaster's branch account accuracy is dependent upon various other aspects e.g., stock unit records being appropriately measured, rollover dates being accurately recorded, trading and cash account periods being aligned, user actions appropriately recorded, and so on. All of which, could be affected by abilities and facilities in place to allow Fujitsu/Post Office to perform the actions listed under Issue 10.

5.494 I therefore cannot agree with Dr Worden and his calculations in respect of paragraph 1175 of his report, since I do not agree there has only ever been **one** balancing transaction performed by SSC, save to say that the probability of impact would **not** be one part in 1.5 million.

5.495 I cannot agree with him further at paragraph 1177 since I do not agree that KELs could be relied upon to reflect the true account of an incident, therefore in my opinion, his basis for performing calculations in relation to assessment of financial impact is flawed.

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6. Expert Declaration

I Jason Coyne DECLARE THAT:

6.1 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.

6.2 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.

6.3 I know of no conflict of interest of any kind, other than any which I have disclosed in my report.

6.4 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.

6.5 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 3 and 4 above.

6.6 I have shown the sources of all information I have used.

6.7 I have exercised reasonable care and skill in order to be accurate and complete in preparing this report.

6.8 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.

6.9 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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6.10 I will notify those instructing me immediately and confirm in writing if, for any reason, my existing report requires any correction or qualification.

6.11 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.

6.12 I have read, the accompanying practice direction and the Guidance for the instruction of experts in civil claims and I have complied with their requirements.

6.13 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

6.14 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: 01 February 2019

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7. Appendices

Appendix A

Letter from WBD re Privileged User Logs and MSC Logs disclosure.

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Appendix B

HNG-X Menu Hierarchy

7.1 HNG-X Menu Hierarchy and Messages, Section 9.2 Role Capabilities[320]

	Capability	MIGRATE	MANAGERS	SUPERVISORS	CLERK	AUDITOR	AUDITOR E	SUPPORT	ENGINEER	SETUP	TRAINER	ADMIN	NOTLOGGEDIN	COURSEWORK
[Administration:]	AddNewOffice	Y					Y	Y		Y	Y			
[Administration:]	AddUser	Y	Y				Y	Y		Y	Y	Y		
[Administration:]	AttachSU	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y		
[Administration:]	CreateSU	Y	Y				Y			Y	Y			
[Administration:]	DeleteSU	Y	Y				Y			Y	Y			
[Administration:]	DeleteUser	Y	Y				Y	Y		Y	Y	Y		
[Administration:]	Migration		Y											
[Administration:]	ModifyUser	Y	Y				Y	Y		Y	Y	Y		
[Administration:]	SalesPrompts	Y	Y				Y	Y		Y	Y			
[Administration:]	UnlockRemoteSU											Y		
[Administration:]	ViewAttach	Y	Y	Y	Y	Y	Y			Y	Y	Y		
[Administration:]	ViewSUs	Y	Y	Y	Y	Y	Y			Y	Y			

[320] DESGENSPE0007_6.2.doc, *HNG-X Menu Hierarchy and Messages*, 5 April 2018 {POL-0153568}

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	Capability	MIGRATE	MANAGERS	SUPERVISORS	CLERK	AUDITOR	AUDITOR E	SUPPORT	ENGINEER	SETUP	TRAINER	ADMIN	NOTLOGGEDIN	COURSEWORK
[Administration:]	ViewUsers	Y	Y	Y	Y	Y	Y			Y	Y	Y		
[Engineer:]	AdjustScreen		Y				Y		Y	Y	Y	Y	Y	
[Engineer:]	InstallPINPad		Y				Y		Y	Y	Y			
[Engineer:]	ModemRecovery								Y					
[Engineer:]	NetworkResilience		Y				Y		Y	Y	Y	Y		
[Engineer:]	RefreshRateBoard		Y	Y	Y		Y		Y	Y	Y			
[Engineer:]	SetRateBoard		Y				Y		Y	Y	Y			
[Engineer:]	TestBarCode	Y	Y				Y		Y	Y	Y		Y	
[Engineer:]	TestCardReader		Y				Y		Y	Y	Y		Y	
[Engineer:]	TestNetwork	Y	Y				Y		Y	Y	Y	Y	Y	
[Engineer:]	TestPINPad		Y				Y		Y	Y	Y		Y	
[Engineer:]	TestPrinter	Y	Y				Y		Y	Y	Y		Y	
[Engineer:]	TestReader	Y	Y				Y		Y	Y	Y		Y	
[Engineer:]	TestSlip	Y	Y				Y		Y	Y	Y		Y	
[Engineer:]	TestTally	Y	Y				Y		Y	Y	Y	Y	Y	
[Other;]	FinalAccount						Y							
[Other;]	Logout	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		

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	Capability	MIGRATE	MANAGERS	SUPERVISORS	CLERK	AUDITOR	AUDITOR E	SUPPORT	ENGINEER	SETUP	TRAINER	ADMIN	NOTLOGGEDIN	COURSEWORK
[Other;]	Memos	Y	Y	Y	Y	Y	Y			Y	Y			Y
[Other;]	NodeInformation	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
[Other;]	OfficeBalancing	Y	Y	Y			Y			Y	Y			
[Other;]	POIDUsersTrainingDetails	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y
[Other;]	PostLoginChecks	Y	Y	Y	Y	Y	Y			Y				
[Other;]	PostLoginOutstTxnAcknowledments		Y	Y	Y									
[Other;]	PostLoginOutstTxnCorrections		Y	Y										
[Other;]	StockBalancing	Y	Y	Y	Y		Y			Y	Y			
[Other;]	TrainingReset										Y			
[Reports;]	AllBranchUsersCurriculaReport		Y											
[Reports;]	BranchTP	Y	Y	Y		Y	Y			Y	Y			
[Reports;]	CtrDaily	Y	Y	Y	Y		Y			Y	Y			
[Reports;]	CtrWeekly	Y	Y	Y	Y		Y			Y	Y			
[Reports;]	EventLog	Y	Y	Y	Y	Y	Y			Y	Y	Y		
[Reports;]	MigrationReport	Y	Y				Y			Y	Y			
[Reports;]	OfficeDaily	Y	Y	Y	Y	Y	Y			Y	Y			
[Reports;]	OfficeWeekly	Y	Y	Y		Y	Y			Y	Y			
[Reports;]	OutstTxnCorr	Y	Y	Y			Y			Y	Y			

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	Capability	MIGRATE	MANAGERS	SUPERVISORS	CLERK	AUDITOR	AUDITOR E	SUPPORT	ENGINEER	SETUP	TRAINER	ADMIN	NOTLOGGEDIN	COURSEWORK
[Reports;]	ProcTxnCorr	Y	Y	Y			Y			Y	Y			
[Reports;]	ProductInformation	Y	Y	Y	Y	Y	Y			Y	Y			
[Reports;]	Reports	Y	Y	Y	Y	Y	Y			Y	Y	Y		
[Reports;]	TradingStatement	Y	Y	Y			Y			Y	Y			
[Reports;]	TxnLog	Y	Y	Y	Y	Y	Y			Y	Y			
[Reports;]	UserEvents	Y	Y	Y		Y	Y			Y	Y	Y		
[Reports;]	UserHistory	Y	Y	Y		Y	Y			Y	Y	Y		
[Transact ional:]	Housekeeping	Y	Y	Y			Y			Y	Y			
[Transact ional:]	PouchCollection	Y	Y	Y	Y		Y	Y		Y	Y			
[Transact ional:]	PouchDelivery	Y	Y	Y	Y		Y	Y		Y	Y			
[Transact ional:]	Transactions	Y	Y	Y	Y		Y			Y	Y			

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Appendix C

USERID's found in Horizon Privileges Access Logs

SYSTEM	OPS$JSIMP01	OPS$JCHAR01	OPS$WBRAG01
OPS$ORACLE	OMDBUSER	OPS$VRAMA01	LVAGENTUSER4
OPS$BRDB	OPS$DSEDD01	OPS$BRSSBTH1	OPS$AWOOD01
STRADMIN	LVBALUSER1	LVAGENTUSER1	OPS$RGELD01
BRDBOMDB	EMDB_SUP	COBEN01	OPS$MOGGBRDB
TRBALUSER	OPS$PCARR01	SSC_TOOLS	OPS$OGGADMIN
LVBALUSER	OPS$KMILL01	OUTLN	XXXX
OPS$BRDBBLV1	OPS$DALLE01	OPS$BRDBBLV4	USREIDALIAS
OPS$SENGL01	OPS$SPARK01	OPS$WCALV01	USERIDALIAS
OPS$EASHF01	OPS$SSURX01	TWS	EXI
OPS$MWRIG01	OPS$LKIAN01	ORAEXCPLV	OPS$NMCKE01
OPS$GSIMP01	OPS$MCROS01	SQUIRLESCAN	OPS$AGIBS01
OPS$COBEN01	STRMADMIN	SQUIRRELSCAN	OPS$BPEAC01
RDDS	OPS$BRDBTR	OPS$PSIMP01	OPS$VKONA01
OPS$JBALL01	OPS$JHARR01	TRBALUSER1	OPS$BRDBBTR1
OPS$GMAXW01	QLPSTRADMIN	TRBALUSER2	OPS$ABEST01
OPS$DAVEN01	OPS$CTURR01	TRBALUSER3	OPS$SNELL02
OPS$AKEIL01		TRBALUSER4	OPS$SSATT01
DBSNMP		LVBALUSER2	PK
OPS$ACHAM01		LVBALUSER3	DAVEN01
OPS$PSTEW01		LVBALUSER4	
OPS$CCARD01			
SYS			

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Appendix D

Amendments to First Expert Report 180503R1935 01-01 Served 16 October 2018

7.2 Page 9 paragraph 1.31 of my previous report should have read "My name is Jason Coyne and I am a Partner at IT Group UK Limited."

7.3 Page 84 footnote 150 of my previous report referenced POL-0512874 which should have read POL-0152874.

7.4 Page 92 paragraph 5.190 Footnotes 169 and 171 are mis-referenced. Footnote 169 'GCSimpson2242L.html' should be replaced by maxwellg5213L.html[321] and footnote 171 should be disregarded in relation to this paragraph as it relates to APS transactions and not JSN duplication.

7.5 Page 67 paragraph 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.*" Should read as "…experts **that each** time there is a change…"

7.6 Page 131 paragraph 8.13 "*…the cause of an issues that arise at anything beyond counter level (and possibly even those that arise at counter level).*" Should read as "the cause of **any** issues".

7.7 Page 133 paragraph 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 properly identified for any reason, then the Subpostmaster would be at risk of being liable for a Transaction Correction*." Should read as "information **in** relation" and "issue or its **impact** was".

[321] KEL Maxwellg5213L, 30 June 2010 last updated 21 March 2011 {POL-0038402}