Claim Nos. HQ16XO1238, HQ17X02637 & HQ17X04248

IN THE HIGH COURT OF JUSTICE

QUEEN'S BENCH DIVISION

The Post Office Group Litigation

Before the Honourable Mr Justice Fraser

BETWEEN:

ALAN BATES & OTHERS

Claimants

– and –

POST OFFICE LIMITED

Defendant

POST OFFICE'S WRITTEN OPENING SUBMISSIONS: HORIZON ISSUES TRIAL

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A. INTRODUCTION

A1. Summary

1. Horizon plays a central role in this litigation. It holds the data which are used to generate branch accounts; those accounts being the foundation of the Post Office business.

2. Post Office maintains that Horizon is reliable and extremely unlikely to be the cause of any given shortfalls. Cs have yet to show any clear cut example of bugs in Horizon causing false shortfalls that affected any one of them, let alone bugs causing the shortfalls of £18.7m that they claim not to be responsible for. At best, possible bugs in Horizon account for no more than 0.4% of the Cs shortfalls. This is an upper-limit which is itself only arrived at by repeatedly making assumptions strongly in favour of Cs. The reality is likely much lower. Any bugs of the necessary order of magnitude would have given rise to a screaming problem that would have been obvious years ago. Nothing like this has been found by either Post Office's expert or the expert acting on behalf of Cs.

3. Cs' suspicion of Horizon is driven by the natural human scepticism to technology. It is easy to blame the computer when something has gone wrong in a branch. It is common knowledge and common ground in this litigation that no IT system is perfect. This does not, however, mean that Horizon is likely to be the root cause of Cs' shortfalls. Nor does it mean that for a specific Claimant in specific circumstances Horizon could not have suffered an error that contributed to a shortfall. However, for the general body of Cs in this litigation to fall into this camp would require them to show a fundamental problem with the system. Again, nothing like this has been found.

4. SPMs are not the only ones who rely on Horizon. Post Office and its clients, many of who are government departments and large corporations, rely on it to process 2.5 billion transactions every year and it has been in continuous use across the entire Post Office network since implementation. Fujitsu's reputation is tied to its success. All

involved have strong incentives to make Horizon work well. None of these stakeholders are raising any concerns.

5. Post Office's expert, Dr Worden, has reached the conclusion that Horizon is robust and extremely unlikely to be the cause of shortfalls in branch accounts.

6. His conclusion is formed from a review of the design of the system and the countermeasures it has in place to correct and remedy those problems that will inevitably arise, as is the case with all IT systems. He describes a well-designed system and effective ongoing support from Fujitsu, with many built-in features and processes designed to prevent, detect and remedy errors.

   6.1 He has then reviewed the extensively documented service history of Horizon over nearly 20 years which comprises over 200,000 recorded events. Using a methodology that combines random sampling with targeted searches for bugs, his view is that the service history shows that Horizon worked well in practice. The dozen relevant bugs shown in these records are not material in the context of Post Office's branch network which has conducted in the region of 48 billion transactions over 20 years and is still used today in more than 11,500 branches.

   6.2 In his opinion, around 40,000 material bugs would need to exist to account for the disputed £18.7m shortfalls. They do not. At its highest, the experts' combined list of bugs reaches 29, of which only 12 are agreed by Dr Worden.

7. Mr Coyne, by contrast, reaches few firm conclusions.

   7.1 His views on the robustness of Horizon are elusive. They range from Horizon being "*relatively robust*" to mealy-mouthed statements that are difficult to follow. He has offered no opinion on the extent to which bugs in Horizon are liable to have caused branch shortfalls. His elusiveness is illustrated most sharply by his abandoning much of his work in Coyne 1 and replacing it with a largely new approach in Coyne 2.

   7.2 He has not identified any fundamental flaw in the design of Horizon or the support practices of Fujitsu.

7.3 From his review of Horizon's service history (being a review of over 6,000 documents) in Coyne 2 he has identified 22 bugs, 21 of which he says had a financial impact on branches. His analysis of these bugs is superficial, ignoring built-in countermeasures that would automatically remedy the financial impact of a bug. His reports only tell half the story and his conclusions are often wrong.

7.4 Even if his analysis were correct, many of the 21 bugs identified in Coyne 2 arose in infrequently used parts of the system and / or were caused by obscure and unforeseeable actions by SPMs. They reflect no more than the common ground that Horizon is not perfect and there is always a risk of errors in fringe parts of any IT system.

7.5 Mr Coyne's reports show that he has set out to prove a thesis – that Horizon is full of problems – rather than to present a balanced view of the system. He was plainly looking for as many bugs as possible but he does not set out any methodology explaining how his 21 bugs were found. From his review of 6,000+ service history documents, he has not recorded those that show Horizon working effectively. He gives no sense of the scale for his 21 bugs in the operation of Horizon over 20 years. They are not put in their proper context, against either the volume of transactions conducted by Horizon, the number of branches in the Post Office network or the shortfalls that Cs wish to challenge.

7.6 Mr Coyne suggests that Fujitsu's perfectly ordinary ability to remotely access Horizon may affect Horizon's reliability. It is unreal to suggest that Fujitsu is editing transaction data regularly, maliciously or carelessly. There is no evidence to support this. His arguments about remote access are a jury point and a distraction.

8. Cs' essential case is that Horizon is so unreliable that no store can be set by the branch accounts it generates. If that case were true, Post Office's business would be inoperable. Notwithstanding all the problems he purports to have found, it should be noted that even Mr Coyne's analysis does not support this case.

9. The flaws in Mr Coyne's approach mean that little weight should be attached to his reports on the central questions of robustness and the extent to which bugs in Horizon caused false shortfalls in branch accounts. Moreover, even if it were assumed that everything that Mr Coyne says was correct, his two dozen bugs are immaterial in the context of a system conducting 2.5 billion transactions per annum in more than 11,000 branches for 20 years. This leads back to Dr Worden's inescapable conclusion: Horizon and its branch accounts are reliable.

A2. The Horizon system

10. The Horizon system is an IT system comprising an electronic point of sale ("**EPOS**") and accounting system for all of Post Office's branches. It comprises both hardware (including communications equipment in branches and central data centres) and software.

11. For part of its activities – such as selling stamps – a Post Office branch acts like a retail outlet, and these activities use the EPOS software component of Horizon. EPOS software allows the counter staff to: record that goods have been provided to a customer; compute the price of those goods; and allow the customer to pay the money required for all the purchased goods.

12. Post Office branches also provide customer services for organisations which Post Office refers to as its "**clients**". They include high street banks (for banking services), gas and electricity companies (for paying bills), DWP (for paying benefits and pensions) and DVLA (for paying road fund tax).

13. In addition to performing the counter activities referred to above, Horizon supports the periodic process by which branches account for the Post Office cash and stock they hold and for the transactions they do on Post Office's behalf. Every branch operates in trading periods, which since 2005 have been either four or five weeks (according to a timetable published by Post Office) but before that were weekly. At the start of each period, the branch should be 'in balance'. This means that the physical stock and cash in the branch should agree with the data on stock and cash held in Horizon. During the

following period, Horizon records all customer transactions made at the branch and it also records any remittances of cash or stock received or sent by the branch (often referred to as "**remming in**" and "**remming out**"). Thus, Horizon records all changes in cash and stock held at the branch during the trading period, and it can therefore compute the expected amounts of cash and stock at the end of the period.

14. Horizon is a system which has run successfully for nearly 20 years. It has done so in 2 broad guises: Legacy Horizon (from the introduction of Horizon in 1999/2000 to 2010) and Horizon Online (from 2010 to the present day).

15. The architecture of these two versions of Horizon differs in various ways. Most significantly, in Legacy Horizon data was held persistently on terminals in the branches before being uploaded to Post Office data centres. This meant that a branch could continue to trade, and could support most business applications, even if the wide-area network was unavailable. When the network was available, data would be regularly replicated to the main data centres to ensure that the data became available to the back-office systems. The only applications which could not run in this way were those that required immediate validation from a client organisation – for instance, withdrawing cash from a bank account.

16. With Horizon Online, persistent data was stored remotely in a central Branch Database ("**BRDB**"), so that without a working network, a branch could no longer trade. By 2010, a more reliable network infrastructure had made this a viable model. No transaction data is persistently held on terminals in branch.

17. It is important to understand the scale of the transactions undertaken through the Horizon system. The following statistics were reported in a Post Office presentation provided in about 2017:[1]

    17.1 approximately 11,800 branches;

    17.2 more than 47 million transactions per week from 18 million customer visits;

[1] Presentation The Post Office, An Insight_.pdf, *The Post Office-An Insight, Angela Van Den Bogerd,* circa 2017, {F/1755}.

17.3 22 million banking transactions every month and 2.5 billion transactions a year, with a cash value of £100 billion; and

17.4 £42 billion of cash, foreign exchange and secure stock collected and delivered each year.

18. On the basis of these sorts of figures, during its lifetime Horizon will have processed something like 48 billion transactions from 18 billion customer visits. The scale is huge.

19. The evidence shows that Horizon is a robust system which works at least as well as any comparable system. This is now agreed between the experts. There is no suggestion that it has any basic design faults or systemic flaws which have a widespread effect across the Post Office network. Nor is there any suggestion of any serious deficiencies in the various processes supporting and protecting Horizon. In these proceedings, Cs are not concerned with the overwhelming majority of transactions undertaken in the ordinary course of Post Office's business. Cs appear to accept that Horizon processes and records the vast majority of transactions accurately. Their case focuses on the possibility of things going wrong in Horizon which may have given rise to particular shortfalls at their branches: each C says that he or she could not have been responsible for a particular shortfall in his or her branch and that some failure in the Horizon system could be to blame.

20. Putting the point another way, Cs are suggesting that there may be shortfall-creating bugs[2] in Horizon of a sort which are not picked up in testing, do not trigger the numerous controls and measures supporting Horizon and do not (or do not often) come to the attention of the 3rd line support line function operated by Fujitsu's Software Support Centre ("**SSC**").

21. It is important to note that Cs have not identified any shortfall-creating bug the adverse consequences of which are said not to have been remedied; still less have they identified any bug which is said to have affected any of the specific Cs' branch

[2] For convenience, in these submissions, the term "**bugs**" encompasses what the Horizon Issues refer to as "*bugs, errors and defects*".

accounts. Their essential case is that there is a possibility of such bugs. Moreover, they say nothing about the extent of this possibility – i.e. nothing about how likely such bugs are to affect branch accounts, and nothing about the likely impacts of such bugs on branch accounts. As will be explained below, Cs' approach to these issues, if accepted, would deprive the Horizon Issues trial of much of its intended utility.

A3. The Horizon Issues trial

22. By its Third CMC Order dated 22 February 2018[3] and its further Order dated 23 March 2018,[4] the Court directed that 15 issues be determined at this trial. These issues ("**the Horizon Issues**") are set out in **Annex 1** to these submissions. They essentially raise three core groups of issues:[5]

22.1 **The robustness issues**:

Is Horizon robust or is it likely to cause shortfalls in branch accounts? See Horizon Issues 1, 3, 4, and 6.

22.2 **The remote access issues**:

Do Post Office and/or Fujitsu manipulate Horizon branch data without the knowledge of SPMs? See Horizon Issues 7, 10, 11, 12 and 13.

22.3 **The operational issues**:

Various short factual questions about how the Horizon system operates and what facilities it makes available to SPMs and Post Office for certain purposes. See Horizon Issues 2, 5, 8, 9, 14 and 15.

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[3] {C7/12}.

[4] {C7/14}.

[5] The experts group the issues together in slightly different ways but both of them recognise these core groups. The names given here to these groups of issues should not be construed too literally. For example, the robustness issues include important issues of extent (to what extent were things likely or unlikely to happen etc) and the remote access issues are far more concerned with altering data than they are to gaining access to data. But these names are a useful high-level way of introducing and referring to the Horizon Issues.

The critical question of robustness

23. The robustness issues are by far the most important. The significance of the remote access issues lies in the extent to which remote access might undermine Horizon's robustness. The operational issues are largely factual issues concerning the extent to which subpostmasters ("**SPMs**") and Post Office had access to data and reporting facilities. They are largely peripheral to the central debate on robustness, and they are (for the most part) relatively uncontentious.

24. The robustness issues are so important because of their impact on the "breach" trials that will be held in this Group Litigation. When the Court comes to decide the claims made by individual Cs, it will do so with the benefit of the generic judgments it will have given in the Common Issues and the Horizon Issues trials:

    24.1 The Common Issues judgment will have determined the contractual rights and obligations between Post Office and the relevant Cs and certain other incidents of their legal relationships.

    24.2 The Horizon Issues judgment will have determined, in effect, the extent to which Post Office can generally rely on the contents of the relevant Cs' Horizon-generated branch accounts as evidence of the true accounting position. In each case, Post Office will rely on the relevant branch accounts as evidence of a deficiency (or shortfall) for which the relevant C is liable. For that purpose, Post Office will wish to say that Horizon is generally reliable to a high degree and so, absent special circumstances, the accounts generated from Horizon can be taken as accurate. Against that, the relevant C will wish to say that Horizon is not anything like so reliable and that, accordingly, the branch accounts generated by Horizon cannot be given anything like as much weight as Post Office contends.

25. In the light of these points, it is worth noting what the Horizon Issues trial is <u>not</u> about:

    25.1 At the end of this trial, the Court will not be in a position to determine any C's claim. As discussed further below, the Court ordered that the witness evidence

was to be generic, not claimant-specific and kept to a minimum.[6] Although Cs are nevertheless calling some claimant-specific evidence, there is no possibility that the Court will be able to decide any individual claim at this trial.

25.2 By the same token, if this Court determines in its Horizon Issues judgment that the Horizon system is generally robust, this will not prevent particular Cs in particular breach trials from asserting factors specific to their cases which suggest that Horizon may have got something wrong in respect of their accounts.

Questions of likelihood and extent

26. Thus, the basic purpose of the Horizon Issues trial is to determine in general terms the extent to which Horizon can be said to be reliable or unreliable. This determination necessarily involves an assessment of the quality of the system's design, features and countermeasures and how likely it is that bugs have affected branch accounts and, if so, what their likely effects have been. This is why the robustness issues are peppered with words such as 'extent', 'likely' and 'risk'. See, for example:

26.1 Issue 1: "*To what extent was it possible or likely for bugs .... to have the potential to cause ... discrepancies*...." (emphasis added).

26.2 Issue 3: "*To what extent and in what respects is the Horizon System 'robust' and extremely unlikely to be the cause of shortfalls*..." (emphasis added).

26.3 Issue 4: "*To what extent has there been potential for errors in data recorded in Horizon to arise* ..." (emphasis added).

26.4 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 ...and in what respects is the Horizon System 'robust' and extremely unlikely to be the cause of shortfalls*..." (emphasis added).

[6] See the preamble to Schedule 1 of the Order dated 23 March 2018 (which sets out the Horizon Issues) {C7/14/3} and Paragraph 10 of the Fourth CMC Order {C7/18}.

A4. The expert reports served in this case

27. In these circumstances, it was incumbent on the parties to adduce evidence of probabilities – evidence on which the Court would make findings regarding the likelihood of bugs creating unremedied shortfalls in the branch network and the likely significance of those shortfalls.

The need to address likelihood and extent

28. This is what Post Office's expert, Dr Worden, has done. However, Cs' expert, Mr Coyne, has not. On the robustness issues, his essential conclusion is that it is "*possible*" that there are bugs which have caused unremedied shortfalls.[7] He refuses to address how likely this is or how significant such shortfalls are likely to be, on the basis that he has addressed the robustness issues "*literally*".[8] Given the wording of those issues (see above), that is a strange contention. It is all the more strange given that the experts have agreed that:[9]

> *"It is difficult to measure the extent of the robustness of Horizon, apart from how it might limit the extent of impact on branch accounts, as in Issue 1"*

29. The net result is that, notwithstanding the great industry that has gone into producing Mr Coyne's two reports, his conclusions on the robustness issues are of little practical utility. Those conclusions do not advance very far beyond the points which have been common ground for years[10] or which the experts agreed in the first joint statement, before they wrote their reports.[11]

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[7] Coyne 2/3.24 {D2/4/17}.

[8] Coyne 2/5.269 {D2/4/195}.

[9] JS3/3.15 {D1/4/4}.

[10] For example, in its GDXC (July 2017) Post Office admitted (1) that Horizon is not a perfect system which has never had any bugs (paras 16 and 55 at {C3/3/5} and {C3/3/24}) and (2) that bugs have caused shortfalls in Horizon (para. 56 at {C3/3/24}. This reflected the pre-action correspondence from 2016.

[11] For example, in their first joint statement, the experts agreed as follows: (1) evidence exists that bugs have caused actual discrepancies or shortfalls {D1/1/4}; (2) robustness does not mean perfection {D1/1/8}; (3) as there are a number of actual reported errors in data recorded in Horizon arising from data entry, transfer or processing, the potential for such errors exists {D1/1/10}; and (4) whilst Horizon contains measures and controls for detecting system integrity concerns, the automatic mechanisms have failed in the past {D1/1/13}.

30. Instead of grappling with questions of likelihood and extent, Mr Coyne has sought to catalogue problems that have been encountered in Horizon over its 20-odd years of operation:

30.1 In Section 3 of Mr Coyne's first report ("**Coyne 1**"),[12] he indiscriminately listed what he described as a large number of problems identified following his and his team's review of over 5,000 KELs[13] and over 1,200 Peaks.[14] On this basis, he concluded:[15]

> *"that it was highly likely for bugs/errors/defects to have the potential to both (a) cause apparent or alleged discrepancies or shortfalls in relating to Subpostmasters' branch accounts/transactions and (b) undermine the reliability of Horizon to accurately process and record transactions."*

30.2 When read carefully, this statement is no more than a truism of all IT systems: they are likely to have bugs and bugs might cause problems. As Dr Worden explained in his first report ("**Worden 1**"),[16] Mr Coyne did not address the extent to which these miscellaneous problems had any impact on branch accounts, he did not discuss the context and meaning of the documents he had identified and he did not explain how these documents justified his conclusions.

30.3 Nor did Mr Coyne address the extent to which, insofar as any of these problems even had the potential to affect branch accounts, their effects would have been picked up by the many controls and measures supporting the Horizon system. Mr Coyne said almost nothing about these controls and measures, although they are a fundamental aspect of any analysis of robustness.[17]

30.4 Mr Coyne sought to address some of these problems in his supplemental report ("**Coyne 2**"). Coyne 2 also sets out the results of a review of an unspecified (but presumably large) additional number of Peaks reviewed in the intervening time.

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[12] {D2/1/25}.
[13] Coyne 1/5.114 {D2/1/92}.
[14] Coyne 2/3.10 {D2/4/13}.
[15] Coyne 2/5.196 {D2/4/175}.
[16] Worden 1/113.1{D3/1/26}.
[17] Worden 1/113.2{D3/1/26}.

30.5 Coyne 2 substantially recasts Mr Coyne's analysis. It represents the case that Post Office has to meet at the Horizon Issues trial. As it was served on 1 February 2019, Post Office has had limited time in which to assimilate and respond to this new case. There is also no responsive report from Dr Worden because the supplemental reports were served simultaneously and Mr Coyne's new points were not in Coyne 1.

30.6 In para 3.21 of Coyne,2[18] Mr Coyne lists what he describes as 22 bugs in Horizon in the Peaks reviewed, 21[19] of which he says had an impact on branch accounts. However, he still refuses to express any view as to the number of branches affected by these bugs or as to their likely impacts, whether on Cs or otherwise.

31. In the Second Joint Statement of the Experts lodged on 25 February 2019, Dr Worden has suggested further possible bugs for consideration. The result is a list of 29 possible bugs / issues which are said by Mr Coyne to have affected some branch accounts or to be relevant for some other reason.

The 29 bugs

32. Due to the limitations of time available, Mr Coyne's contentions regarding these 29 bugs will be an important focus of attention at the Horizon Issues trial. In short, Post Office contends that his analysis is often superficial.

32.1 Some are not bugs at all.

32.2 Of the real bugs, most had no impact on branch accounts or any potential impact would inevitably have been picked up by the measures and controls supporting Horizon.

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[18] {D2/4/15}.

[19] The table of page 11 of Coyne 2 shows 20 bugs with financial impact. Mr Coyne puts "no" financial impact next to "concurrent logins". But his analysis of that bug at 3.179 and in JS2 seems to suggest that he believes there was branch impact. Dr Worden also thinks there was possible branch impact on this bug.

32.3 None of these bugs affect the core of Horizon. They arise from unusual circumstances.

33. On proper analysis, the vast review that Mr Coyne and his team has undertaken of Horizon's operation over the past 20 years has produced a remarkably small number of bugs would could have had a non-transient effect on any branch accounts – in Dr Worden's view, no more than 12.

34. In any event, taking Mr Coyne's analysis at its highest, the number of bugs identified – even allowing for the possibility that further industry on Mr Coyne's part might reveal more such issues – is remarkably small. Having regard to the length of time that Horizon has been in operation, the size of the branch network (currently about 11,800 branches – it used to be more – and tens of thousands of users) and the quantity and variety of transactions and other operations conducted on the Horizon system, only 29 bugs is itself a testament to Horizon's robustness.

35. Mr Coyne's essential approach is to note that bugs have occurred in Horizon and then point out that they were missed in testing and in some cases were missed by Horizon's automatic countermeasures, meaning that they were only spotted because of human detection. This might have happened, for example, because an SPM phoned the helpline with a query.

36. At points in his report, Mr Coyne gives the impression that points such as this represent serious challenges to the robustness of Horizon. In fact, they are unexceptionable statements that could be made of any IT system, however robust. As has always been accepted on both sides, no system is perfect. There are always going to be bugs which are not detected in testing and which do not trigger the system's automatic countermeasures. A robust system has fall-back measures, such as procedures to obtain and investigate reports from users of the system and the bugs that Mr Coyne has raised show this happening. Pointing to several examples over a 20 year period where such things happened does not undermine Horizon's robustness. The fact that there are so few examples, and that those examples show corrective steps in action, accentuates it.

Likelihood and extent (again)

37. The conclusion to be drawn from this analysis is that, when faced with a set of accounts for any particular branch and any particular month, the chances of those accounts including a shortfall that has been created by a Horizon bug are vanishingly small.

38. Mr Coyne does not draw this conclusion. He avoids doing so on the basis that "*there are potentially thousands more PEAKs that illustrate financial discrepancy arising in branch accounts*".[20] However, he refuses to make any assessment of how likely it is that there are thousands of shortfall-creating bugs out there, or of what the likely impact on branch accounts would be if there were.

39. Mr Coyne also refuses to address an important point noted by Dr Worden in Worden 1[21] (derived by a simple calculation) concerning the scale of bugs that would be required if Cs' shortfalls are to be explained by bugs in Horizon. If in some month there was a significant shortfall in any C's branch accounts (assumed to be a shortfall of £300 or more), Dr Worden calculates that the chances of that having arisen from a bug in Horizon which has not been detected is of the order of four parts in a million. To make that probability as large as one part in 10, there would need to tens of thousands[22] of distinct bugs in Horizon, each of which created errors in branch accounts comparable to one of the three bugs that are admitted in the generic pleadings. The figure of tens of thousands of bugs is to be compared to the many times smaller number of bugs possibly affecting branch accounts which have been found by the experts.

Second order issues

40. On a number of issues on which Mr Coyne places considerable emphasis in questioning Horizon's robustness, Mr Coyne overlooks that they are second-order

[20] Coyne 2/3.105 {D2/4/43}.

[21] Worden 1/ section 8.5 {D3/1/148}.

[22] Worden 1, para 635 {D3/1/151}. Dr Worden estimated 50,000 bugs in Worden 1 but revised that to 40,000 in Worden 2/ para 117 {D3/6/30}. The figure can be further refined in the light of the agreements in JS2 but it remains extremely high.

issues that can only have minimal effect: at best they represent a very small fraction of a very small fraction of any cases. Remote access is one such issue; Transaction Corrections ("**TCs**") are another.

41. Taking remote access as an example, the need for remote intervention affecting branch accounts will obviously be rare. On any view, the occasions on which privileged users at Fujitsu have exercised their ability to remotely inject, edit or delete branch transactions or accounting entries will represent a tiny percentage of the relevant transactions/accounting entries. And the occasions on which they have done so negligently or dishonestly will, in turn, represent a very small percentage of those occasions. So, compared with the volume of business recorded in branch accounts, the number of cases in which false data will have been remotely introduced will be extremely small (multiplying a small chance by a small chance). This is a "**second order effect**" (a small proportion of a small proportion) which is, by definition, extremely unlikely to have any significant impact on the robustness of Horizon.

A5. What the evidence shows

42. Post Office submits that the evidence paints a clear picture. In summary:

    42.1 Horizon has operated extremely well for some 20 years. In that time, it has processed billions of transactions without incident. Even now, after all the advertising and other efforts made to persuade the c. 11,800 current and many more former SPMs to take up an opportunity to litigate against Post Office without any cost or risk, fewer than **561** have lent their names to this claim.

    42.2 Post Office and its clients, including government departments and large corporations, continue to rely on Horizon today. They have no interest in propping up a failing system and would be the first to seek to fix problems. Problems in a system has a cost to all stakeholders, including Post Office and Fujitsu. It is in everyone's interests to make sure Horizon works.

42.3 The Horizon system was designed by Fujitsu from scratch, without the difficulties usually encountered as a result of having to accommodate continuing legacy systems. It has a complete Fujitsu service record and it continues to be supported by Fujitsu. There have inevitably been many updates to the system, but there has also been considerable continuity of service.

42.4 Dr Worden describes a design comprising comprehensive countermeasures which do what they were designed to do.[23] Mr Coyne does not mention such countermeasures in his first report and, although he disputes some of Dr Worden's points about them (or the strength of those points) in his supplemental report, he does not challenge the substance of Dr Worden's evidence about the importance of these countermeasures.

42.5 Although Mr Coyne says that there are 'limitations' (whatever that means)[24] in the Peaks and KELs[25] generated by Fujitsu in the course of its support function, those Peaks and KELs demonstrate the lengths to which Fujitsu went and the professionalism it demonstrated in identifying and fixing problems in Horizon. It is because of that record that Mr Coyne has been able to conduct a thorough review of contemporaneous evidence relating to bugs.

42.6 Mr Coyne has not found any systemic flaw in Horizon, in the countermeasures or in the support function provided by Fujitsu. He has identified some bugs, as is inevitable, but not as many as he thinks. And in the scheme of things, even the number, nature and extent of the bugs he thinks he has found is reassuringly small.

42.7 It is clear that Horizon works well almost all of the time: no computer system could sensibly claim to do any better than that. Branch-affecting bugs have very

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[23] {D3/1/12}.

[24] {D4/2/84}; {D4/2/117}.

[25] Peaks and KELs are described in the glossary in the Annex. In short, Peaks are records of potential problems raised and how they are investigated by Fujitsu and, if needed, fixed. KELs are guidance for helpline staff that also document know errors, with their workarounds and fixes. There are around 220,000 Peaks and 8,000 KELs. Together, they could be described as the service history of Horizon.

occasionally been detected, often manifesting themselves only in rare situations, but these are diagnosed and fixed by Fujitsu, often quite quickly.

42.8 The chances of a bug in Horizon creating a false shortfall in any given branch's accounts on any given month are extremely small. If Cs are seeking to explain the shortfalls which they dispute by looking for defects in Horizon, they are almost certainly looking in the wrong place.

A6. Some procedural points

43. Before turning to the Horizon Issues themselves, it would be helpful to address two matters which arise from a point often taken in Mr Coyne's reports regarding the absence of relevant disclosure and evidence.

43.1 First, it appears that it may be Cs' intention to persuade the Court to draw adverse inferences from alleged failures on Post Office's part to give full disclosure on issues which Mr Coyne identifies as significant.

43.2 Second, Mr Coyne has raised some particular issues on which Post Office believes that helpful light would be shed by some short supplemental evidence from two Fujitsu witnesses.

Adverse inferences

44. There is no basis for drawing adverse inference against Post Office. As in any case, when considering whether any inferences can be drawn from alleged gaps in the disclosure given or evidence adduced, the procedural history of the proceedings has to be examined. In this case:

44.1 The parties were not directed to plead out their cases on the Horizon Issues so as to identify all the matters in dispute.[26] Instead, the detail of Cs' case is

[26] The Court directed Cs to provide an outline case {C7/12/5}; {C7/18/4}; {C7/22/2} which was served on 17 August 2018. It was no substitute for a properly pleaded case, provided virtually no assistance to Post Office and has hardly been referred to by either party. Mr Coyne goes so far as to say in the First Joint Statement dated 4 September 2018 {D1/1} that "*the technical issues can be answered without reference to the Claimants high level allegations document*".

effectively set out in Mr Coyne's expert reports. That case has evolved considerably in recent weeks. Until 1 February 2019, Post Office was not even aware of many of the points that Mr Coyne is now relying on, let alone the detail underpinning those points.

44.2 As is explained in **Annex 3**, Post Office was directed to give the Model C form of request-led disclosure. For this purpose, Cs made many requests for disclosure, most of which were agreed or ordered but a number of which went far beyond Model C and were refused by the Court. Many of the categories of documents on whose absence Mr Coyne now relies to draw adverse inferences were either not specifically requested in the first place or would have been comprehended by wide requests for documents which were refused by the Court. Post Office has acted reasonably and co-operatively throughout and no application has been made for specific disclosure at any stage.

44.3 Moreover, Mr Coyne had the opportunity to make requests for information, through which he also sought further disclosure. The 5th CMC Order set out a process for this that was to run during Summer 2018. The process allowed Post Office to challenge any unreasonable requests and for Mr Coyne to respond to those challenges. Post Office agreed to most of the requests and Mr Coyne did not respond to any of the challenges raised by Post Office. As far as Post Office was aware, the scope of Mr Coyne's access to documents was resolved by the end of September 2018.

44.4 As noted below, the Court made it clear that there should be the "*barest*" evidence of fact at the Horizon Issues trial. This is why the agreed list of Horizon issues attached to the Order for Directions dated 23 March 2018 indicated that there should be "*limited, if any, evidence of fact*",[27] and it is why the Fourth CMC Order dated 5 June 2018 directed that any witness evidence should be generic, as opposed to claimant-specific.[28] Cs disregarded these

[27] {C7/14/3}.
[28] {C7/18/3}.

stipulations, but Post Office has tried to tried to comply with them.[29] There is no basis for drawing adverse inferences against Post Office because Post Office has not given evidence that it was not required to give (and, indeed, was directed not to give).

Supplemental evidence

45. By the Third CMC Order following a hearing on 22 February 2018,[30] the following directions were given:

45.1 Cs to serve a provisional outline document setting out the nature of their allegations by 18 July 2018;

45.2 first joint statement of experts by 31 August 2018;

45.3 Cs' expert report by 14 September 2018;

45.4 Post Office's expert report by 2 November 2018;

45.5 supplemental reports by 18 January 2019; and

45.6 second joint statement of experts by 20 February 2019.

46. The rationale behind the sequencing in this Order was that, in the absence of any fully pleaded case on bugs and errors in the generic pleadings, Cs would at least set out their outline case; the experts would reach such agreement as they could, based on the outline case and their initial work; Cs' expert would then put forward his views; Post Office's expert would respond; there would be an opportunity for supplemental reports; and then a further joint statement.

47. By the Fourth CMC Order,[31] the dates of some of these steps were pushed back. In addition, the parties were to exchange witness statements of any witness of fact whose generic evidence was to be relied on. The parties were also given permission to serve

[29] To protect its position, in the limited time available Post Office did its best to say something in response to Cs' claimant-specific evidence. It did this under protest.
[30] {C7/12}.
[31] {C7/18}.

supplemental witness statements in response to factual matters relied on by either expert: Post Office by 16 October 2018 and Cs by 14 December 2018.

48. So the intention was still that the experts' supplementary reports would be the last stage in the evidence (other than the second joint statement) and would set out the experts' views in light of the supplementary witness evidence.

49. It was to be expected that, in the ordinary way, this final round of evidence would be relatively brief and help to identify further common ground and/or elucidate and build upon existing areas of disagreement. However, Coyne 2 represents a significant recasting of Cs' case. It is 258 pages long (plus appendices) and puts forward 13 new bugs[32] that were not raised in Coyne 1 or Worden 1 and raises 14 new allegations in relation to remote access[33].

50. It is not the purpose of these submissions to criticise Mr Coyne for this: nothing would be achieved by arguing about why it happened or whether anyone is to be blamed for the fact that it has happened. The simple fact is that it has created the outcome which caused Post Office most concern – that the case which Post Office has to face on these important, complicated and highly technical issues was not set out until a few weeks before the trial.

51. Having done its best to assimilate and understand the issues raised by Coyne 2, Post Office believes that the parties and the Court would be assisted by some supplementary evidence addressing certain points on which particular reliance is placed in Coyne 2. Accordingly, on 28 February 2019 it served short supplemental witness statements for which they do not have permission.[34] These are in additional to a supplemental witness statement by Mr Parker which was served on 29 January 2019, for which they also did not have permission.[35]

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[32] Those from paras 3.106 to 3.211, some of which actually include two or more discrete issues under one heading.

[33] Although Mr Coyne groups these under four headings in Section 3, there are 14 discrete points in reference to different Peaks: see paras 3.221, 3.223, 3.224, 3.232, 3.234, 3.432, 3.247, 3.249, 3.263, 3.266, 3.270, 3.271, 3.275 and 3.277.

[34] {H/230}.

[35] {H/181}.

A7. These opening submissions

52. These submissions are structured as follows:

52.1 First, the witness evidence is briefly considered, in Section B. For the reasons explained below, it is submitted the claimant-specific witness statements and Ian Henderson's witness statement are of little utility.

52.2 The extent of agreement between the experts is then considered, in Section C. There is in fact a broad measure of agreement between the experts on core architecture and controls within Horizon and on several key issues.

52.3 The three principal issues – robustness, remote access and operational issues – are then considered in turn, in Sections D, E and F. Robustness is by far the most important section and occupies most space. The approach taken by Mr Coyne in his two reports is considered first; and then the approach taken by Dr Worden.

B. WITNESS EVIDENCE

B1. Background

53. As is explained in Annex 3, the Court has directed that there was to be minimal factual witness evidence at the Horizon Issues trial and that such evidence was not to be claimant-specific.

54. This is reflected in the preamble to Schedule 1 to the Order dated 23 March 2018 which sets out the Horizon Issues and records that they are to "*require limited, if any, evidence of fact*".[36] Similarly, paragraph 10 of the Fourth CMC Order dated 21 June 2018 (from the hearing on 5 June 2018) provided that:[37]

> *"By 4pm on 14 September 2018, each party shall file and serve witness statements of any witness of fact whose generic evidence (in distinction to Claimant-specific evidence) they wish to rely upon for the purposes of determining the Horizon Issues."*

B2. Cs' Witnesses

55. Cs are calling evidence from the following 7 witnesses, in the following order:[38]

55.1 Jayesh Tank

55.2 Adrees Latif

55.3 Anup Patny

55.4 Aakash Patny

55.5 Angela Burke

55.6 Richard Roll

55.7 Ian Henderson

[36] {C7/14/3}.
[37] {C7/18/3}.
[38] Cs have confirmed that they are not calling Charles McLachlan or Setpal Singh.

56. Cs have produced claimant-specific evidence: the first 5 witnesses listed above are SPMs or assistants, 3 of whom are Cs and one of whom (Aakash Patny) gives evidence on behalf of his father who is one of the Cs and also himself a witness. On 27 February and 1 March 2019 Cs served a supplemental statement from Mr Tank and various amended statements.

57. This is not generic evidence but is "*evidence of individual cases"* and (except for Mrs Burke) "*Claimant-specific evidence",* i.e. evidence relating to specific examples of individual experiences with Horizon of the type the parties were directed not to adduce. Moreover, much of it is vague as to dates, circumstances and as to the details of the specific complaints being made. It suffers the combined vices of being too vague to assist in the determination of the particular C's claim (even were that appropriate at this stage) and too specific to assist in the resolution of any of the Horizon Issues.

58. Post Office does not understand why Cs are calling this evidence. None of them give evidence relating to specific bugs, and their evidence is not relied on by Mr Coyne to explain his reasoning or to demonstrate a chain of evidence linking a particular SPM's experience to an identified KEL or Peak.

59. Regarding the claimant-specific witnesses, it seems that Cs consider these their best examples of how individuals have been affected by Horizon bugs. However, as Ms Van Den Bogerd's evidence explains, there are alternative explanations for all of the situations cited by these witnesses. The Court is not in a position to make findings in relation to which version of events is to be preferred – and has made it clear that this is not the purpose of this trial. Post Office suggests that for the purposes of this Horizon Issues trial, the Court is unlikely to be assisted by this evidence.

60. Mr Roll's evidence is relevant to some of the remote access issues in Legacy Horizon. He left Fujitsu in 2004 so has no evidence on Horizon Online.

61. Mr Henderson is a forensic accountant and partner in Second Sight. The Court was addressed about his evidence at the PTR. It remains unclear what material factual evidence he is able to give. The Court has made it clear that it will not be side-tracked

into determining any issues regarding the correctness of the opinions he refers to in his statement.[39]

B3. Post Office's Witnesses

62. Post Office is calling evidence from the following witnesses, in the following order:

62.1 Angela Van Den Bogerd

62.2 Dawn Phillips

62.3 Tracy Mather

62.4 Paul Smith

62.5 David Johnson

62.6 Andy Dunks

62.7 William Membery

62.8 Torstein Godeseth

62.9 Stephen Parker

63. Mr Parker and Mr Godeseth essentially deal with robustness issues and respond to Mr Roll's evidence on remote access. (In paragraphs 7 to 28 of his second witness statement, Mr Godeseth also responds to Professor McLachlan's evidence. Since Professor McLachlan is not being called, this part of Mr Godeseth's evidence can be disregarded.)

64. Ms Van Den Bogerd gives responsive evidence to the Cs' claimant-specific evidence. Some of that evidence is unlikely to be required:

64.1 Ms Van Den Bogerd responds to Mr Singh's evidence in paragraphs 31 to 58 of her second witness statement. Since Mr Singh is not being called on behalf of Cs, it is not necessary to go into this part of Ms Van Den Bogerd's evidence.

64.2 Similarly, in paragraphs 9 to 27 of her witness statement, Ms Van Den Bogerd responds to certain points made by Mr Henderson. On the assumption that the

[39] Judgment at PTR on 14/2/19, para 11 {C7/41/4}.

Court will be making no findings regarding the opinions he describes in his evidence,[40] again it should not be necessary to consider this part of the evidence.

64.3 Finally, in paragraphs 111 to 152 Ms Van Den Bogerd set out responsive evidence to some issues raised by some of the Lead Claimants in their witness statements prepared for the Common Issues Trial because Mr Coyne made reference to the evidence of these Claimants in Coyne 1.[41] At that time it was not known whether the Cs would be calling any of the Lead Claimants to give evidence again in the Horizon Issues trial. Since these individuals are not being called for the present trial, Ms Van Den Bogerd's responsive evidence also does not need to be considered.

65. The other Post Office witnesses essentially give evidence relating to various aspects of Horizon and Post Office's operating procedures and audit processes. However, some of them cover points that are not now in issue. In particular:

65.1 The whole of David Johnson's second witness statement responds to a number of points in the witness statements of Professor McLachlan and Mr Henderson. The evidence which is responsive to Professor McLachlan can be disregarded and, on the assumption that the Court will make no finding regarding Mr Henderson's opinions, it should also not be necessary to consider the evidence which is responsive to those.

65.2 As noted above, paragraphs 7 to 28 of Mr Godeseth's second witness statement, responding to Professor McLachlan's evidence, can also be disregarded.

[40] Judgment at PTR on 14/2/19, para 10 {C7/41/4}.
[41] {E2/5/27}; {E2/5/28}; {E2/5/29}; {E2/5/30}; {E2/5/31}; {E2/5/31}; {E2/5/32}; {E2/5/33}; {E2/5/34}.

C. MATTERS AGREED BY THE EXPERTS

C1. Introduction

66. The experts have so far agreed three Joint Statements: the First Joint Statement dated 4 September 2018 ("**JS1**");[42] the Second Joint Statement dated 25 February 2019 ("**JS2**");[43] and the Third Joint Statement dated 1 March 2019 ("**JS3**").[44] All of the agreements recorded in this section are set out in one or other of those Joint Statements.

67. There is a significant amount of agreement between the experts, both on factual and background matters and in relation to the individual Horizon Issues. It is proposed in this section briefly to summarise the extent of their agreement between the experts but not to describe in any detail the extent of their disagreement since this emerges from their respective reports, considered in Sections D, E and F below.

68. Before turning to the 15 Horizon Issues, it should be noted that in JS2 the experts have reached substantial agreement on what they have identified as "global" issues which act as the foundation and background for the specific issues.[45] Such agreements include:

    68.1 It is agreed that the experts' descriptions of: (i) the Horizon architecture; and (ii) support processes, are each consistent with one another and can be taken together as agreed descriptions.

    68.2 In relation to KELs and Peaks it is agreed that:

        (a) Together they form a useful source of information about bugs in Horizon but are a limited window on what happened. It is sometimes necessary to

[42] {D1/1}.
[43] {D1/2}.
[44] {D1/4}.
[45] JS2/Horizon Issue 0/p.26 {D1/2/26}.

use evidence from both, but even so they are not a comprehensive picture. It is to be expected that both KELs and Peaks are incomplete in various respects.

(b) KELs are aimed to help provide useful guidance to helpdesks in supporting SPMs, and to the back-end support function. As such they often give information about the impact of a bug or user error and may also give information about causes.

(c) Peaks record a timeline of activities to fix a bug or a problem. They sometimes contain information not found in KELs about specific impact on branches or root causes – what needs to be fixed. They are written by people who know Horizon very well. They do not contain design detail for any change. They are generally about development activities and timeline rather than about potential impact. Peaks typically stop when development has done its job, so they are not likely to contain information about follow-on activities, such as compensating branches for any losses. Some Peaks record observations of financial impact.

69. Turning to the three groups of Horizon Issues, other agreements between the experts include:

C2. Robustness Issues (Horizon Issues 1, 3, 4, and 6)

Issue 1:

70. The experts agree that there is evidence that bugs (which, as explained in footnote 2 above, is used throughout these submissions to mean 'bugs, errors or defects') have caused actual shortfalls to Subpostmasters' branch accounts; that each time any IT system is changed there is the potential to introduce new bugs; and that any bugs take time to resolve.

71. As explained below, Mr Coyne introduced a significant amount of new material in his supplemental report and in particular Mr Coyne identified for the first time the 22 bugs

which he considers important. The first opportunity that Dr Worden had to address these 22 bugs was in JS2. Through discussions between the experts, 7 more bugs have been added to the complete list in JS2.[46] The table in JS2 sets out 29 bugs, 28 of which in the opinion of either or both experts appear to have had or may have had an impact on branch accounts.[47] In relation to 12 of these bugs, the experts are agreed that they may have had a financial impact on branch accounts: in relation to the rest, this is in dispute.

72. They disagree, amongst other things, as to the extent of the impact of any such bugs. This is central to the matters to be resolved in this trial.

73. It is important to note the differing approaches which the experts have taken to "branch impact", since this explains a significant amount of apparent difference between them. The experts have recorded their different approach as follows:[48]

> *"Mr Coyne refers to any discrepancy that caused a loss (or gain) within branch accounts that needed corrective action as an "impact to branch accounts". Dr Worden only considers an effect or impact on branch accounts where a discrepancy loss (or gain) was not rectified by a correction such as a Transaction Correction."*

Issue 3:

74. It is agreed that robustness does not mean perfection, but that the consequences of imperfection must be managed appropriately. It is further agreed that the level of robustness may have increased or decreased as the system was changed. The existence of branch shortfalls is agreed but it is not agreed that this indicates any lack of robustness. They also agree that from their experience of other computer systems, Horizon is relatively robust and that, in line with most other large-scale computer systems, Horizon's robustness has generally improved over time. Robustness does not mean infallible but robustness limits the impact of faults and other adverse events.

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[46] Four of the bugs referred to at paragraph 742 of Worden that were not already part of Mr Coyne's 22 bugs were added as bugs 23- 26 in JS2. Through discussions between the experts, three further bugs were added, being bugs 27 – 29 in JS2.

[47] Both experts agree that Bug 21 had no financial impact, but it was included for completeness because it was part of Mr Coyne's original 22 bugs.

[48] JS2/p.28/1.9 {D1/2/28}.

Issue 4:

75. It is agreed that there have been a number of actual reported errors in data recorded within Horizon arising from (a) data entry, (b) transfer or (c) processing of data. The potential therefore exists for errors in data recorded but the experts do not agree as to its extent.

76. It is agreed that some of the bugs which had the potential to produce discrepancies in branch accounts relate to reference data. In relation to this the experts agree that:[49]

> *"while reference data bugs may be a significant proportion of the bugs with financial impact, once discovered, they could be quickly fixed (by a change to the reference data) once the bug is correctly identified."*

Issue 6:

77. It is agreed that whilst Horizon contains measures and controls for detecting system integrity concerns, the automatic mechanisms have failed in the past. The experts do not agree as to the extent of prevention, detection, identification, reporting or risk reduction that the automatic and manual control measures deliver.

C3. Remote Access Issues (Horizon Issues 7, 10, 11, 12 and 13)

Issue 7:

78. It is agreed that Fujitsu could access all transaction data recorded by Horizon, that both Post Office and Fujitsu can read data remotely, and that Fujitsu needs remote access for support purposes.

Issue 10:

79. It is agreed that the very nature of rolling out fixes within any IT system has the potential to affect transaction data or data in branch accounts.

[49] JS3/4.4 {D1/4/7}.

Issue 11:

80. It is agreed that the use of tools to insert, inject, edit or delete transaction data or data in branch accounts, to implement fixes that had the potential to affect such data or to rebuild branch transaction data, should be auditable, but that the maintenance of logs would be dependent upon retention periods and size.

Issues 12, 13:

81. The experts have not yet reached agreement on these Issues.

C4. Operational Issues (Horizon Issues 2, 5, 8, 9, 14 and 15)

Issue 2:

82. It is agreed that Horizon did not, in general, alert Subpostmasters to any significant bugs or other defects in the system itself. It is also agreed that the extent to which any IT system can automatically alert its users to bugs within the system itself is necessarily limited and that while Horizon has automated checks which would detect certain bugs, there are types of bugs which would not be detected by such checks.

Issue 5:

83. It is agreed that reconciliation between transactions recorded on Horizon and transactions recorded by Post Office's clients is largely automated and that the adequacy of Post Office back office processes to prevent discrepancies in branch accounts can be measured by the quality of the TC process.

Issue 8:

84. It is agreed that Post Office had access to data which would not have been available to SPMs and that Post Office were reliant on Fujitsu for diagnosis of whether the occurrence of shortfalls was caused by bugs in Horizon.

Issue 9:

85. It is agreed that the causes of some types of apparent discrepancies and shortfalls may be identified from reports or transaction data available to Subpostmasters. Other causes may be more difficult or impossible to identify from reports or transaction data available to SPMs.

86. It is agreed that SPMs would not be expected to have detailed knowledge of the Horizon system; but that 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.

Issue 14:

87. The experts agree that their respective descriptions of facilities available to SPMs are consistent with each other. They also agree the functionality enabling SPMs to deal with, dispute, accept or make good alleged discrepancies.

88. It is agreed that SPM comparison of Cash and Stock in branch and figures recorded within Horizon can be determined by the SPM/Auditor physically counting the cash and stock in branch and inputting those values derived into Horizon for a comparison to be made against the electronically derived figures held by Horizon.

89. In relation to TCs it is agreed that:

89.1 TCs arise (on the majority of occasions) as a result of either Post Office or a SPM identifying an imbalance or discrepancy;

89.2 Between 2006 to 2017 TCs were applied more than 100,000 times each year;

89.3 The TC process could lead to TCs being issued in error and when disputed and the dispute is upheld, some TCs are corrected by issuing another TC;

89.4 Post Office does not inspect Audit Data before issuing a TC. As there are typically more than 100,000 TCs per annum, it would incur additional cost and delay for Post Office to inspect audit data before issuing any TC;

89.5 When a TC is disputed, it is to be expected that Post Office will investigate/validate with more data sources than utilised in the initial determination

Issues 15:

90. It is agreed that the TC process arise on the majority of occasions as a result of either Post Office of an SPM identifying an imbalance or discrepancy. Between 2006 to 2017 TCs were applied more than 100,000 times each year. It is also agreed that the TC process could lead to TCs being issued in error and when disputed, some TCs are corrected by issuing another TC.

D. ROBUSTNESS (HORIZON ISSUES 1, 3, 4 AND 6)

(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?

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

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

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

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

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

D1. Introduction

91. This section covers the following:

91.1 Section D2 discusses Mr Coyne's first report (Coyne 1).

91.2 Section D3 discusses Mr Coyne's supplementary report (Coyne 2) and the largely new analysis that was not provided in Coyne 1.

91.3 Section D4 contains Post Office's submissions on Mr Coyne's approach to the central issue of robustness in light of the above discussions of Coyne 1 and Coyne 2.

91.4 Section D5 sets out Dr Worden's views.

92. The submissions below make regular reference to Peaks and KELs so it will be useful to introduce these concepts before beginning.

93. Peaks and KELs are described in paragraph 6.7.2 and 6.7.3 of Dr Worden's first report (Worden 1). Peaks are records of potential issues in Horizon that need to be addressed by Fujitsu's Service Support Centre ("SSC") and development teams.[50] They are a workflow tool updated in real time as an issue progresses. A Peak documents a chronology of steps taken by Fujitsu and, where appropriate, the investigation and fix of a bug. They are raised from a variety of sources, including internal reports by Fujitsu and by SPMs calling helplines.

94. KELs are guidance notes for helpline staff that document known issues, with their workarounds and fixes. There should only be one KEL for each known issue but each KEL may be relevant to multiple Peaks.

95. There are around 220,000 Peaks and around 8,000 KELs. They date back to 1999, though some Peaks and KELs from the early years of Horizon had been deleted long before this litigation began. Together, Peaks and KELs form the core of the service history for Horizon.

D2. Mr Coyne's First Report

96. The primary focus of Coyne 1 was on providing a wide (but not deep) review of KELs. Mr Coyne examined 5,114 KELs[51] but he also had a copy of the Peak database, which had been provided two and a half weeks earlier[52] and he had reviewed 1,262 Peaks which he considered "*might specifically relate to branch accounts*".[53]

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[50] Parker 1/62 {E2/11/20}.

[51] Coyne 1/5.114 {D2/1/83}.

[52] As explained in Annex 3, the Cs never made a request for disclosure of the Peak database and so they were provided voluntarily after Fujitsu built a system to extract them from their native database. 218,366 Peaks were disclosed on 27 September 2018 and 3,886 Peaks that had responded to keyword searches targeting privileged material were disclosed on 25 October 2018

[53] Coyne 1/1.28{D2/1/20}; {D2/1/21}.

97. The key failings in Coyne 1 are discussed below. In short, they are that:

97.1 Mr Coyne's opinion on robustness is elusive (but seems to be that Horizon is robust).

97.2 His review of KELs is superficial, gives a misleading impression and is an unsound foundation on which to form an opinion.

Robustness

98. Mr Coyne's views on robustness – a central issue in this trial – are unclear. He makes several contradictory comments in Coyne 1:

98.1 In the executive summary, he states that the present-day version of Horizon may now be considered "*relatively robust in the spectrum of computer systems used in businesses today*",[54] although he thinks it "*likely*" that it was less robust when it was first commissioned. The basis of this latter conclusion is not clear.

98.2 He accepts in the executive summary that "*robustness does not mean perfection*"[55] but he also considers that "*Horizon's relative robustness does not mean that [it] is thereby extremely unlikely to be the cause of shortfalls*".

98.3 In section 5, he makes the observation, with which Post Office agrees, that:

> "*It is important to note that robustness does not equate to a guarantee that software is bug or error free. A system's reliability can be improved by rigorous testing and debugging (provided no further bugs are consequently introduced through this process) however, complex systems can never be completely tested or ever entirely free of bugs*."[56]

98.4 Later in section 5, he appears to retreat from the view set out in the executive summary and suggests that he is "*unable to estimate the level of the Horizon system's robustness...[and]…there are not many people who could. The sheer*

[54] Coyne 1/3.7{D2/1/26}.
[55] Coyne 1/3.10{D2/1/26}.
[56] {D2/1/76}.

enormity of the task to garner a thorough understanding of the code, which would be required to estimate robustness is, in my opinion, nearly impossible".[57]

98.5 Later still, he appears to change his mind again:

"*Overall, from my review of the evidence it is likely (whilst putting aside the large number of often required manual processes) that the electronic processes within Horizon are relatively robust based upon the literal, contextual, definition. Certainly, both instances of Horizon (Horizon and Horizon Online) appear to be in-line with other IT systems of similar size and industry.*"[58]

98.6 And in the following paragraph:

"*The extent to which Horizon is robust, in my opinion, is reasonable but not a guarantee of no shortfalls or branch account accuracy.*"[59]

99. It appears, therefore, that Mr Coyne accepts that Horizon is robust but at the same time assert that this is a conclusion he could not reach without examining every line of code which comprises the Horizon system. If that really is his position, he appears to have misunderstood his role, which is to assist the Court with exactly this type of challenge.

100. Putting the suggested impossibility of any robustness assessment to one side, it is clear that Mr Coyne's view is that Horizon *is* robust – certainly compared to other similar systems[60] – and that its robustness has improved over time, as one would expect for such a system[61] - but that this is not a guarantee of no Horizon-caused shortfalls. Post Office agrees with that: this really says no more than that (1) it is possible for there to be bugs in Horizon and (2) it is possible in some cases for those bugs to result in shortfalls in branch accounts. That is common ground,[62] and the evidence shows that these possibilities have eventuated over the last 20 or so years in an extremely small minority of transactions. Mr Coyne's approach takes matters no further.

101. The question is not 'Is it possible that any given shortfall was caused by Horizon?' – in the absence of specific evidence about the shortfall, that is certainly possible. The

[57] Coyne 1/5.88{D2/1/77}.
[58] Coyne 1/5.111{D2/1/82}.
[59] Coyne 1/5.112{D2/1/82}; {D2/1/83}.
[60] JS3/3.1 {D1/4/2}.
[61] JS3/3.1 {D1/4/2}.
[62] Both on the generic pleadings and in the experts' joint statements {D1/1} and {D1/2}.

question is 'How likely is it, all else being equal, that any given shortfall was caused by a bug in Horizon?'. On that key question, Coyne 1 had almost nothing to say – even though Mr Coyne agrees that it is difficult to measure of the extent of robustness of Horizon other than by considering how Horizon might limit the extent of impact on branch accounts.[63]

Review of KELs

102. Mr Coyne is consistent – and consistently unhelpful – in his treatment of KELs. His overall view is that "*The sheer volume of Known Error Logs and reconciliation reports confirm the wide-ranging extent of the impact of such bugs/errors/defects*".[64]

103. This view is amplified in Section 5 of Coyne 1. Mr Coyne set out over 50 pages a series of KELs and other issues which have affected Horizon from time to time. It is evident that he and his team had considered an enormous amount of material – 5,114 KELs and some at least of their associated Peaks.[65] From that review, he said that 163 had been found "*that could be of significant interest*", and he refers to about 60 of these in the body of Coyne 1.[66]

104. There is little or no analysis in the relevant section: it is simply a long catalogue of factual descriptions of the sort of issues identified and described by the documents. Coyne 1 does not consider whether the KELs had any (or any non-transient) financial impacts on branch accounts and if so, how substantial such impacts were and how those impacts compare in scale to the overall number of transactions undertaken on the Horizon system. These are the questions of *extent* on which the key Horizon Issues focus.

105. There is no attempt here (or anywhere in Coyne 1) to put these KELs into context, for example by indicating whether the issues to which they relate either did cause, or even

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[63] JS3/3.15 {D1/4/4}.

[64] Coyne 1/3.3{D2/1/25}.

[65] Coyne 1/5.114{D2/1/83}. In Coyne 2/3.10{D2/4/13}, he says that when he produced Coyne 1 he had reviewed 1,262 Peaks.

[66] Coyne 1/5.114{D2/1/83}. Mr Coyne said in para 5.114 that he had referred to 76 KELs in his report but only around 60 are identified in the following section.

could have caused, any shortfalls in branch accounts; or by describing the robustness countermeasures supporting Horizon; or by explaining whether and to what extent they prevented or mitigated any adverse consequences from the issues or problems identified or alerted the user or the system to the fact that something had gone wrong, triggering an investigation.

106. Instead, Mr Coyne presents a miscellaneous series of untested examples and effectively invites the Court to conclude that given this volume of issues, "*it is evident that the Horizon system itself and errors within it have been the cause of shortfalls attributable to branches*".[67] There is again no indication of the *extent* of such errors and shortfalls. No sense of perspective is given.

107. When studied carefully, it can be seen that Coyne 1 gives the false impression that there have been *significant* numbers of *relevant* problems in Horizon. But proper scrutiny of the KELs relied on by Mr Coyne reveals that there is not much smoke, let alone fire.

108. In his first witness statement,[68] Mr Parker sets out a table at Appendix 1 which goes through 58 KELs expressly referred to by Mr Coyne in Coyne 1 and provides Fujitsu's views on them.[69] Crucially, they consider something that Mr Coyne disregards, namely whether the problems had any financial impact on branch accounts and, if so, whether that impact was a lasting one or whether it was merely temporary (because it would be corrected through the application of what Dr Worden describes as Horizon's robustness countermeasures). Of the 58 KELs considered by Mr Parker's team at Fujitsu:[70]

    108.1 39[71] had no financial impact (including those which would have had no impact if the clerk followed the proper recovery process);

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[67] Coyne 1/5.113{D2/1/83}.
[68] {E2/11}.
[69] Appendix 1 at {E2/11/23}.
[70] Mr Parker was unable to tell where Mr Coyne's figure of 76 KELs had come from.
[71] Items: 2, 3, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 23, 26, 27, 28, 29, 30, 33, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 56, 57, 58.

108.2 3[72] are to be disregarded either because the KEL is not available, or was generic or is not known due to its age.

108.3 12[73] had or might have had a temporary financial impact but this would have been resolved either by mechanisms within Horizon or through Post Office's client reconciliation processes; and

108.4 4[74] had a financial impact that would not inevitably have been resolved: these relate to either the known Payments Mismatch or Local Suspense Account issues. These bugs were detected, and the shortfalls were ultimately resolved by Post Office.

109. It is important to note that Mr Coyne does not dispute the accuracy of this analysis in Coyne 2. He does not re-visit the points that he made in reliance on those KELs in Coyne 1. Instead, he appears to abandon most of the points made in Coyne 1 and adopts a different analysis in Coyne 2, as explained below.

110. On the extent of errors in data recorded within Horizon arising from data entry, transfer or processing of data, Coyne 1 takes a similar approach. Again, Mr Coyne cites various examples he has seen, again giving an appearance of widespread problems. But he ultimately comes to the view that it is not possible to measure "*the full extent of errors in data recorded*", since he says that it is "*possible*" there is further evidence that might indicate further errors and the information contained in KELs (and other documents) is not complete.[75] Notwithstanding these reservations, he concludes that "*it is clear that significant errors in data recorded within Horizon have occurred*".[76] He does not attempt to provide a measure of their significance.

111. Again, Mr Coyne gives an impression of saying something more powerful than he is in fact saying. On analysis, the objective content of Coyne 1 is anodyne: it would be remarkable if over a 20 year period a system with the size and complexity of Horizon

[72] Items: 24, 25, 34.
[73] Items: 4, 5, 6, 7, 12, 20, 21, 22, 31, 35, 36, 38.
[74] Items: 1, 32, 50, 55.
[75] Coyne 1/5.153{D2/1/95}.
[76] Coyne 1/5.154{D2/1/95}.

did *not* have bugs and it would be astonishing if there were not *some* evidence of errors in data recorded. That says nothing about the likely *extent* of such problems, as to whether they were likely to cause any lasting shortfalls in branch accounts or as to the likelihood of any particular individual having suffered loss as a result.

112. Mr Coyne's overall conclusion on this central issue is that it "*was highly likely for bugs/errors/defects to have the potential to both (a) cause apparent or alleged discrepancies or shortfalls in relating to Subpostmasters' branch accounts/transactions and (b) undermine the reliability of Horizon to accurately process and record transactions*".[77] When read carefully, it can be seen that this formulation says less than it appears to say. In any event, it is of no real assistance to the Court:

112.1 It is not "*highly likely*" that bugs caused apparent shortfalls in branch accounts, it is certain (and admitted) that they did so. This is no more than a truism that bugs, which by their nature are unforeseen anomalous events, can cause problems.

112.2 The issue for determination is whether it is likely that there have been other bugs of this kind that are of a sufficient number and a sufficient scale to undermine the robustness of Horizon and the likelihood of any given shortfall in any given set of accounts being a genuine shortfall. Mr Coyne does not wrestle with that at all.

Note on Transaction Corrections

113. Before leaving Coyne 1, it may be helpful to say something about Mr Coyne's approach to the processes by which Post Office checks Horizon transaction data against Horizon data and issues Transaction Corrections (or TCs). Mr Coyne's view was that he could not reach clear conclusions on whether TCs might undermine Horizon's robustness. However, he pointed that the process is not *"infallible*".[78]

[77] Coyne 1/5.196{D2/1/107}.
[78] Coyne 1/6.77{D2/1/130}.

114. Post Office's reconciliation processes are outside the scope of the Horizon Issues. As was explained at the time the Horizon Issues were agreed, had an attempt been made to use the Horizon trial to investigate these processes, the quantity of disclosure and witness evidence required would have made a 20 day trial in March 2019 out of the question. The scale of the disclosure and witness evidence required to give anything like adequate evidence of the many different reconciliation processes would have been enormous.[79] This is why Horizon Issues 5 and 15 are limited to how Horizon compares its data against outside data and how Horizon processes and/or records TCs.[80] These are questions that require the description of the functioning of Horizon but not any opinion on its sufficiency or quality. In any event:

114.1 The reconciliation process results in relatively few transactions being corrected on Horizon. The volume of TCs (either credit or debit) is about one TC per branch per month.[81]

114.2 Even if one assumes an unreal inaccuracy rate in TCs of 50%, that would result in an around 6 incorrect TCs per branch per year.

114.3 That represents a tiny percentage of the transactions in an average Claimant branch which undertake on average 48,000 transactions each year.[82]

114.4 So even on a basis generous to the Cs, incorrect TCs may be amount for 0.000125% of all transactions undertaken by Cs.

115. Dr Worden adopts a far more sophisticated calculation yielding a much lower figure.[83] But even on the basis of the simpler and more generous calculation explained above, it

[79] See, e.g., the exchange between Mr Cavender QC and the Court at the CMC on 22 February 2018: transcript at pp. 53G-54F {C8.4/4/54}.

[80] {C1/1}. It is also why the Horizon Issues as agreed do include the first issue that Cs proposed in February 2018 (or anything like it). That issue referred to errors arising through reconciliation process and would have taken the factual enquiry well beyond the Horizon system itself and into accounting processes: see the list of issues proposed by Cs in February 2018 {C8.4/1/27}.

[81] Worden 1/para 930{D3/1/206}.

[82] Dr Worden calculates, that the average Post Office branch carries out approximately 439 transactions per day and so more than 11,000 per month (assuming 26 working days per month). Cs' branches are on average smaller than the average Post Office branch, but applying Dr Worden's branch size factor of 0.37 to correct for this,[82] one is still left with a figure in excess of 4,000 transactions per month or 48,000 transaction per year. See Worden 1/para 629{D3/1/150}.

[83] Worden 1/section 9.6{D3/1/205}.

would be unreal to suggest that TCs could undermine the robustness of Horizon. The effect of false TCs is a second order effect (a small fraction of a small fraction), and it would be misleading to suggest otherwise.

116. This is an example of several second order issues raised by Mr Coyne as apparent challenges to Horizon's robustness (another is remote access). The suggestion is not that Horizon itself contained a bug but that, when a discrepancy which may have arisen for a wide range of reasons is dealt with, it is possible that some human error may be made leading to a false TC. This is of course a possibility, but this is not a viable candidate to explain a material proportion of branch shortfalls because TCs themselves form a very small proportion of branch transactions.

117. It also cannot be assumed that even erroneous TCs are the cause of shortfalls or that all TCs have been raised in relation to a problem in Horizon. TCs are intended to correct an already existing accounting discrepancy (whatever its root cause) and that is what they ordinarily do.

Dr Worden's Response to Coyne 1

118. Dr Worden's first report dated 7 December 2018 (Worden 1) provides a comprehensive answer to Coyne 1. Worden 1 is addressed below, but in short:

    118.1 Dr Worden sets out details of the Horizon system and describes the many different robustness countermeasures that support Horizon.

    118.2 He concludes that Horizon is a very robust system and explains why in detail, including because the evidence shows that the countermeasures were properly implemented and worked well in practice.

    118.3 He considers the KELs referred to by Mr Coyne as well as several others (a total of 200) on a sampling basis and, unlike Mr Coyne, he analyses them in detail. He concludes that very few of these KELs had, or could have had, any impact (or any lasting impact) on branch accounts.

119. Dr Worden then performs qualitative and quantitative analyses which seek to estimate to a good level of confidence the maximum extent of bugs causing shortfalls across the

lifetime of Horizon. In doing this, he makes various assumptions, but at every turn he adopts unrealistic assumptions to favour Cs' case (tending towards overestimating the likely number of bugs and their likely financial impact). He demonstrates that, in order for there to be a good chance that Cs' shortfalls (or some significant portion of them) were caused by bugs, there would have to be tens of thousands of bugs of the type and of the scale of the Local Suspense bug (a bug which had an unusually high financial impact).

120. There is, of course, no evidence to suggest anything like tens of thousands of large bugs lurking undetected in Horizon. All the available indications point the other way.

D3. Mr Coyne's Supplementary Report

121. In Coyne 2, Mr Coyne states that he has concluded that *"Horizon is less robust than as originally expressed in my first report*"[84] but does not go on to say how robust he now believes it to be. He sets out his reasons for this conclusion in Coyne 2/1.2. There appear to be two broad types of reason:

    121.1 The first type of reasons (grounds a to c) are based on the ways in which problems arising in Horizon have been dealt with.

        (a) Grounds a and b concern remote access: Mr Coyne's view is that privileged user access to modify the Horizon branch database was not as restricted as he thinks it should have been and that actions by support staff were unaudited.

        (b) Ground c concerns the data used by Post Office when discrepancies are queried: according to him, before reaching any conclusion as to the cause(s) of a discrepancy it should have consulted the full audit data held in the data store rather than using the copies contained in its own back office systems.

[84] Coyne 2/1.2{D2/4/6}.

(c) These points are disputed, but it is important to note that, even if they are all correct, they are examples of second order issues, i.e. they relate to possible mistakes made when dealing with issues, in the relatively small number of cases where such issues have arisen. It is not clear how Mr Coyne can think that such matters could undermine the fundamental robustness of the Horizon system.

121.2 The second type of reasons (grounds d to g) appear to be based on his review of certain Peaks. The validity of his conclusions here depends on the nature of his review of Peaks and of whether it is appropriate to draw generalised inferences from the results of that review. These points are addressed below.

122. Mr Coyne does not suggest, however, that his views on robustness as set out in Coyne 1 are wrong or that he has changed his mind in any fundamental way. Coyne 2 suggests that any change in view is a matter of degree only.

123. Mr Coyne acknowledges that existence of the countermeasures which Dr Worden refers to in Worden 1 but appears to dismiss them as "*simply basic elements of practical system design*".[85] If this is intended as a criticism, it has no force. It is unsurprising that key countermeasures are considered standard, and as Dr Worden explains, robustness depends not only the use of such countermeasures but on their effective combination and implementation in practice. Mr Coyne persists in failing to consider the effect of the countermeasures to which Dr Worden refers or the extent to which they successfully prevented any bugs creating lasting shortfalls in branch accounts. Putting it at its highest, he says that there have been some occasions in which the countermeasures were not triggered. In itself, that is a fundamental criticism of Mr Coyne's approach.

124. The principal additional analysis undertaken in Coyne 2 is in relation to the Peaks database. Mr Coyne has carried out extensive searches on more than 200,000 Peaks and concludes that *"[t]he PEAKs are consistent with many more bugs/errors and*

[85] Coyne 2/1.4{D2/4/8}.

defects shown to impact branch accounts than the initial three acknowledged by Post Office."[86]

125. Mr Coyne's starting point is that Peaks are a more valuable resource than KELs "*as they are documents that are created when issues which need further analysis* are *reported…[and]…conclude with the determination of the root cause of the issue and supporting guidance for closure of the record*".[87]

126. In fact, the purpose of Peaks is to provide a diary or log of who did what to fix a bug, i.e. they are a tool for workflow tracking.[88] Consistently with this, the entries in the "root cause" field are often generic. Mr Coyne is right to say that KELs do not provide a comprehensive view of the specific impact, if any, on branch accounts,[89] but that is hardly surprising since that is not their purpose.[90] The experts agree that KELs are intended to summarise an issue and to provide information to other support users on how to assess a particular problem and/or treat it.

127. The results of Mr Coyne's additional researches are set out in section 3 of Coyne 2. In basic approach, this section bears a striking resemblance to section 5 of Coyne 1 in that it contains a mass of examples that, without careful analysis, tend to create the false impression of problems that were sufficiently widespread to undermine the robustness of the system.

128. A persistent theme in both Coyne 1 and Coyne 2 is an apparent suggestion that the material presented is (or might be) just the tip of the iceberg. The implication seems to be that, if only Mr Coyne had more time and could trawl through every line of code and every available record, he would (or at least might) be able to come up with yet more examples. For example, Coyne 2/3.105 states:

> *"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*

[86] Coyne 2/1.2 {D2/4/6}.
[87] Coyne 2/3.1{D2/4/11}.
[88] The second joint statement includes an agreement to this effect at issue 0.5 {D1/1/27}.
[89] Coyne 2/3.2{D2/4/11}.
[90] See the agreed purpose of KELs set out at issue 0.4 of the second joint statement {D1/1/26}.

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." (emphasis added)

129. Such an approach invites speculation in the place of reasoned inference. The reality is that Mr Coyne (assisted by a team of four others – see the cover sheet of Coyne 1) has had access to an immense amount of material over the last year. Much of that material (in particular KELs and Peaks) is capable of being word-searched or otherwise filtered so as bring focus to any review. Any suggestion that Mr Coyne has been overwhelmed by the sheer volume of material would be incorrect (as would any contrary suggestion that he has not been provided with enough material). Plainly, Mr Coyne and his team have been doing their best to find evidence to undermine the robustness of Horizon. That has been the focus of their work, rather than assessing Horizon's overall robustness and the overall effectiveness of the countermeasures to which Dr Worden refers.

Mr Coyne's table of 22 bugs, errors or defects

130. For all the thousands of KELs and Peaks which Mr Coyne and his team have now investigated, Mr Coyne's analysis in Coyne 2 came down to 22 bugs or issues which he considers are indicative of relevant concerns in the Horizon software. These are set out in Table 1 of Coyne 2.[91]

The JS2 table of 29 bugs, errors or defects

131. A table at the beginning of JS2[92] holds a full set of 29 bugs or issues, having added in those found by Dr Worden and other changes from the experts' discussions.[93] The experts agree that 12 bugs may have had a financial impact on branch accounts. They do not agree on the remainder.[94]

132. Of the issues on which the experts do not agree:

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[91] Coyne 2/3.21{D2/4/15}.
[92] {D1/2/3}.
[93] See paragraph 71 above for a fuller explanation.
[94] JS2 1.2 {D1/2/27}.

132.1 Counter Replacement Issues arose from localised hardware failures in branches.

132.2 Branch Customer Discrepancies and Recovery Issues contain no evidence in the Peaks and/or KELs of any software fault in Horizon.

132.3 Network Banking Bug appears to be a communication problem with BT. Reconciliation Issues, Post & Go and TPSC250 related to issues in reporting data in systems outside of Horizon. It is unlikely any of these caused an impact on branch accounts.

132.4 Girobank Discrepancy, Phantom Transactions, Transaction Correction Issues and Bugs/Errors Defects Introduced by previously applied Peak fixes either did not impact branch accounts or the evidence is inconclusive of any impact.

132.5 Dalmellington, Remming In, Remming Out, Local Suspense Issue, Reversals and Recovery Failures would have been caught by automatic reporting mechanisms and any impact on branches corrected in the ordinary course of Post Office operations.

133. Of the 12 issues which the experts agree were bugs which may have had a financial impact on branch accounts:

133.1 Data Tree Build Failure Discrepancies arose in 1999 during the pilot phase of Horizon but did have an impact on branches.

133.2 Withdrawn Stock Discrepancies had a remote possibility of causing a loss but was only triggered by a failure of an SPM to return withdrawn stock on time.

133.3 Bureau Discrepancies was treated as high priority.

133.4 Concurrent Logins was said to be a bug that might produce small discrepancies for a short period of time.

133.5 Bureau de Change did have branch impact but was limited to very small rounding errors on foreign exchange transactions.

133.6 Wrong branch customers change displayed and Lyca top up related to incorrect reference data rather than a fault in the Horizon software.

133.7 TPS arose as a result of a back-end reporting issue and any impact on branch accounts would have been small.

133.8 Drop and Go was very visible on the counter and so would have been resolved easily by way of a TC.

Mr Coyne's analysis of bugs

134. Mr Coyne's approach to analysing possible bugs that have impacted branch accounts can be illustrated by considering three of the examples from his list of 22 bugs. These highlight the three key flaws in his analysis:

134.1 Some of his issues are not bugs at all.

134.2 Some of his bugs had no financial impact on branch accounts.

134.3 Some of his bugs only had a transient impact on branch accounts and were automatically corrected in the ordinary course of Post Office operations.

Issue 17 Branch Customer Discrepancies

135. Mr Coyne's analysis is set out from paragraph 3.174 of Coyne 2:[95]

135.1 Mr Coyne does not indicate the potential cause of this issue or its branch impact.

135.2 In fact, this affected just one branch and any discrepancy in the branch's accounts were caused by user error in failing to follow the recovery process. The SPM declined the recovery process rather than complete it. This was not caused by a bug in Horizon.

135.3 Further, any discrepancies that did arise were transient. This issue did not result in lasting effects on branch accounts. Fujitsu picked up the SPM's error

[95] {D2/4/59}.

through its own automated reporting and pro-actively contacted the SPM twice to assist the SPM with the recovery process.

Issue 19 Post & Go

136. Mr Coyne's analysis is set out from paragraph 3.185 of Coyne 2:[96]

136.1 Mr Coyne describes this issue as being caused by a "*bug*"[97] that "*could have impacted branch accounts*"[98]. He is wrong on both points.

136.2 Post & Go terminals are self-service kiosks in branches. Due to an error in branch, the kiosks were not associated with stock units in the branch accounts. This meant that transaction data from the kiosks was incompatible with Post Office's back-end finance system, POLSAP.

136.3 The issue did not cause any impact on the branch's accounts. Transaction acknowledgments of the transactions from the kiosks were being correctly recorded within the accounts. The issue affected the communication of data from Horizon to Post Office's back-end system.

136.4 The issue was remedied by the branch correctly associating the kiosks with stock units.

Issue 5 Remming In

137. Mr Coyne's analysis of this issue is set out at paragraph 3.56:[99]

137.1 Mr Coyne correctly identifies two issues as bugs in relation to remming in of cash. He omits to explain the highly unusual way that the SPMs acted to cause the bugs to occur.

(a) In the first case[100], SPMs were remming in the same pouch of cash twice on two different terminals simultaneously. This was a user error that

[96] {D/2/4/61}.
[97] Coyne 2, para 3.188 where he refers to a "bug fix" {D2/4/63}
[98] Coyne 2, para 3.185 {D2/4/61}
[99] {D2/4/27}.

should have been prevented by Horizon but was not and so can be classed as a bug.

(b) In the second case[101], SPMs were partly remming in a pouch of cash, then stopping the process without cancelling the rem in, and then remming in the same pouch again. Again, this was a user error that should have been prevented by Horizon but was not and so can be classed as a bug.

137.2 Mr Coyne's own analysis correctly records this would cause a duplicate pouch of cash to be remmed in by the user causing a shortfall. But he fails to take into account Post Office's reconciliation processes that check that cash pouches sent by Post Office match with the cash pouches remmed in by branches. This report is run to detect all types of remittance discrepancies, whether caused by user errors, bugs or otherwise. That reconciliation process automatically generates TCs to correct any discrepancies.

137.3 Unless there was a failure in the TC process (a good example of a second order issue), it was very unlikely that there would be a lasting effect on branch accounts.

Mr Coyne's commentary on Worden 1

138. Mr Coyne takes issue with Dr Worden's quantitative approach to ascertaining the likelihood of bugs in Horizon having been responsible for the shortfalls complained of by Cs. He puts forward a number of reasons for this:

138.1 He says that it is difficult to investigate the full impact of a bug through KELs (or Peaks) and that therefore Dr Worden's statistical approach is "*ultimately flawed*".[102]

138.2 Mr Coyne disagrees with a number of the assumptions made by Dr Worden in carrying out his analyses.[103] Essentially, Mr Coyne appears to say that in each

[100] Coyne 2, para 3.56 {D2/4/27}.
[101] Coyne 2, para 3.60 {D2/4/28}.
[102] Coyne 2/4.90{D2/4/118}.

case where Dr Worden has made an assumption (e.g. that bugs would affect all branches equally), there is evidence or an argument to suggest that a different assumption might be appropriate.

139. There are several problems with this approach:

139.1 Mr Coyne pays no regard to the fact that Dr Worden consistently makes central assumptions (based on his best assessment of the evidence) and then adjusts these dramatically in Cs' favour before using them in his key calculations. These adjustments are cumulative. Possible concerns of the sort expressed by Mr Coyne have been accommodated by skewing the qualitative assessment in Cs' favour and away from what would follow from a simple best estimate based on Mr Worden's assessment of the evidence.

139.2 Mr Coyne does not offer any alternative way to estimate the likely number of bugs and/or the total financial impact of such bugs in Horizon. It is easy to attack assumptions without proposing better alternatives. The attacks here lack merit. For example, he mischaracterises some of Dr Worden's assumptions and he offers no reason to suppose that Cs' branches were more affected by bugs than other branches.

139.3 Mr Coyne's refusal to give <u>any</u> response to the question of the likely extent of bugs in Horizon causing shortfalls, apparently on the grounds that the available evidence is imperfect, is both unhelpful and unrealistic. This point is returned to below.

D4. Mr Coyne's Approach

140. Stepping back from the detail of Coyne 1 and Coyne 2, it can be seen that there are certain themes running through both of Mr Coyne's reports. These are:

140.1 he avoids the key questions;

[103] Coyne 2/5.292 {D2/4/200}.

140.2 he applies a doctrine of perfection;

140.3 he embraces uncertainty in the face of imperfect evidence; and

140.4 he engages in speculation where there is uncertainty.

Each of these will be dealt with in turn.

Avoiding the question

141. In order to answer the core Horizon Issues, a critical task is to give a sense of how good the Horizon system is and of whether there are aspects of Horizon that make it likely that branch accounts might often be permanently affected by discrepancies attributable to bugs. The Court is unlikely to be assisted by a catalogue of issues that might conceivably have given rise to a difficulty for an SPM over the past 20 years.

142. It is obviously right that specific instances of (potential) bugs should be considered (which Dr Worden does), but that analysis must go beyond merely noting that they exist. It must address the nature and significance of the bug and how it operated in the Horizon system. The following questions need to be asked:

142.1 Did the issue actually affect branch accounts at all, even temporarily?

142.2 If so, is it clear or likely that it was or would have been picked up by the operation of a Horizon countermeasure?

142.3 Was it ultimately resolved by Fujitsu after it was detected?

142.4 Is there any evidence that any SPM, or better still, any of the Cs, actually suffered any lasting shortfall as a result of the bug?

143. Mr Coyne asks none of these questions. Instead, in both Coyne 1 and Coyne 2 he lists a series of things that he thinks might cast doubt on the Horizon system, giving some indication of the potential seriousness of each bug but little more than that. No sense of scale or perspective is given. There is little to assist the Court in arriving at a balanced view as to whether the matters investigated could plausibly be said to have caused Cs' shortfalls, for example.

144. A typical approach is the reference in Coyne 1 to the fact that there have been 19,842 changes in Horizon. This is relied on as white noise to suggest that robustness could be affected by each change.[104] In fact the experts agree that it is to be expected that many of these changes will have been minor and others will have been made to improve the system or fix bugs.[105] Inevitably some changes will occasionally affect, directly or indirectly, particular countermeasures and conceivably this could mean that a particular countermeasure might be more or less efficient in a particular situation from time to time. But the fact that there are multiple countermeasures in place – so that if one does not pick up a bug, another probably will – means that these inevitable slight variations over time are very unlikely to make any lasting difference.

145. Mr Coyne takes the same approach to the question of the extent to which it is likely that bugs in Horizon caused actual loss to SPMs, which Dr Worden approaches in various ways, including by asking what is the likely financial impact of all bugs (allowing him to then ask how much of that total impact would be expected to fall on Cs). Mr Coyne's answer to this crucial question is as follows:

> *"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."*[106]

146. Mr Coyne makes a similar point when he records his position in JS3:[107]

> *"Horizon bugs, errors, and defects, along with mistakes made by Fujitsu/Post Office employees and branch user errors were all likely causes of shortfalls. Therefore, it would be incorrect to say that Horizon was extremely unlikely to be the cause of shortfalls."*

147. Mr Coyne seems to be saying no more than the fact that an event has happened in the past makes it likely that an event of that type will happen in the future. That takes matters no further on the central issue of extent.

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[104] Coyne 1/5.89-5.90 {D2/1/78}.
[105] JS3/3.10 {D1/4/3}.
[106] Coyne 2/5.315{D2/4/105}.
[107] JS3/3.25 {D1/4/6}.

148. Answers of this sort cannot assist the Court. They involve a refusal to engage with what is in truth the central issue of this trial. It is common ground that it is *possible* that bugs have caused discrepancies and shortfalls (indeed, it is admitted that some bugs have done just that). It has never been Post Office's case in this litigation that it is impossible for there to have been further bugs that may have had a similar effect. Given the scale of Horizon and the length of time that it has operated, it would be unrealistic to suggest that there could be no shortfalls caused by undetected bugs. Mr Coyne merely restates what is obvious and admitted. The central issue is, all else being equal, how unlikely is it that any given shortfall in any given set of branch accounts was caused by such a bug?

149. What the Court requires, it is submitted, is a sensible account of the likelihood of bugs in Horizon being responsible for a sufficiently high number of shortfalls that the robustness of Horizon – and thus the general reliability of branch accounts – is undermined.[108] Mr Coyne does not provide evidence that can materially assist the Court in reaching a view on this key common or generic issue.

Doctrine of Perfection

150. Although, as set out above, Mr Coyne's views on robustness are not consistently expressed, he does accept that robustness is not the same as perfection. It follows that he also accepts that it is unremarkable for a system such as Horizon to suffer from bugs, but this does not detract from the proper conclusion that the system is a robust one.

151. Any other conclusion would be lacking in common sense and would be all the more remarkable given that there are, and have always been, teams of people within Fujitsu dedicated to supporting Horizon, including identifying bugs and doing all that they can to resolve them.

152. Although Mr Coyne pays lip service to this obvious point, he does not apply it in his analysis and argument. See for example Coyne 2/5.216:

[108] Of course, as indicated in Section A above, whatever the general position, any particular C could have a particular basis for contending that his or her specific shortfall was caused by Horizon.

> *"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"*

153. Mr Coyne's true position therefore appears to be one of perfectionism: it is all right to have bugs, but not if they are 'unsafe'; and any bug that has affected a branch account in any way is unsafe, which means the system is not robust after all. A single branch-affecting bug is enough to warrant that conclusion.

154. This incoherent position again provides no assistance to the Court. Mr Coyne is not presenting a balanced view. He fails to take any account of the fact that during its two decades of operation Horizon has successfully completed billions of transactions without incident. He also fails to have regard to the fact that many of the bugs which have occurred were picked up by countermeasures, i.e. Horizon and its support system doing what it was supposed to in preventing any bugs having adverse consequences.

155. Latching onto the few issues that he and his team have been able to identify – after immense effort – as evidence of there being 'unsafe' bugs tends to suggest that the Court should draw an inference of inherent unreliability which Mr Coyne does not himself draw. This is not a helpful approach.

Indeterminacy due to incomplete evidence

156. A further theme is that Mr Coyne is unable to reach any concluded view, in particular on the likelihood of bugs having caused any part of Cs' shortfalls, since he has not been able to look at every possibly relevant document or examine every line of code in the Horizon system.

157. See, for example, Coyne 2/5.217:

> *"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."*

158. There appear to be two strands to this theme:

158.1 The first is that Post Office has failed to provide all of the documentation which Mr Coyne has requested.

158.2 The second is that Mr Coyne needs to see every line of code and every potentially relevant Post Office and Fujitsu document created over more than 20 years before he can express any view – or, rather, any view in favour of the system's robustness and reliability.

159. As to the first of these arguments, it is important to have in mind the history of disclosure in this case. This is discussed briefly in paragraph above 44 and more fully in Annex 3.

160. In short, disclosure has been a claimant-led process, with Post Office providing large volumes of documents and data in response to requests from the Cs and Mr Coyne. In the relatively few instances where requests have been refused, this is generally because, far from being narrow Model C requests for disclosure, they have been framed in impossibly wide terms that Post Office could never have provided in a proportionate way or at all. The amount of documentation that has been provided is vast, and the costs of providing the disclosure have been enormous. Over 400,000 documents have been provided that directly relate to Horizon, including:

- 112,000 technical documents that describe the design and operation of Horizon.
- 21,000 OCRs and OCPs being records of changes made to Horizon.
- 40,000 TFS entries being the records captured in the call logging software used by the Horizon helpline.
- 220,000 Peaks that describe events that might require investigation or action to be taken in relation to Horizon, including a description of the steps taken by SSC in respect of each event.
- 10,000 KELs documenting known issues and related guidance for support teams at Fujitsu.
- 5,000 user and audit logs.
- 6,000 other documents voluntarily disclosed or disclosed in response to requests from Cs.

161. Post Office has endeavoured to provide sensible responses to the large number of requests made, many of which have been far wider than the sort of requests that were directed by the Court. Cs have not made any applications for further disclosure. The Court will be alive to the risk of late complaints about disclosure being used to distract from a weakness in a party's case. If Post Office had behaved inappropriately and refused disclosure to which Cs were entitled, the Court would have heard about this well before the trial.

162. As to the second of these points, there are echoes both of Mr Coyne's doctrine of perfection and of his avoidance of the key questions. Mr Coyne at times seems to suggest that he cannot arrive at any sensible view on the likely extent of bugs in Horizon, or more specifically on the likelihood that some part of the Cs' shortfalls was caused by such bugs, until he has examined every line of code, reviewed every change to the software and so on.[109]

163. This is an unrealistic position to take. It is impossible for any individual properly to consider such an amount of material, still less for it to be properly understood and assimilated within any sensible timeline to trial. The Horizon system is the product of millions of man hours expended over decades. Its operation has generated untold volumes of material. It is absurd to suppose that these volumes of material should (or could) be reviewed in their entirety, still less within the timetable required for a workable trial. It is equally absurd to suppose that a Court would be assisted by such an approach. The experts, like the parties, have to tailor their approach to the trial process that has been directed by the Court.

164. The approach apparently advocated by Mr Coyne is inappropriate. In every case, the Court will arrive at a view based on limited evidence, especially in a time-limited trial. An expert who effectively says that he cannot address the questions he has been asked unless he is given unlimited time and information is not helping the Court.

[109] E.g. Coyne 1/5.88 {D2/1/77}.

Speculation that there are widespread errors

165. Although he says that he cannot reach final conclusions in the absence of complete evidence as to every aspect of the Horizon system, Mr Coyne speculates that there are (or may be) widespread bugs lurking undetected in Horizon. He effectively invites the Court to infer that such bugs are affecting many branch accounts.

166. Mr Coyne's apparent purpose is to create an impression that there are widespread bugs in Horizon and that at each stage – including in the Horizon software, in the way problems are handled, and in updates to the software – serious issues are to be found which undermine the general reliability of Horizon. Both Coyne 1 and Coyne 2 seek to establish this in the same way: by setting out long lists of issues (shorn of context and perspective) and suggesting that this is the tip of the iceberg. The lack of perspective creates an impression of chaos, but the chaos is in the presentation of evidence relating to the system, rather than in the system itself.

167. Mr Coyne claims that Dr Worden's structured approach is invalid, but what he offers instead is much worse. He refuses to engage in the "*extent"* aspects of the Horizon Issues in any systematic way, but he nonetheless invites the Court to infer from the specific (his examples) to the general (robustness and reliability at large). He shuns numbers, assumptions and structured analysis in favour of impressions, without putting such issues as have been identified into their proper context and without assessing in any rigorous way the likelihood of branch shortfalls having been caused by bugs in Horizon or the number and seriousness of bugs which would be required for Cs' basic case theory to be justified.

168. Mr Coyne also says nothing about the likelihood of issues with the system being reported and investigated so that, if there were a genuine bug, it is likely to be discovered and remedied. He looks to what bugs the system might have thrown up, without asking how the robustness countermeasures would operate to prevent adverse consequences from those bugs (whether immediately or through the ordinary processes of correction).

169. Stepping back from Mr Coyne's scattergun approach, the reality is that Cs have had access to an immense amount of information in the form of KELs and Peaks (sources which between them are recognised by both experts to be the best source of information about issues in Horizon). Mr Coyne and his team have had the ability to undertake extensive searches through this information.

170. The product of that effort is that, in Coyne 2, Mr Coyne identified 22 issues which he considered indicate concerns with the Horizon system and which might be relevant to the Court's consideration of the Horizon issues. The 22 bugs have now become 29 – see paragraph 71 above.

171. Taken at face value, 29 issues over almost 20 years of operation is not significant. Moreover, when a proper analysis of those issues is carried out, it becomes apparent that the nature, scale and significance of these issues have been overstated.

172. In any event, the key issue is just not how many bugs there were, but how well the effects of these bugs were countered and mitigated by the robustness countermeasures, to prevent them from creating lasting shortfalls in branch accounts. Mr Coyne gives the Court almost no assistance on that issue.

D5. Dr Worden's Views

173. Dr Worden's first report (Worden 1) is split into sections. Each section is relevant to aspects of the Horizon Issues but the Court may find that approaching the report on a section-by-section basis is useful.

    173.1 Sections 1 and 2 are an introduction and summary.

    173.2 Sections 3-6 provide essential explanations of Legacy Horizon and Horizon Online. These sections can be read in conjunction with Appendices B and C to Dr Worden's report which set out explanations about accounting systems generally (Appendix B) and further aspects of architectural topics across Legacy Horizon and Horizon Online (Appendix C).

173.3 Section 7 deals with the robustness of Horizon from a qualitative point of view, i.e. the extent to which Horizon can be described in words as a robust system. It is in this section that Horizon Issues, 3, 4 and 6 are addressed. Dr Worden considers the many countermeasures available in Horizon and their effectiveness, in preventing errors from arising and in detecting such errors.

173.4 Section 8 deals with the effect of Horizon bugs on branch accounts and, specifically, Horizon Issue 1. Dr Worden carries out various quantitative analyses based on standard IT risk analysis techniques which, at a high level, put figures on the likelihood of a bug or error having been the cause of any given shortfall. Post Office submits that the Court will be assisted by this analysis.[110] Section 8 should be read in conjunction with Appendices E and F which contain further quantitative analyses which support Dr Worden's views.

173.5 Section 9 deals with Reconciliation and Transaction Corrections and specifically with Horizon Issues 5 and 15.

173.6 Section 10 deals with Facilities available to SPMs and specifically with Horizon Issues 2, 9 and 14.

173.7 Section 11 deals with Facilities available to Post Office and Fujitsu and specifically with Horizon Issues 7, 8, and 10-13.

174. In his supplemental report, Dr Worden: addresses Cs' factual evidence (section 2); summarises his expanded review of KELs (section 3); addresses documents cited by Mr Coyne in his first report (section 4); updates his quantitative analysis in light of the foregoing sections (section 5); sets out his analysis of further documents relevant to Issues 3 and 11 (section 6); and updates his views on Issue 15 (section 7). None of the newly reviewed material causes Dr Worden to make any substantial changes to his opinions, although he has adjusted aspects of his quantitative analysis in Cs' favour to

[110] Mr Coyne has taken the view that he should not present any quantitative analysis whatsoever, limiting himself instead to criticisms of the assumptions that Dr Worden makes in his analysis – see e.g., Coyne 2, paras 5.269 and 5.292{D2/4/195}; {D2/4/200}.

reflect a better estimate of the size of Cs' branches relative to the average Post Office branch.

175. The overall thrust of the supplemental report is that the further material that Dr Worden has been able to review has increased his confidence in the opinions expressed in his first report.

176. Dr Worden has carried out a number of overlapping analyses and cross-checks. It is not intended to summarise each of these here. The intention is to give an overview of the key points as follows:

176.1 Dr Worden's definition of robustness;

176.2 Dr Worden's qualitative assessment; and

176.3 Dr Worden's quantitative assessment.

Dr Worden's definition of robustness

177. Dr Worden considers robustness to be the key concept for answering many of the questions posed by the Horizon Issues.[111] It is at the core of Issue 3, and features heavily in the analysis for Issues 1, 4 and 6.

178. The experts agree that robustness does not equate to perfection, as all IT systems suffer from bugs and errors. Consistently with this agreed position, Dr Worden's view is that robustness is a matter of degree. In his view, a robust system is one that includes and makes effective use of measures to guard against errors and to prevent errors resulting in unacceptable consequences.[112] Dr Worden refers to measures aimed at ensuring robustness as "countermeasures". This term covers both technical characteristics of the IT system itself (including the application of various design principles) and the procedures that build upon and complement the protections provided by the hardware and software (including testing and other practices and procedures aimed at the prevention and/or detection of bugs in the system). These measures should aim to limit

[111] Worden 1, para 48{D3/1/11}.
[112] Worden 1, para 54{D3/1/13}.

the occurrence of bugs to a realistic minimum and to minimise adverse consequences of those residual bugs that inevitably slip though.[113]

179. Dr Worden explains that robustness is typically achieved by many different countermeasures acting together – so that even if one countermeasure does not catch and counter a given risk, other countermeasures act as extra lines of defence. The idea is that, if sufficient countermeasures are put in place, very few threats will be able to get past all the lines of defence.[114] It follows that evidence that a particular bug was not stopped by one or more countermeasures does not mean that it must have resulted in adverse effects; nor is it evidence that the particular countermeasures were not properly implemented.

180. The countermeasures do not only address bugs that arise from the coding itself. They are also intended to prevent or limit adverse consequences arising from user error and other external threats to reliability.[115]

Qualitative assessment of robustness

181. Horizon is a comprehensively documented IT system. Over 100,000 technical documents describing the system and its support practices are held in a dedicated data room (called Dimensions) by Fujitsu. Having reviewed many of these documents, Dr Worden has formed the view that Horizon is robust through three different prisms: the system's architectural design, its countermeasures against errors and Fujitsu's support practices. He has also taken into account how Horizon has changed over time and Mr Coyne's counter-arguments – neither of which have changed his overall assessment. These points are summarised in more detail below.

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[113] Dr Worden gives the example of Microsoft Word, which although prone to freezing, is made more robust by the inclusion of an "auto-save" function that prevents much work being lost when the programme does freeze: Worden 1, para 387{D3/1/98}.

[114] Worden 1, paras 385 and 389{D3/1/98}; {D3/1/99}.

[115] Worden 1, para 386{D3/1/98}.

Horizon's architectural design: prevention of errors

182. In Dr Worden's view the design of Horizon has many features that intrinsically make it robust.[116] The key features are summarised below:

183. Horizon is built on the principles of double entry accounting, which is a tried and trusted method of ensuring that accounts are accurate. Any numerical error affecting only part of an accounting transaction will be rapidly detected.[117]

184. Horizon is generically coded so that it can be configured to adapt to changing circumstances. Where business changes are required, these can often be made to reference data rather than Horizon's software code. For example, to change the price of a product requires a change in reference data. No new code needs to be written. This reduces the risk of errors being introduced into Horizon.[118]

185. Every basket of products is required to be zero-sum so that no transactions can be missed. In every basket, the value of services rendered to the customer should match exactly the payments (by any method) provided to or taken from the customer. The net value of the basket must therefore be zero. This means that no part of the basket can be missing and that a user cannot complete a basket until the correct payments to or from the customer are recorded.[119]

186. Once a basket is completed in branch, it needs to be accurately and completely communicated from branch to Post Office. This worked differently in Legacy Horizon and Horizon Online, but the high level design principles were the same. Both versions of Horizon:[120]

186.1 sequentially numbered each basket so to prevent missing and duplicated baskets;

186.2 secured each basket with a cryptographic seal to prevent the basket being tampered with during transmission; and

[116] Worden 1, para 239 {D3/1/68}.
[117] Worden 1, paras 156.1 and 241 {D3/1/38}; {D3/1/68}.
[118] Worden 1, paras 156.4 and 272 {D3/1/39}; {D3/1/74}.
[119] Worden 1, para 156.1 {D3/1/38}.
[120] Worden 1, para 178 and 267 {D3/1/47}; {D3/1/73}.

186.3 would only allow whole baskets to be recorded. No part baskets were permitted.

187. Sections 3 to 5 of Worden 1 describe the full range of features. Mr Coyne agrees with his description of Horizon's architecture.[121]

Countermeasures and bug detection

188. Dr Worden lists 18 major techniques[122] (which he refers to as countermeasures) which are routinely applied on IT systems and which have been deployed in Horizon.

189. He has reviewed the operation of the countermeasures built into Horizon through reading KELs and Peaks. His view is that at all times for which there are KELs – which is nearly all the lifetime of the system – Horizon has been a "*very robust system*".[123] A review of 120 further KELs since the first report was prepared has increased Dr Worden's confidence in this assessment.[124]

190. In Dr Worden's view, KELs and their associated Peaks provide a good record of what happened when there was a user error, software error or reference data error, including the robustness countermeasures which were triggered and helped to prevent or mitigate any adverse effects.[125]

191. From this examination, Dr Worden concludes:[126]

191.1 Many KELs are not about bugs in Horizon. In those cases, Horizon is acting as intended, and the KEL exists to give appropriate advice to be given to an SPM in specific circumstances.

191.2 Of the KELs which are related to bugs in Horizon, many of those bugs self-evidently could have no effect on branch accounts – for instance, some KELs relate to an inconvenience for an SPM in operating the system in specific

[121] JS2, Index 0.1 {D1/2/26}.
[122] Worden 1, para 391{D3/1/99}.
[123] Worden 1, para 49.1{D3/1/12}.
[124] Worden 2, para 104.1{D3/6/25}.
[125] Worden 1, para 428{D3/1/110}.
[126] Worden 1/para 402 {D3/1/103}.

circumstances or back-end reporting issues (which would not even be visible to an SPM, let alone affect branch accounts).

191.3 Of the remaining KELs, which describe bugs with at least some potential for impact on branch accounts, in many cases it can be seen (or easily inferred) that one or more countermeasure prevented any actual impact on branch accounts.

192. Once these types of KEL (and their associated Peaks) are removed from consideration, very few remain – i.e. where there is a possible bug in Horizon, and it is not obvious (for one of the reasons above) that it would have had no impact on branch accounts. Dr Worden only found a small number of KELs meeting this description.[127]

193. Those bugs in Horizon which do have a possible impact on branch accounts can be further categorised as follows:

193.1 Bugs whose effect is immediately evident to the SPM or assistant in the branch. The SPM will immediately see that something has gone wrong with Horizon and will in all likelihood report the problem and seek assistance.

193.2 Bugs whose effect is only visible to the SPM when carrying out monthly balancing. Bugs that are not visible at the time when they take initial effect may nonetheless give rise to a discrepancy that becomes apparent in the balancing process. The SPM may well, if unable to identify the cause of the discrepancy, report a problem to Post Office, triggering an investigation.

193.3 Bugs which are never visible, either to the SPM or centrally, but which nevertheless affect the branch accounts.[128]

194. Dr Worden considers that there are very few bugs in the final category. One reason for this is that, by definition, any discrepancy in branch accounts should become visible to the SPM when he tries to balance the accounts. It is impossible for any bug to

[127] Worden 1, para 404{D3/1/104}.

[128] Worden 1, para 405{D3/1/104}. Dr Worden also concludes from his extensive review of KELs, that Fujitsu had "*a support team that knew what they were doing, on an IT system that they understood well*" (para 596.5) {D3/1/142}.

influence the branch accounts without showing itself in those accounts, whether that is in erroneous customer transactions or in some distortion of the balancing process itself. One way or another, for any bug to affect the SPM's accounts, it must affect an entry that goes into the audited transaction records for the branch.[129]

195. Accordingly, the balancing process contributes substantially to the detection (and so investigation and correction) of bugs. It is of course not the only process that contributes to detecting bugs – both Fujitsu and Post Office monitor the system in different ways,[130] such that many bugs may be detected without any involvement from an SPM whose branch may be affected.

196. Nonetheless, that Horizon has very many SPM users and that those users have a stake in its accuracy contribute to its robustness. This is unsurprising: SPMs (and their staff) make up the vast majority of persons who interact with the system on a day-to-day basis. It would be perverse for Fujitsu not to have built the system with that in mind or to have failed to put in place effective measures to obtain, record and investigate reports of problems from the front line.

197. SPMs who find an unexplained discrepancy in their accounts and trigger an investigation obviously protect their own financial position, but they also confer an important indirect benefit on Post Office, Fujitsu and all other SPMs. They do this by helping to discover and remedy bugs that might otherwise have remained in the system and might have affected other SPMs' branches. Post Office, Fujitsu and SPMs share an interest in identifying and correcting bugs, each playing different roles in that process.

198. For obvious reasons, the larger an unexplained discrepancy, the greater the chance that an SPM will report it and trigger an investigation. It is common sense that an SPM is more likely to dispute a large discrepancy than a small one. Having taken into account para 187 of the second witness statement of Ms Angela Van Den Bogerd (*"Generally,*

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[129] Worden 1, paras 406-408{D3/1/105}. In this context, audited means the Core Audit Process which is the process by which transactions conducted at the counter are securely and accurately communicated to the data centre. Mr Coyne has not identified any material flaw in this process in Legacy Horizon or Horizon Online.

[130] An example would be the BIMS process for flagging discrepancies raised in automated reports. See Parker 3 at paragraph 10. {E2/13/3}

when discrepancies are of a value of several hundreds of pounds, I would expect Subpostmasters to contact NBSC"),[131] Dr Worden is able to form some tentative conclusions as to the likelihood of discrepancies being reported.[132]

199. Even on the basis of very conservative assumptions, there is only a small chance of any substantial bugs not being reported by at least one of the affected SPMs. This adds to Horizon being robust.

Fujitsu's support practices

200. The experts agree that there is a considerable amount of material relating to known bugs and that work that was done in relation to them. From the light this sheds on the practices and procedures in relation to recording bugs, Dr Worden considers it likely that, where a bug was reported to Fujitsu which might have affected branch accounts, it was highly likely (90%) to result in the creation of a KEL.[133] This is based in part on his experience that any IT system support team has an incentive to detect commonalities between different calls from users (whatever their cause, whether it be user errors or bugs in the software) so that they can be handled efficiently and effectively – for instance, by creating KELs which describe how to handle them, and maintaining those KELs.[134] However, it should be noted that Dr Worden uses a much lower probability (70%) in the quantitative analysis described below. He does this in order to make his calculations more conservative, in the sense of being more favourable to Cs.

201. Having reviewed many KELs and Peaks, Dr Worden's view is that they form a reliable source of evidence about Fujitsu's performance in bug-finding and correction. They also provide a rich source of evidence in relation to the implementation and effectiveness of robustness countermeasures.

202. Dr Worden's sampling of KELs and their associated Peaks leads him to conclude that:

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[131] {E2/5/4}.
[132] Worden 1, para 413{D3/1/106}.
[133] Worden 1, para. 422. {D3/1/108}.
[134] Worden 1, para 422{D3/1/108}.

202.1 Across all KELs, Fujitsu were generally able to identify the cause and any fix required.

202.2 A small proportion of reported anomalies could not be reproduced in testing, and remained perplexing. Dr Worden's view is that this is to be expected in any complex system. There is no reason to think that it discloses a lack of knowledge or ability on the part of the Fujitsu personnel.[135]

202.3 Once they had identified the cause, Fujitsu were generally able to identify all occurrences of any bug in system logs and often to suggest workarounds while it was being fixed.

202.4 The speed with which the fix was made and put into live use depended on its priority (except for reference data fixes, which were generally made very quickly).

202.5 On a small proportion of occasions, fixing one problem caused another, which was observed later (the suspense account bug was one of these: it was a side-effect of a previous fix).[136]

203. The ways in which countermeasures were applied to particular KELs are considered in Appendices D.2 (30 KELs selected at random evidencing 54 instances of countermeasures being applied)[137] and D.3 (62 KELs cited in Mr Coyne's first report). In section 7.7 of his report, Dr Worden sets out a detailed consideration of how many of the countermeasures worked in practice: the KELs provide illustrations of many of these countermeasures.

204. Dr Worden extends his analysis of KELs in the supplemental report. Having now examined a sample of 200 KELs, he concludes that, in respect of the "*great majority*" of those KELs, the problems they addressed were either unrelated to branch accounts or would have had no effects on branch accounts. As to the few KELs not meeting that

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[135] On the contrary, Dr Worden's view is that the KELs paint a picture of a *"support team that knew what they were doing, on an IT system that they understood well*" (Worden 1, para 596.5) {D3/1/142}.
[136] Worden 1, para 425{D3/1/109}.
[137] Worden 1st Report, para 435{D3/1/112}.

description, Dr Worden's opinion is that none of them shows that lasting inaccuracies were introduced to branch accounts.[138] The detail of his analysis is set out in Appendix A of Worden 2.[139]

Horizon over time

205. Dr Worden also addresses the suggestion that Horizon's robustness may have varied during its life:

205.1 In his first report, Mr Coyne accepted that the Horizon system is *now* robust[140] but suggested that it is "*likely*" that the system was less robust in the past.[141]

205.2 Dr Worden's assessment of the robustness of Horizon relies on the existence and observed effectiveness of the various countermeasures that he identifies and explains. Those countermeasures are common to all versions of Horizon over its lifetime, and there is no evidence that they were applied more or less effectively in any period.[142]

205.3 Dr Worden notes that there is a marked spike in 2010.[143] The experts agree that this was probably the result of the move to Horizon Online and of a mandatory cash check undertaken in all branches before that move.[144]

Response to issues raised in Coyne 1

206. Mr Coyne relied in his first report on various documents that were argued to undermine in some way the robustness of Horizon.

207. In his supplemental report, Dr Worden analyses 37 of these documents. His view is that only 3 of the 37 "*even come close to indicating any bug which might have affected*

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[138] Worden 2, para 104{D3/6/25}.
[139] {D3/7/2}.
[140] Coyne 1st Report, para 3.7{D2/1/26}.
[141] Coyne 1st Report, para 3.7{D2/1/26}.
[142] Worden 1, paras 525-529{D3/1/127}; {D3/1/128}. Now see 3.16 in JS3.
[143] There was also a higher than usual number of KELs in 2009-2010: see Worden 1, para 538{D3/1/130}.
[144] Worden 1, 535 {D3/1/129}; Mr Coyne 2, 5.345 {D2/4/216}.

Claimants' accounts" and that, even for those, any such impact is *"very unlikely*".[145] Many of the documents relied on by Mr Coyne do not even relate directly to Horizon.

208. Overall, Dr Worden's view is that Horizon is a "*very robust*" system which is very unlikely to cause significant shortfalls in branches.[146] The additional work done for the purposes of his supplemental report has increased Dr Worden's confidence in this overall qualitative assessment.[147]

Quantitative analysis of robustness

209. Dr Worden has also carried out a detailed quantitative analysis of the likely incidence of bugs that might have affected branch accounts and the likely overall value of shortfalls that could be attributed to such bugs. He has, amongst other things, compared that likely incidence of bugs and errors to that which would be implied by the total shortfalls claimed by Cs in these proceedings and alleged to have been caused by bugs.

210. Mr Coyne has refused to conduct any such analysis. He states that it is outside his expertise. For the reasons set out below, Post Office contends that Dr Worden's approach is useful and that Mr Coyne's approach makes his evidence substantially less useful in determining the Horizon Issues.

211. As noted in the introductory Section A above, many of the Horizon Issues (specifically Issues 1, 3, 4 and 6) ask to "*what extent*" it was: e.g. likely or possible for bugs to cause shortfalls in branch accounts (Issue 1) or extremely unlikely to be the cause of shortfalls in branches (Issue 3). These are matters in relation to which basic numerical analysis is highly pertinent. It is no mistake that the issues are framed in these terms – the Horizon Issues were agreed between the parties and ordered by the Court as issues arising on the pleadings and suitable for determination on the basis of expert evidence.

212. In this context, how the experts engage with the questions of "*extent*" will affect how much assistance their evidence can provide to the Court. If the Court were deprived of

[145] Worden 2, para 109.2{D3/6/28}.
[146] Worden 1, para 49{D3/1/12}.
[147] Worden 2, para104{D3/6/25}.

any measures of extent and degree, it would be unable to reach conclusions on the Horizon Issues that would be of real assistance in resolving the disputes in these proceedings. It would be unsatisfactory for the experts to answer questions of extent and degree in words alone because it is difficult to quantify and test the difference between, for example, something being "unlikely", "very unlikely" or "extremely unlikely". It is not possible to weigh one expert's view that something is "extremely" unlikely against another's view that it is only "very" unlikely, unless each of them has carried out some quantitative analysis to give objective content and support to their *characterisation* of the likelihood as either extremely or very low.

213. On any view, there are very few observed bugs which have affected branch accounts and those bugs can account for only an extremely small number of shortfalls over the lifetime of Horizon, relative to the total value of transactions and the total value of shortfalls likely to have been caused by human error. That alone would make it extremely unlikely that any given shortfall was (all else being equal) caused by a bug or error in Horizon.

214. In Post Office's submission, there is a good chance that the experts have identified at least a significant proportion of any such bugs. But the Court will want to know about the scale of possibility that there have been undiscovered material bugs and errors and, if there have been, how many of those bugs might be and what the scale of their effects might have been. The question, therefore, is what one can infer about the existence of unknown bugs and errors, basing that inference on the observed bugs, the review of KELs and Peaks and other evidence that goes to the likely number of undetected bugs.

215. That exercise of inference from a small population (observed bugs) to a potentially larger population (total bugs, including the unknown bugs) can be usefully undertaken through statistical analysis. Such analysis forms part of standard techniques of risk assessment.[148]

216. Dr Worden undertakes statistical analyses on the basis of the evidence and of various assumptions which he explains. Those assumptions have been adjusted significantly in

[148] Worden 1, paras 382 and 868{D3/1/97}; {D3/1/194}.

Cs' favour. They factor in a wide range of variables e.g. that Claimant branches are on average smaller than all branches in the network. This enables him to present upper limits to the "*extent*" parts of the Issues in relatively precise terms.

217. His four key quantitative conclusions are as follows:

217.1 Recognising that neither expert can review all 8,000 KELs, he estimates, based on the KELs that he has reviewed, that there are probably not more than 200 KELs that relate to bugs with possible impact on branch accounts.[149]

217.2 In order to illustrate the tiny incidence of bugs across all transactions, Dr Worden asks what proportion of the £18.7m of shortfalls disputed by Cs could be attributed to bugs. He estimates that bugs in Horizon could only account for a maximum of 0.4% of the Claimants' shortfalls.[150]

217.3 He estimates that there would need to be 40,000 distinct bugs for there to be a 1 in 10 chance of a Suspense Account-type bug affecting any Cs' branch accounts in a given month.[151]

217.4 The distribution of C's shortfalls indicates user error rather than a software error.

218. In short, Dr Worden's view is that shortfalls caused by bugs are likely to have been extremely rare, and much rarer than Cs' case gives the appearance of suggesting. Further explanation of the methodology used by Dr Worden to reach these conclusions is set out below.

Quantitative conclusion 1: Maximum number of bugs with financial impact

219. Given the impossibility of examining all KELs and Peaks in proper detail, Dr Worden has adopted a well-explained methodology for his review of these documents. This

[149] Worden 1, para 722{D3/1/168}, concluding that there are probably not more than 200 KELs that relate to bugs with possible impact on branch accounts. He does not alter this estimate in Worden 2.

[150] JS2/1.32 {D1/2/33}. In Worden 2 para 134{D3/6/34} this was 0.181% but has been adjusted upward by new bugs found by Mr Coyne.

[151] In Worden 1, para 635{D3/1/95}, he estimated that this would require 50,000 substantial bugs and errors over the lifetime of Horizon. This was revised to 40,000 in Worden 2, para 117{D3/6/60}.

combines randomly sampling so to get a balanced result and then targeted searches looking for KELs and Peaks to find documents that would favour the C's views on Horizon.

219.1 For the purposes of his first report, he examined 80 random KELs (increased to 200 in his supplementary report). For the great majority of the 80, it was immediately obvious either that they were not bugs in Horizon or that they would have no effect on branch accounts. For the remaining KELs, he used his knowledge of the countermeasures to assess which countermeasures would have applied, and whether or not they would have prevented any lasting impact on branch accounts. As a result, he found no KELs with possible lasting impacts on branch accounts.[152] Extending the sample to 200 did not alter these conclusions.[153]

219.2 For the second sample, he used all those KELs whose text includes the symbol "£" on the basis that a KEL with a possible financial impact was more likely to contain that symbol. He found 259 and examined 50 of them, selected at random. For 42, either the KEL did not arise from a bug in Horizon; or if it did, there was no possible or lasting impact on branch accounts. For the remaining 8, he concludes there was a possible impact on branch accounts – erring in Cs' favour, given that he considers the possibility of such an impact to have been remote.[154] He notes Fujitsu's view that only 4, rather than 8, could have had a financial impact.[155]

219.3 For the third sample, Dr Worden examined 62 KELs cited by Mr Coyne in Coyne 1. He found that fewer than 8 of them might have had non-transient financial impacts.[156]

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[152] Worden 1, paras 718-719{D3/1/167}.

[153] Worden 2, paras 102 -105{D3/6/25}; {D3/6/26}.

[154] Worden 1, para 723{D3/1/168}.

[155] Worden 1, paras 725-728{D3/1/168}; {D3/1/169}.

[156] Worden 1, para 733 and Appendix D {D3/1/169}; {D3/2/95}. Fujitsu's own analysis is that only 4 meet this test, as Dr Worden notes at Worden 1, para. 728 {D3/1/169}.

220. Dr Worden has combined these samples and drawn inferences from them. His view is that out of the set of 8,390 KELs disclosed and their associated Peaks, it is likely that no more than 100 will have had any effect on branch accounts. Again, so as to favour Cs, he doubles that figure to give 200 KELs with potential financial impact.[157]

Quantitative conclusion 2: Extent of Cs shortfalls caused by bugs

221. The next analysis looks to determine the extent to which the Cs shortfalls could be caused by bugs. Dr Worden estimates that a maximum of 0.4% of the Cs shortfalls can be caused by bugs in Horizon.

222. From the above KEL analysis, Dr Worden found only 11 bugs with possible financial impact on branch accounts: the 3 known bugs cited by Mr Coyne (and covered by the generic pleadings) and the 8 with possible impact which he found. Having considered the new bugs raised in Coyne 2 and through discussions with Mr Coyne, Dr Worden now considers that there are 12 bugs with possible financial impact on branches.

223. The methodology for this analysis is described in Worden 1[158] and the revised figures, taking into account the 12 bugs, is appended to JS2.[159] It is explained in simple terms below.

224. In order to estimate the total financial impact of bugs, Dr Worden identifies the quantifiable (actual or potential) effects on branch accounts for the 12 bugs.

Bug	**KELs**	**Financial Impact £**
Receipts/payments mismatch	wrightm33145J	20000
Callendar Square	JSimpkins338Q	3000
Suspense account	acha2230K	14000
Data Tree Build	MSCardifield2219S	105000
Withdrawn stock	pothapragadac4359R	5000

[157] Worden 1, paras 738-741{D3/1/170}.
[158] {D3/1/162}.
[159] {D1/3}.

Bureau Discrepancies		3000
Concurrent logins		9000
Bureau de change	AChambers2252R	300
wrong customer change	AChambers4134R	300
Lyca top up	ballantj020J	2000
TPS	ballantj2547K	2000
Drop and Go	cardc235Q	2000

225. This leads to a mean financial impact of any single bug across all affected branches of approximately £13,800 (being the total financial impact of all 12 bugs of £165,600 divided by 12 bugs). This is strongly conservative in favour of Cs since Dr Worden believes that a number of affected branch accounts would have been corrected in the ordinary course of events and the above numbers are not adjusted for this.

226. From the analysis in the preceding section, it has already been established that there are no more than 200 KELs showing a bug with a financial impact. 200 bugs multiplied by the average financial impact per bug of £13,800, gives a total financial for all bugs in KELs over 20 years of £2.76m.

227. To this figure, an adjustment is needed to factor in that there may be bugs that have not been recorded in a KEL. Dr Worden conservatively estimates that only 30% of bugs end up in KELs[160], meaning that the total financial impact for all bugs over 20 years is £9.2m.[161]

228. To estimate the likely impact of Horizon bugs on Cs' branch accounts, Dr Worden scales this result down from all branches to just claimant branches. Claimant branches only represent 1/119th of all branches[162] so £9.2m divided by 119 arrives at a total impact of all Horizon bugs on all Claimant branches of £77,311.

229. When this total impact of £77,311 is compared to Cs' shortfalls of £18.7m it is immediately obvious that Horizon bugs might only account for a tiny fraction of those

[160] See Table 5.1 in Worden 2 – Row X {D3/6/34}.

[161] £2.76m divided by 0.3

[162] This scaling factor also takes into account that few Cs were SPMs for the whole 20 year period and that Claimant branches were smaller on average than the average Post Office branch. See Table 5.1 in Worden 2 – Row H

shortfalls – only a maximum of 0.4%.[163] Again, it needs to be emphasised that even this very low figure is only reached by making assumptions that about the incidence of unspotted and unremedied bugs in Horizon which Dr Worden considers to be extreme and unrealistic.

Quantitative conclusion 3: Likelihood of a material bug affecting a Claimant

230. The third quantitative conclusion looks to assess the likelihood of a material bug affecting on a Claimant.

231. For this assessment, Dr Worden takes the Suspense Account bug as his benchmark for a material bug because it was well documented. The Suspense Account bug impacted 14 branches[164] causing an average financial impact of £1,000 in each branch. For the sake of the calculation below, Dr Worden has assumed that a material bug affects 16 branches, building in a margin of error that strongly favours Cs' case.

232. For a bug to cause a financial impact on a SPM, it must show in the end of month accounts (otherwise there would be no shortfall for which the SPM was liable). An assessment is therefore needed of how likely a material bug is to occur in any given branch's monthly accounts.

233. Since the introduction of Horizon, there have been 3,091,680 sets of branch accounts.[165] If material bug occurs 16 times over 3,091,680 accounts, this gives a probability of any one set of accounts being impacted by a material bug of 1 in 193,203.

234. The average Claimant branch is however only 45% of the size of the average branch in the wider Post Office network, when judged by volume of transactions conducted each month.[166] Because the average Claimant branch conducts fewer transactions and therefore uses Horizon less, there is a reduced chance of it encountering a bug. An

[163] £77,311divided by £18,700,00

[164] The actual number was 14 but Dr Worden has assumed 16 so to include a margin of error that favours the Cs.

[165] Worden 1, para 619 {D3/1/148}.

[166] Worden 1, para 630{D3/1/150} as updated by Worden 2, para 112.

adjustment is therefore needed to reflect the reduced risk faced by Claimant branches: 193,203 divided by 0.45. This gives a probability of a material bug occurring in a Claimant branch's monthly accounts of 1 in 427,117.

235. Put another way, for there to be a 10% chance of a material bug (like the Suspense Account bug) occurring in a Claimant branch's monthly accounts, there would need to be 40,000 different bugs in Horizon.

Quantitative conclusion 4: Analysis of Cs shortfalls

236. Dr Worden has examined the total shortfalls claimed by Cs in these proceedings to ascertain whether they display the patterns that would be expected were they caused by bugs in the system, as Cs allege.

237. Dr Worden explains that, in the absence of evidence to the contrary (and none has been identified by Mr Coyne), bugs can be assumed to occur randomly across branches, including Cs' branches.[167]

238. An analysis of the shortfalls asserted by Cs shows that the monthly amounts claimed differ greatly between Cs. Some Cs claim very small monthly average shortfalls (£50 or less), while others claim very large average monthly shortfalls (£1,000 or more). Also, the shortfalls do not occur anything like randomly over time – for example, many Cs experienced periods of 36 months or more with no shortfalls, and shortfalls tended to arrive in "clumps".[168] This is, in Dr Worden's view, consistent with a pattern of user error and other human factors (with shortfalls varying over time and across branches in accordance with variation in the management of branches).

239. In another part of Dr Worden's analysis of the claimed shortfalls, he identifies that there is a relationship between the period of tenure and the average monthly shortfall. In short, Cs with shorter tenures claim much higher shortfalls. This is show in Figure 8.2:[169]

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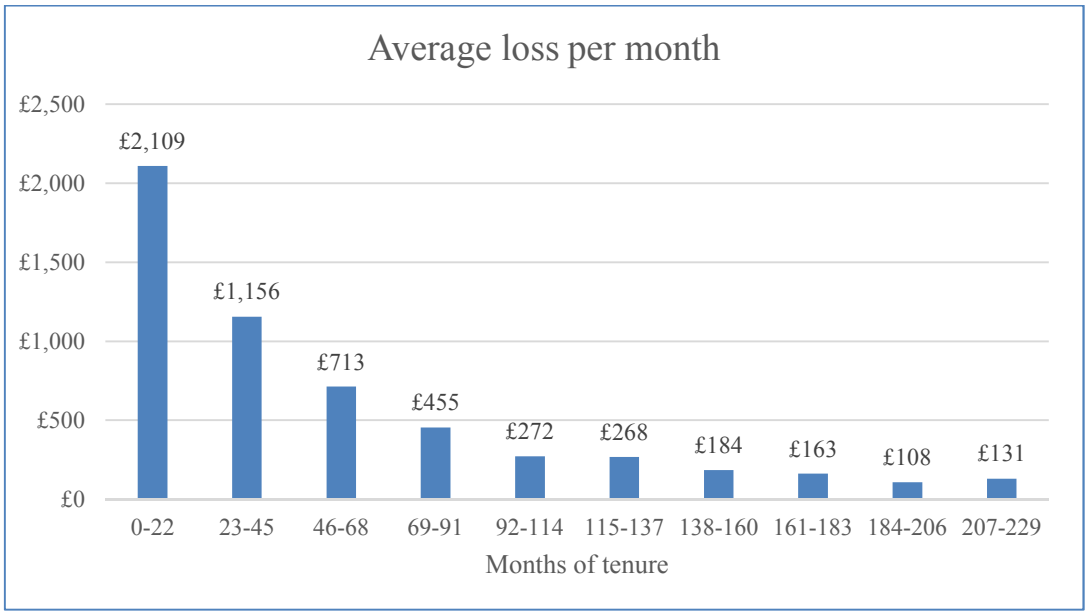
[167] Worden 1, para 622{D3/1/148}.
[168] Worden 1, para 805{D3/1/182}.
[169] Worden 1, p. 185{D3/1/50}.



240. Dr Worden's opinion is that this pattern is not what would be expected were the shortfalls attributable to randomly occurring system bugs. In his view, the pattern is more consistent with less experienced users of the system being more prone to error, and those human errors leading to losses.[170]

[170] Worden 1, paras 816-820{D3/1/185}; {D3/1/186}.

E. REMOTE ACCESS (HORIZON ISSUES 7 AND 10 TO 13)

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

(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:

f. at all;
g. without the knowledge of the Subpostmaster in question; and
h. without the consent of the Subpostmaster in question.

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

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

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

E1. Introduction

241. Horizon Issues 7 and 10 to 13 concern remote access to transaction data and, more importantly, the potential for alteration of transaction data by Fujitsu and/or Post Office to undermine the reliability of branch accounts. It is common ground that Fujitsu has at all times required the ability to have access to and alter data in order to perform its functions as database administrator and, more generally, to operate and maintain the system.

242. The principal differences between the parties are as to: (1) precisely what methods of data insertion, editing or deletion were possible at various times in the history of Horizon; (2) the extent to which the various abilities to insert, edit or delete transaction data were in fact used; and (3) what significance any such use has for the reliability of branch accounts on Horizon.

243. There are some important clarifications to make at the outset. Although Cs will probably draw attention to a dramatic, but only theoretical, possibility of the malicious alteration of transaction data by a rogue employee of Fujitsu, there is no evidence that this ever took place, nor any allegation to that effect. It is unlikely to assist the Court for the parties to engage in speculation as to what might have happened, in theory, if there had been some rogue employee who had abused his or her access rights. If there is any reason, in a specific case, to think that it might have happened, that can of course be explored on the facts of that individual case in due course. But there is no generic issue as to any malicious alteration of transaction data.

244. The real thrust of Cs' case is that, in the course of using their abilities to insert, edit or delete data to correct problems arising in the operation of Horizon, Fujitsu personnel might accidentally have introduced a further or different error into transaction data.[171] This is a clear example of what Dr Worden calls a second order issue – the contention is that there occurred an unusual event (a problem requiring correction through injecting, editing or deleting transaction data) and then, in the course of that unusual event, another unusual event occurred (a mistake in the process of correction).[172] Such second order issues are, for this reason alone, not viable candidates to explain any significant proportion of disputed shortfalls.

245. Prior to the witness and expert evidence in these proceedings, Post Office set out in para 57 of the GDXC its understanding of what was technically possible in terms of adjustment to transaction data.[173] There is now witness evidence as to what was possible from time-to-time, including two recent witness statements from Mr Godeseth and Mr Parker, expanding on some points raised (or brought into focus) in Coyne 2.

246. Inevitably, the picture is complex. There are different Fujitsu methods for altering different kinds of data remotely, and Fujitsu's current methods are themselves different from the tools and methods that were available under Legacy Horizon. The Fujitsu

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[171] See, e.g., Coyne 2/5.427 {D2/5/242}. See also Coyne 1/9.40-9.41 {D2/2/156}.

[172] For example, the experts agree that privileged user facilities should rarely be required for this purpose – see Coyne 2/5.449 {D2/5/248}.

[173] {C3/3/25}.

witnesses have done their best to recollect, investigate and, to some extent, hypothesise as to what may have been possible in the fairly distant past.

247. The picture is also complicated by the fact that the parties do not agree on what counts as remote alteration of data. For example, Mr Coyne appears to consider Transaction Corrections to amount to a form of remote alteration,[174] whereas Dr Worden points out that these only take effect if and when accepted by the SPM in-branch, so are not remote in any relevant sense.[175] The Fujitsu witnesses explain that they consider "remote" to mean access to data other than through a terminal in branch.[176]

248. As to Global Users, the position is different. Fujitsu's evidence (and Dr Worden's view)[177] is that transactions performed by Global Users have to be performed in the branch itself.[178] If that is right, it would presumably be common ground that transaction data that Global Users insert is not inserted remotely. It is not clear whether or not there will be any dispute on this factual point. Mr Coyne suggests in his supplemental report that Global Users can insert transactions from outside the branch,[179] but he reached that view without the benefit of the recent evidence from Mr Godeseth. In any event, if Mr Coyne were right that Global Users could inject transaction data from outside the relevant branch, it would be common ground that this amounts to remote insertion. Whether or not Global User access can involve the remote insertion of transaction data thus depends on a (potential) dispute of fact, rather than a matter of characterisation.

249. On top of these problems, there are complications of terminology. For example:

    249.1 Mr Coyne discusses the deletion of *session data* and the deletion of *transaction data* as though these were, in essence, the same thing.[180] That is misleading.

[174] See, e.g., Coyne 2/5.489(i) {D2/5/259}.
[175] Worden 1/1094-1097 {D3/1/241}.
[176] Godeseth 1/47 {E2/1/13}.
[177] Worden 1/1100-1103 {D3/1/242}.
[178] Godeseth 3 / 4-9. {E2/14/2}; {E2/14/3}
[179] Coyne 2/ 4.11-4.19 {D2/5/98}. See also para. 5.425 {D2/5/241}.
[180] See Coyne 2/3.266-3.276 {D2/5/80}. See also Coyne 2/5.484 {D2/4/258}, where these different things are bundled together – "*transaction data and related operational activities were edited and deleted within Horizon*".

Horizon holds more than just transaction data;[181] it stores and tracks a lot of other forms of data that are needed to make the system operate properly, including data that does not relate a customer transaction and which does not affect a branch's accounting position. Session data is a good example of this: it may well not include transaction data at all; it can consist entirely of other types of data associated with a counter session (such as the data "flag" that determines whether a stock unit is locked or unlocked and available for use).[182] The deletion of data of that kind does not affect branch accounts and cannot create a discrepancy. It merely affects the availability of the system to an SPM or an assistant wishing to perform transactions or conduct other branch business.

249.2 Mr Coyne also adopts a terminology that is inconsistent with the terminology used by Fujitsu, creating the impression of contradiction where there is none. Specifically:

(a) A "**Balancing Transaction**" is a specific and documented function that Fujitsu can exercise using a designated Horizon Online tool.[183] Fujitsu's evidence is that there has only ever been one Balancing Transaction, in March 2010.

(b) In apparent contradiction of this, Mr Coyne says at Coyne 2/5.408(b) that "*it is evident that more than one Balancing Transaction has been conducted by Fujitsu*".[184]

(c) Mr Coyne does not make clear that, despite retaining the capitalisation, he is using the term "Balancing Transaction" in a different sense (which appears to be one of his own invention). He uses the term to refer to any remote alteration of data, even extending it to cover the insertion of

[181] i.e. a record of a transaction undertaken in a branch or other branch activity causing a change in the branch's cash or stock position: Godeseth 3/3 {Opus reference not available at time of submission}. {E2/14/1}

[182] Godeseth 3/17 {Opus reference not available at time of submission } {E2/14/5}

[183] Godeseth 1/58 {E2/1/16}. See also Godeseth 3/24 {Opus reference not available at time of submission }. {E2/14/7}

[184] {D2/5/236}.

transaction data under Legacy Horizon and the possibility of data being altered through privileged user access.[185] This is needlessly confusing.

249.3 The parties' cases as to "rebuilding" data do not involve rebuilding in the ordinary sense of that term. The function that is described involves the deletion of all the data in one store (typically where it has been corrupted) and its replacement with a complete set of the same data from another store; it is loosely analogous to a person using a desktop computer performing a back-up from a separate hard disk.[186]

E2. Witness evidence

250. Mr Godeseth's first witness statement sets out the basic architecture of Legacy Horizon and Horizon Online and identifies the circumstances in which data could be inserted, edited or deleted.[187] His evidence is focused on abilities the use of which could, in principle at least, have a financial impact on branch accounts, rather than purely administrative functions that could not affect branch accounts. As regards Legacy Horizon:

250.1 Mr Godeseth explains that data was stored in-branch, duplicated across all counter positions, before being replicated to correspondence server message stores.[188]

250.2 A user with sufficient access permissions could insert additional data at the correspondence server.[189] Each "message" (containing data) would be identified by three individual numbers – a Group ID (identifying the branch), a Node ID

[185] Coyne 2/5.407(b) {D2/5/235}. See also Coyne 2/5.471 {D2/5/254}.
[186] Parker 3/22 { Opus reference not available at time of submission }. {E2/13/5}
[187] {E2/1}.
[188] Godeseth 1/ 35 {E2/1/11}.
[189] Godeseth 1/ 36 {E2/1/11}.

(identifying the counter at which the message was written) and a Message ID (a unique number for the message itself).[190]

250.3 Any Software Support Centre ("**SCC**") employee injecting a transaction should have used a counter number higher than 32 (making it clear that the data came from outside the branch).[191] Mr Godeseth has since been made aware (from reading the evidence of another Fujitsu witness, Mr Parker)[192] that it was also possible to inject a transaction in such a way that it would not be shown with a counter number of over 32,[193] although the evidence is that this alternative method was used very rarely (only 14 times in total, and only once for transaction data).[194]

251. As regards Horizon Online, Mr Godeseth explains as follows:

251.1 Fujitsu employees working within the SSC are able to inject additional transactions using a specific tool, creating a Balancing Transaction.[195] As far as he is aware, there has only ever been one Balancing Transaction (in March 2010), which was specifically approved by Post Office.

251.2 It is theoretically possible for certain Fujitsu employees to use their privileged user rights to edit or delete transaction data in the BRDB.[196] But there are no policies, procedures or operational practices under which this should take place, and Mr Godeseth is not aware of it having ever occurred.[197] Privileged user access is required for system updates and maintenance.[198] Since July 2015, all

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[190] Godeseth 1/38 {E2/1/11}.
[191] Godeseth 1/58.10 {E2/1/17}.
[192] Parker 2/27-31 {E2/12/9}.
[193] Godeseth 3/25 { Opus reference not available at time of submission }. {E2/14/7}
[194] Parker 2/30 {E2/12/10}.
[195] Godeseth 1/58 {E2/1/16}.
[196] Godeseth 1/59 {E2/1/17}.
[197] Godeseth 1/59 {E2/1/17}. See also Godeseth 3/19-22 { Opus reference not available at time of submission }. {E2/14/6}
[198] See, e.g., Parker 3/15 { Opus reference not available at time of submission }. {E2/13/4}

privileged user access, including the actions taken by the user, are recorded in an audit table.[199]

252. For completeness, Mr Godeseth also explains that Fujitsu use a tool, called a Transaction Information Processing Repair Tool ("**TIP Repair Tool**"), to alter the format of transaction data in the TPS system so that it could be read by other Post Office back-end systems.[200] Use of the tool does not alter the transaction data stored in the BRDB, and the data in the TPS system is not used to generate branch accounts. Mr Parker explains the purpose and use of the TIP Repair Tool in paras 11-13 of his third witness statement.[201] It does not involve remote access or alteration in any relevant sense.

253. Cs' witness evidence in relation to remote access comes from two statements provided by Mr Richard Roll (dated respectively 11 July 2016 – "**Roll 1**", and 16 January 2019 – "**Roll 2**"). Roll 2 is considerably more detailed than Roll 1 on several points.

254. Mr Roll worked at Fujitsu for three years between 2001 and 2004. His experience is therefore limited to the early days of Legacy Horizon. Inevitably, his evidence (and much of the evidence in response) has the limitation of being based on long-distance recollection from 15 or more years ago.

255. Mr Roll was in a relatively junior position in the SSC team, which performed 2nd and 3rd line support. He was primarily focused on Operational Business Change.[202] This involved supporting the engineers who were opening and closing branches and increasing and decreasing the number of counters in branches. Mr Roll's job also involved correcting the application environment after engineers had replaced failed counter hardware and clearing temporary files to increase disk space. He was not working at a level where he would be required to review much code and did not play any significant part in extensive source code examination.[203] He did not write any

[199] Godeseth 1/59.4 {E2/1/18}.
[200] Godeseth 1/60 {E2/1/18}.
[201] Parker 3/3{ Opus reference not available at time of submission }. {E2/13/1}
[202] Parker 1/34 {E2/11/9}.
[203] Parker 1/35 {E2/11/9}. Mr Roll appears to accept this at Roll 2/25 {E1/10/8}.

application code fixes. Records show that he was rarely involved in the detailed examination of potential software errors – only 3.2% of his work fell within this category.[204]

256. In Roll 1, Mr Roll gives vague evidence as to events from upwards of a dozen years earlier (at the time of that statement, made in 2016). Once it is properly understood, much of Roll 1 may be uncontroversial. For example, he refers to the fact that the SSC would "*frequently access a Post Office counter IT system remotely*",[205] and gives some examples of circumstances in which this might happen. The inference that this evidence invites (whether intentionally or not) is that there was or might have been some manipulation of branch data. Mr Parker explains the various reasons for which such access may have been used, none of which involves any such manipulation. [206]

257. Mr Roll's suggestion that "*much of the work*" carried out by himself and other SSC workers involved "*fire fighting coding problems in the Horizon system*"[207] is not supported by the records to which Mr Parker refers;[208] nor is it consistent with the very small number of KELs and Peaks that relate to the correction of coding problems.

258. The thrust of Mr Roll's evidence may be that members of the SSC team were *capable* of inserting fraudulent transactions without a SPM knowing. Mr Roll says he did not engage in such behaviour himself, and he does not suggest that he was aware of anyone else doing so.[209] As noted below, Mr Coyne does not attach much, if any, weight to the theoretical possibility of transaction data being inserted maliciously.

259. Mr Parker responds to Roll 1 and Roll 2 in his two witness statements dated, respectively, 16 November 2018 ("**Parker 1**") and 29 January 2019 ("**Parker 2**"). Mr Parker is employed by Fujitsu as Head of Post Office Application Support (and is Head of SSC). He has been working on the Post Office account since July 1997. He was the

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[204] Parker 1/51{E2/11/14}.
[205] Roll 1/15{E1/7/3.}
[206] Parker 1/ 55-57 {E2/11/15}.
[207] Roll 1/11 {E1/7/2}.
[208] Parker 1/51 {E2/11/14}. See also Parker 2/39 {E2/12/13}.
[209] Roll 1/18 {E1/7/3}.

deputy manager of the SSC at the time Mr Roll was employed, although did not have that formal title.[210]

260. Mr Parker's evidence is that:

260.1 The assertion 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.[211]

260.2 This is to be distinguished from the wholesale deletion of corrupted data stored on one terminal in a branch so that a mirror copy of the (uncorrupted) data could be automatically replicated from another source, usually another terminal in the branch or the central data store. This process would be used where the data on the first terminal had been corrupted or the hard disk in that terminal had suffered a physical failure. Mr Parker explains this process at Parker 1/55.4[212] and identifies rare cases in which a more involved process might be required at Parker 2/38.[213] He draws an analogy with the use of a back-up hard drive.[214]

260.3 It was also possible to inject transactions into counters. The standard way of doing this was via the correspondence server, which resulted in a counter number of 32 or higher being associated with the transaction in the transaction log, making the insertion immediately identifiable.[215] However, it was also possible to inject data which would appear to have been initiated at the branch counter. The injection of data in this way was rare: it happened only 14 times when Mr Roll was employed by Fujitsu, and in only one instance was transaction data injected.[216] Moreover, when it happened, the SSC user would ensure that it was clearly identified in the audit trail as having been inserted by SSC.[217]

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[210] Parker 1/8 {E2/11/2}.
[211] Parker 1/19 {E2/11/4}, referring to Godeseth 1/37 {E2/1/11}.
[212] {E2/11/16}.
[213] {E2/12/12}.
[214] Parker 3/21 { Opus reference not available at time of submission }. {E2/13/5}
[215] Parker 2/33 {E2/12/11}.
[216] Parker 2/29-30{E2/12/10}.
[217] Parker 2/29-30{E2/12/10}.

260.4 Any injections of transactions required compliance with strict change controls. Two staff were required to be present when the change was made, and all changes had to be audited (identifying both the specific alteration and the person making it).[218]

260.5 System misuse would have been discovered by consistency checks or colleagues (all access was controlled and audited), and would have resulted in the instant dismissal of the relevant employee.[219]

260.6 Mr Roll's suggestion that software issues in Horizon "*routinely*" caused discrepancies in branch accounts is misleading. In the vast majority of cases, such an occurrence would cause a receipts and payments mismatch that would be flagged by the branch system as part of the balancing process (the Horizon system carries out self-consistency checks which generate alerts in the event of a receipts and payments mismatch that are picked up by SMC and incidents raised for the SSC) and appear on MSU reporting).[220] These would then be investigated and resolved by the SSC.

260.7 While a hardware issue could very occasionally affect a branch's accounts, the vast majority of hardware issues were not capable of having any impact on such accounts (in the sense of leading to a financial discrepancy). Mr Parker explains that, in the rare circumstance that data was not replicated accurately, Fujitsu would inform both the SPM and Post Office and provide them with any information that it could to help resolve any discrepancies.[221]

260.8 Mr Parker is not aware of any case in which baskets were not zero sum (i.e. any case in which a non-zero-sum basket of transactions was accepted into Horizon).[222]

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[218] Parker 2/33 {E2/12/11}.
[219] Parker 2/35 {E2/12/11}.
[220] Parker 1/42 {E2/11/11}.
[221] Parker 2/5.2 {E2/12/2}.
[222] Parker 2/10 {E2/12/4}.

260.9 Mr Parker cannot recall any instances of incorrect reference data misdirecting payments while Mr Roll was employed by Fujitsu. Although one example did occur to Mr Parker's knowledge much later (in 2012), this was picked up and resolved quickly.[223]

261. Post Office regrets that some of the witness statements it has served in relation to remote access has required correction, clarification or amplification. To a significant extent, this is the result of a lack of detail in Roll 1,[224] coupled with the fact that Roll 1 was talking about a system that went out of operation almost a decade ago. Once Roll 1 was clarified by Roll 2, it became possible to give a more focussed consideration of, and response to, the issues that Mr Roll raises in relation to Legacy Horizon. It is of course the case that both Mr Roll and Mr Parker are trying to recollect events from many years ago and, in Mr Parker's case, to investigate the potential for various things to have happened (even if they did not happen at all or happened very rarely). There has also been a need to respond, in the most recent evidence, to points that were raised (or at least drawn into focus) for the first time in Coyne 2 – see, for example, Mr Godeseth's correction of what he considers to be a factual misunderstanding on Mr Coyne's part in relation to Global Users.[225]

E3. Mr Coyne's views

262. Mr Coyne's view is that it is to be expected that, in an estate such as Horizon, Fujitsu would be able to provide support services without physically having to attend the branch.[226] This is uncontroversial.

263. He concludes that a wide range of users at Fujitsu had the ability to access and modify transaction data and were able to implement changes that had the potential to affect

[223] Parker 2/11 {E2/12/4}.

[224] Roll 1 was prepared shortly after proceedings were issued and before any of the pleadings in the case {E1/7}.

[225] Godeseth 3/4-9 { Opus reference not available at time of submission }. {E2/14/2}; {E2/14/3}

[226] Coyne 1/9.69{D2/1/163}.

transaction data.[227] At times, his views are presented in a confusing manner: he does not make clear in each case what kind of data alteration process he is describing or even the kind of data that he contends was subject to that process: see paras 247 to 249 above. The essential distinction, which often becomes blurred in his analysis, is between transaction data and other (operational) data stored in Horizon.

264. Mr Coyne does not express criticisms of any remote abilities *per se,* and he does not identify any circumstances in which use of them has caused any shortfall in branch accounts. Nor does he identify any errors caused by Fujitsu, but he suggests that "*any consequent errors*" would not be visible unless they were identified by Fujitsu.[228] It is not clear what he bases this second point on, and the Peak on which he relies to show that Fujitsu could (and, implicitly, did) alter message store data in fact demonstrates Fujitsu's acute unwillingness to do so – "*We don't want to have to be doing this as making manual changes to the messagestore is open to error*...".[229] Mr Coyne also fails to make clear that the manual change discussed in the Peak would be a change to a data object relating to the status of a stock unit, rather than inserting, editing or deleting transaction data. It could not result in a discrepancy.

265. More generally, Mr Coyne's analysis of the documents that he says shed light on remote access issues is often superficial and can be unreliable. He does not, in many instances, explain precisely what action he considers the Peak demonstrates was taken and why, in his view, that action would generate a material risk of adverse financial impact (if indeed that is his view): see, for example, Coyne 2/3.276 where he refers to an intervention that permitted a branch to rollover and says only, "*Whilst this is not necessarily the deletion of transaction data, it is the modification of operations that are all intrinsic to transaction accounting.*".[230] It could be put more simply: the change did not affect transaction data and could not, even in principle, result in any financial impact on the branch.

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[227] Coyne 1/9.71{D2/1/163}.
[228] Coyne 2/3.231{D2/4/72}.
[229] Peak PC0130275 (21 December 2005) {F/323/2}, quoted at Coyne 2/3.230{D2/4/71}.
[230] {D2/4/82}.

266. As noted above, Mr Coyne appears to accept that it was appropriate that Fujitsu have the powers that it did have in order properly to discharge its role in managing the system. His argument, as Post Office understands it, is that in some instances there should have been greater visibility to the SPM (at the time and/or retrospectively) of what Fujitsu had done, and this affects his view on the robustness of the Horizon system. Specifically, he considers that the procedures in relation to remote access were less stringent than they could have been, with the result that there was some risk that (in certain circumstances) it may have been less obvious than it should have been whether and to what extent Fujitsu had altered branch transaction data or other data relating to branch activity: see, for example, Coyne 2/3.281 and 3.327.[231]

267. Post Office does not accept this. As set out below, Dr Worden refers to the service audits conducted by EY, which give Fujitsu a clean bill of health in relation to its controls and records, with no noted deviations and no recommendations for improvement.[232] But even if some element of Mr Coyne's criticism were to be justified, it is of very limited significance in relation to the key Horizon Issues. Taking Mr Coyne's points at their highest, the most that can be said is that on some occasions it is possible that Fujitsu, in seeking to resolve a problem, might have made some human error and that their error might have been harder to detect than it could have been (because of, for example, the absence of detailed logs of all possible types of access). These things are theoretically possible, but the likelihood of them occurring in combination in any given case is extremely small. Mr Coyne does not identify any instance of this happening.

268. It is *conceivable* that one or more shortfalls were caused by the use of remote alteration tools and that there are (in some sense) inadequate records of the relevant intervention, but there is no basis for thinking that this series of unusual events would happen with any material frequency. In fairness to Mr Coyne, he does not suggest that errors made in the course of exercising remote access abilities could account for any significant proportion of shortfalls (whether Cs' shortfalls or more generally).

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[231] {D2/4/83} and {D2/4/93}.
[232] Worden 2/164-171 {D3/6/44}.

269. Mr Coyne merely points out an unquantified risk. He does not provide any answer as to the extent to which the use of remote alteration facilities potentially affected branches' accounting positions. He says that he has not considered the "*probability of financial impact*" but only whether an effect was "*technically feasible*".[233] He goes on to dispute Dr Worden's view that the probability of adverse financial impact from Balancing Transactions is as low as one in 1.5 million, but provides no alternative probability.[234]

E4. Dr Worden's views

270. Dr Worden comments in detail on remote access to and alteration of transaction data in Worden 1 at paras 1075-1080[235] and 1089-1183[236] and in Worden 2 at paras 82-97.[237] Horizon Issue 7 is concerned with *access* to data, whereas Issues 10 to 13 are focussed on the insertion, editing and deletion of transaction data (including remotely). He addresses these issues separately.

271. As to Horizon Issue 7, the experts agree that both Fujitsu and Post Office could remotely access (in the sense of read-only access) transaction data. They agree that access of this kind is required and appropriate. Issue 7 is therefore straightforward.

272. As noted above, more detailed points arise under Issues 10 to 13 and relate to the extent to which Fujitsu could insert, edit or delete transaction data remotely under Legacy Horizon and under Horizon Online, what controls there were on such processes, how often the processes were used and whether, and to what extent, the use of them had the potential to affect the reliability of branch accounts.

273. Dr Worden necessarily bases much of his opinion on his analysis of evidence from Fujitsu employees, including Mr Roll's evidence as to what he recollects from the

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[233] Coyne 2/5.490{D2/4/259}.
[234] Coyne 2/5.494{D2/4/260}.
[235] {D3/1/237}; {D3/1/238}.
[236] {D3/1/240}; {D3/1/241}; {D3/1/242}; {D3/1/243}; {D3/1/244}; {D3/1/245}; {D3/1/246}; {D3/1/247}; {D3/1/248}; {D3/1/249}; {D3/1/250}; {D3/1/251}; {D3/1/252}; {D3/1/253}; {D3/1/254}; {D3/1/255}; {D3/1/256}.
[237] {D3/6/20}; {D3/6/21}; {D3/6/22}; {D3/6/23}; {D3/6/24}.

period of his employment by Fujitsu. There are also, however, design and policy documents that make clear that any data alteration should be exceptional and subject to tight controls, and there are indications as to the scope and nature of remote access in practice from certain KELs and Peaks. The witness and documentary evidence is consistent with a very low level of remote alteration of transaction data.

274. As to Horizon Issue 10, as noted above, there is an important point on terminology – the issues refer to an ability to "*rebuild*" transaction data (something that only happened with data held by counters under Legacy Horizon). The term "*rebuild*" might tend to suggest manual intervention to recreate transactions line-by-line, and Cs and Mr Coyne sometimes appears to use it in this sense. But that is not what in fact took place. Dr Worden explains that "*rebuilding*" branch transaction data involves merely copying a complete record of data from one source where (for example) another has become corrupted, which he regards as demonstrating an appropriate use of the robustness countermeasure RDS (redundant data storage).[238] This is consistent with Mr Parker's evidence: see para. 260.2 above. It should be noted that any disputes between the parties here relate to Legacy Horizon only, where data stored locally in the branch sometimes required replacement from (in essence) a back-up.

275. As regards Horizon Issue 11 and the processes put in place to control and record the remote insertion, editing and deletion of transaction data, Dr Worden's view in his first report was that permission controls to restrict the use of data alteration facilities were in place but were imperfect.[239] He noted in Worden 1 that the logging of privileged user access was limited to log-in and log-off until July 2015 and that external audits had identified room for improvement.[240] He also observed that security may have been improved if the number of privileged users and SSC users with the ability to create Balancing Transactions had been lower.[241]

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[238] Worden 1/1130-1131{D3/1/247}.
[239] Worden 1/1153{D3/1/251}.
[240] Worden 1/1152{D3/1/251}.
[241] Worden 1/1149{D3/1/251}.

276. In his supplemental report, however, Dr Worden identifies additional audits (service audits carried out by EY) that he considers are relevant to assessing the effectiveness of Fujitsu's permission controls. He notes that these audits "*gave Fujitsu a clean bill of health, with no recommendations for improvement*".[242] Overall, therefore, the evidence in relation to permission controls does not detract from his opinion that Horizon is very robust. Dr Worden also considers the additional evidence from Mr Roll and Mr Parker and concludes that none of it alters his overall views on the remote access issues.[243]

277. In relation to Issue 12 – the frequency with which remote alteration of transaction data occurred – Dr Worden is able to provide only limited assistance. He notes that Mr Godeseth's evidence is that there has been only one Balancing Transaction in Horizon Online (which did not affect any C's branch) and that he has seen nothing to contradict that evidence.[244] Aside from this, he has seen no evidence to confirm how often various potential methods of remote alteration were used in practice. He comments, to the extent that he can, in Worden 2 on the relevant further witness evidence.[245]

278. Dr Worden is able to provide more assistance on Issue 13 – the extent to which the use of remote alteration facilities had the potential to affect the reliability of branch accounts. He asks in respect of each facility how likely it would be for its use to create an adverse financial impact on any given branch monthly account. He concludes as follows:

    278.1 The chance of a monthly account being affected by an erroneous balancing transaction would be in order of 1 in 10 million.[246]

    278.2 The chance of a monthly account being affected by an error in reference data is "*extremely small*".[247]

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[242] Worden 2/169{D3/6/45}.

[243] Worden 2/46 et seq {D3/6/12}. Parker 3 post-dates this consideration.

[244] Worden 1/1164{D3/1/253}.

[245] Worden 1/See also Worden 2/46 et seq {D3/6/12}, commenting on Roll 2 (generally and in relation to these issues). Parker 3 and Godeseth 3 post-date Worden 2.

[246] Worden 1/1175{D3/1/254}.

[247] Worden 1/1177{D3/1/255}.

278.3 The chance of a monthly account being affected by an erroneous change made by global users or by SSC would also be extremely small.[248] There would first have to be the use of such alteration facilities; the change made through that facility would have to be erroneous; and that error would have to escape detection and correction. On the basis of Dr Worden's analysis of the efficacy of error detection and correction within Horizon, he considers the overall probability here to be extremely low – "*perhaps one in ten million*".

278.4 As regards bugs arising from the implementation of fixes, these would be a sub-category of bugs more generally. Dr Worden's views on the small number and total value of bugs therefore apply to this sub-category.[249]

278.5 The rebuilding of branch transaction data would have to occur many times for there to be any material chance of it causing a shortfall. As with erroneous changes made by global users, there would first have to be the use of such facility; the use would have to introduce an error; and that error would have to escape detection and correction. Unless branch transaction data was rebuilt on many thousands of occasions, there is no practical chance of that process having adversely affected any given monthly account.[250]

279. Ultimately, therefore, Dr Worden's view is that the remote alteration of transaction data is highly unlikely to have introduced any substantial degree of uncorrected error in branch accounts.

E5. Submissions on remote access

280. Post Office invites the Court to accept Dr Worden's views on the significance of remote access to the reliability of branch accounts (Horizon Issue 13). Mr Coyne has failed to address that issue.

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[248] Worden 1/1178{D3/1/255}.
[249] Worden 1/1181{D3/1/255}.
[250] Worden 1/1183{D3/1/256}.

281. The other issues here are mostly factual and will be addressed in more detail in closing submissions, following cross-examination of the witnesses. It is hoped that the scope of disagreement between the experts in relation to these issues may reduce further, such that any remaining points of expert opinion can be addressed briefly in closing.

282. Post Office submits that the evidence shows that the occasions when Fujitsu needs to do anything which involves any change to transaction data are extremely rare, and the last thing anyone in Fujitsu wants to do is manipulate data, not least because any manual intervention is a complex exercise. Specifically:

282.1 Mr Parker's evidence is that the "*SCC was (and is) hugely reluctant to change financial data as that was not their job and they recognised the seriousness of doing so*".[251] Mr Godeseth express similar sentiments, referring to the deletion of transaction data as a "*very different thing*" from deleting operational data.[252]

282.2 Fujitsu's reluctance to alter transaction data is clear from contemporaneous documents: "*We don't want to have to be doing this as making changes to the messagestore is open to error*" (Peak PC0130275, 21 December 2005).[253]

282.3 Dr Worden's view is that Fujitsu, in its role in administering the database, can be expected to have exercised any power to alter data in the database with "*great caution*" because any attempt to modify data directly is "*fraught with risks*". He says that any responsible data base administrator will avoid doing so "*at all costs*" and will, where possible, build and use tools instead of making direct (manual) changes.[254]

282.4 Dr Worden also points out that there would be little need to edit or alter transaction data itself, given that the same outcome (correcting the accounting position) could ordinarily be achieved through the standard processes, including Transaction Corrections.[255] He refers to the ability to alter data through

[251] Parker 2/34{E2/12/11}.
[252] Godeseth 3/17 { Opus reference not available at time of submission }. {E2/14/5}
[253] {F/323/2}, quoted at Coyne 2/5.444{D2/4/246}.
[254] Worden 1/1108-1110{D3/1/243}.
[255] Worden 1/1122{D3/1/245}.

privileged user access as a "*backstop robustness countermeasure*" that is required in systems such as Horizon but which is "*typically used only very rarely*".[256]

282.5 The vast bulk of the contemporaneous evidence of data alteration does not relate to the alteration of *transaction data*; it relates to the alteration of other types of data (such as session information, stock unit status, etc). This is the kind of remote alteration that the experts agree would have to form part of Fujitsu's role in administering the system. It is a different beast.

283. Dr Worden has used his expertise and experience of similar systems to bring a welcome measure of reality and perspective to Cs' concerns around remote alteration of data. The powers that Fujitsu has to insert, edit or delete data are unremarkable and are necessary for the administration of the database and the maintenance of a robust system. The use of the powers that seem to concern Cs would be exceptional, for good practical reasons. Moreover, the chance that mistakes in the use of those powers contributed materially to the shortfalls at issue in this case is vanishingly small. Remote access is, on analysis, little more than a sideshow.

284. Lastly, it is of course possible that allegations of remote data alteration will be made in individual cases, in which context the factual dispute will be of much narrower scope and may well be capable of easy resolution by reference to logs and the audit trail.

[256] Worden 1/1124{D3/1/246}.

F. OPERATIONAL ISSUES (HORIZON ISSUES 2, 5, 8, 9, 14 AND 15)

F1. Introduction

285. These operational issues cover: Horizon Reporting – Facilities for Subpostmasters; Reporting for Subpostmasters and Post Office; and the technical aspects of the Horizon system that are relevant to reconciliation and Transaction Corrections.

286. There appears to be nothing of substance between the experts on these issues. It is hoped that the experts will be able to produce an agreed list of responses.

F2. Horizon Issue 2 – Horizon alerting SPMs to bugs

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

287. The experts agree the following:

> *"Horizon did not, in general, alert Subpostmasters to any significant bugs or other defects in the system itself. That said, the extent to which any IT system can automatically alert its user to bugs within the system itself is necessarily limited. Whilst Horizon has automated checks, there are bugs that would circumvent such checks."*

288. Dr Worden's view is that it would be counter-productive for Horizon to alert users with precise details of abnormal conditions beyond their day-to-day experience of the system.[257] He points out that the system records unexpected or significant events in logs that can then be interrogated in the course of any investigation into unexplained discrepancies.[258]

289. In Coyne 2, Mr Coyne clarifies that he did not intend to suggest in his first report that it would be a "*good thing*" for SPMs to be provided with more information about the

[257] Worden 1, para 983{D3/1/219}.
[258] Worden 1, para 984{D3/1/219}.

inner workings of Horizon.[259] He appears to agree that it would be counter-productive to do so. He does not consider that there is any useful automatic way in which SPMs could be alerted to Horizon faults;[260] nor does he consider that SPMs' could benefit from information about the back-end systems of Horizon.[261]

290. It follows that neither expert supports Cs' pleaded case that SPMs should have been provided with more detailed information from Horizon, including (at least implicitly) as to potential bugs or errors in the system.[262]

F3. Horizon Issue 8 – Reporting functions available to Post Office

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

291. The experts agree that Post Office had access to variety of reports through its own management information systems and through the ability to request information from Fujitsu.[263] They agree that Post Office had access to information that was not available to SPMs.[264]

292. Dr Worden sets out further detail of Post Office's access to transaction data and reports that could assist in identifying and investigating shortfalls:

292.1 The primary sources of data are fed by the Transaction Processing System, which provides transaction data to various Post Office IT systems.

292.2 These Post Office IT systems include Credence and a succession of systems based on SAP, which have culminated in POLSAP. (Ms Mather describes Post

[259] Coyne 2/5.380 (1st row of the table) {D2/4/226}.
[260] Coyne 2/5.380 (2nd row of the table) {D2/4/226}.
[261] Coyne 2/5.380 (4th row of the table) {D2/4/228}.
[262] See, e.g., Generic Reply, paras 13-16 {C3/4/6} and 21.11 {C3/4/17}.
[263] See Worden 1/1083-1088 {D3/1/238} and Mr Coyne's views on Issue 8 in JS1 {D1/1/15}.
[264] Coyne 2/5.411 {D2/4/236}.

Office's use of the Credence and POLSAP systems at paras 9-17 of her statement.)[265]

292.3 Post Office has analytical facilities that are not available to and not required by SPMs.

292.4 Post Office can run standard database reporting tools, on demand, to retrieve and analyse information about branch transactions.

292.5 Post Office can also request transaction data from Fujitsu's audit system. (Ms Mather and Mr Godeseth address the use of ARQs to obtain data from the audit store.)[266]

292.6 Post Office may also obtain from Fujitsu information as to system events that are detected by the System Management Centre.[267]

293. It is unclear to what extent, if any, Mr Coyne disagrees with this further detail. He has focussed in his reports on the potential for these systems to provide imperfect information, rather than identifying what the systems are and what they do.[268] Horizon Issue 8 does not ask how reliable the sources of information were.

294. It seems unlikely that there can be any material disagreement between the experts on the factual issues that actually fall within Horizon Issue 8.

F4. Horizon Issue 9 – Reporting functions available to SPMs

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

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

b. accessing and identifying transactions recorded on Horizon.

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[265] {E2/8/1}.

[266] See Mather/18-20 {E2/8/4} and Godeseth 1/29-33 {E2/1/9}.

[267] See Worden 1/1083-1088 {D3/1/238}

[268] See, e.g., Coyne 2/5.412-414 {D2/4/237}.

295. This is, again, a purely factual issue as what transaction data and reporting functions were available to SPMs. It does not involve any consideration of the effectiveness of such reporting functions, for example.

296. It appears that the experts agree the following:

296.1 SPMs could run various (more than one hundred) different types of report covering transactions conducted in the branch.[269]

296.2 These reports provide a useful source of information when performing normal reconciliation activities.[270]

296.3 In the ordinary course, the reports show enough information for an SPM to balance transactions.[271]

297. Mr Coyne agrees with the account given by Dr Worden of the reports that are available.[272] They include the following: reports by stock unit on a daily or weekly basis, reports by user, balance reports and journals such as transaction or event logs.[273] Dr Worden gives detailed descriptions of certain of the reports and logs and how they could be used to investigate discrepancies. He gives specific consideration to the Transaction Log,[274] the Event Log,[275] the Balance Snapshot[276] and the Stock on Hand report.[277]

298. Mr Coyne states that the information available to SPMs is what he would expect to see given that they are the users of the Horizon system and "*would not typically be given*

[269] Coyne 1/8.12 {D2/1/143}; Worden 1/991 {D3/1/220}.
[270] Coyne 1/8.12 {D2/1/143}.
[271] Coyne 1/8.20 {D2/1/146}.
[272] JS2/14.1 {D1/2/40}.
[273] Worden 1/991 {D3/1/220}.
[274] Worden 1/1000 {D3/1/222}.
[275] Worden 1/1004 {D3/1/224}.
[276] Worden 1/1007 {D3/1/225}.
[277] Worden 1/1007 {D3/1/225}.

access to anything beyond what was necessary for them to carry out their 'business as usual' activities".[278]

299. Although this goes somewhat beyond Horizon Issue 8, the experts have also agreed a statement as to the usefulness of the reports available to SPMs in identifying the causes of discrepancies and shortfalls:

"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 knowledge of the complex back-end systems. Identification requires cooperation of Post Office staff and Subpostmasters."

300. Post Office addressed the requirement for cooperation at the Common Issues Trial.

F5. Horizon Issue 14 – Comparison of cash and stock by SPMs

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

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

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

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

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

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

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

[278] Coyne 1/8.11 {D2/1/143}.

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

301. These sub-issues can be taken in turn.

(a) Comparison of stock and cash in branch against the stock and cash indicated on Horizon.

302. The experts agree that the comparison requires the SPM (or an auditor) to carry out a physical count of cash and stock and input the figures from that count into Horizon, allowing Horizon to then carry out a comparison against the electronically derived figures held by Horizon.[279]

303. Mr Coyne points out that Post Office procedures require SPMs to carry out a daily cash declaration for each stock unit and that it is recommended to carry out weekly balancing.[280] Dr Worden expresses the view that the more frequent cash declarations and balance reports are carried out, the sooner any discrepancies can be identified and investigated. He points out that making daily cash declarations can limit the necessary investigation to a single day of trading.[281] Mr Coyne states that carry out weekly balancing should help detect discrepancies that can then be moved into a suspense account pending its resolution.[282]

(b) Subpostmasters deciding how to deal with or dispute discrepancies

304. The experts have agreed the following[283]:

It is agreed that functionality enabling the Subpostmasters to deal with, dispute, accept or make good alleged discrepancies is as follows:

At the end of the Trading Period, Horizon reports to the user the amount of any discrepancy. The system invites the user to transfer this amount into the local suspense account and continue to roll over - or to discontinue this operation.

If, at the end of a Trading Period, there is a discrepancy (i.e. either a surplus or a shortfall) of less than £150, the Subpostmaster must 'make good' the discrepancy - either by removing money from the till (in the event of a surplus) or by adding money to

[279] JS2/14.2 {D1/2/40}.
[280] Coyne 1/7.20 {D2/1/135} and 7.24-25 {D2/1/136}.
[281] Worden 1/998 {D3/1/222}.
[282] Coyne 1/7.25 {D2/1/136}.
[283] JS2/14.3 {D1/2/41}.

the till (in the event of a shortfall). The ability to make good through Horizon was also available before 2005 under Cash Accounting. 'Making good' causes the derived cash position to remain the same and the actual cash position to change accordingly. The next Trading Period can then begin with a balanced account (both physical cash and electronically recorded). If, at the end of a Trading Period, a branch has a discrepancy of more than £150, they have the option to either make good or settle the discrepancy centrally.

The ability to 'settle centrally' was not available under Cash Accounting. If the Subpostmaster chooses to settle centrally, they do not have to physically place cash in the till (in the case of a shortfall) at the time. Instead, a message is sent to Post Office's Finance Services Centre and the discrepancy is moved to a central account. A Subpostmaster may wish to dispute a discrepancy. This only appears to have been available post 2005.

The Subpostmaster cannot dispute a discrepancy on Horizon or record that they have raised a dispute. This is done through contacting the helpline.

305. The ability to settle centrally was introduced in 2005. Prior to this, the process was for the SPM to seek approval from Post Office to retain a shortfall or gain in a local suspense account pending the outcome of the dispute. Mr Coyne refers to this at Coyne 1/7.28.[284]

(c) Horizon recording or reflecting disputes as to discrepancies

306. It is common ground, and the experts agree, that the SPM cannot dispute a discrepancy on Horizon or record on Horizon that they have raised a dispute. Disputes are raised through contacting the Helpline.[285] Post Office's back office account facilities record disputes and take decisions on investigations into discrepancies.[286]

307. The experts state that the flowcharts agreed between the parties at the Common Issues Trial reflect their understanding of the processes for disputing transaction corrections and shortfalls / gains shown in the Branch Trading Statement.[287]

(d) Enabling SPMs to produce Cash Accounts and Branch Trading Statements

308. There does not appear to be any difference between the experts on these issues.

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[284] {D2/1/136}.
[285] JS2/14.3 {D1/2/41}.
[286] JS2/14.6 {D1/2/42}.
[287] JS2/14.5 {D1/2/42}.

309. The experts agree that, since 2005, SPMs have been required to produce a Branch Trading Statement ("**BTS**") at the end of every trading period (of 4 or 5 weeks). Dr Worden describes the process of producing the BTS as follows:

"Each branch is required to perform a full balance of every SU [stock unit] in the branch at the end of each Trading Period. Before the final balance is produced, the Subpostmaster must make declarations of stock on hand, foreign currency, stamps, travellers cheques and cash. After the balance report, a Postage Label report must be produced. The next step is to complete the Suspense Account report for the branch. Once all of the stock units in a branch have been balanced and rolled over to the next Trading Period, the Branch Trading Statement can be produced."[288]

310. Mr Coyne does not appear to dispute any of this.

311. Prior to 2005, SPMs had to produce weekly cash accounts.[289] It appears to be common ground between the experts that the process for producing such accounts was similar to that for Branch Trading Statements.[290]

(e) Enabling or requiring SPMs to continue to trade if they do not complete a BTS

312. Cs contend that the system prevented SPMs continuing to trade unless they completed the BTS.[291]

313. The experts do not support that contention. They agree that there is no evidence of any technical controls that prevent SPMs continuing to trade if they do not complete a BTS.[292] Mr Coyne appeared to contend otherwise in his first report, stating that "*Subpostmasters are not able to continue trading until the Branch Trading Statement process is complete*",[293] but he has clarified that he meant to say that there are

[288] Worden 1/1029 {D3/1/229}.
[289] Worden 1/1031 {D3/1/229}.
[290] Worden 1/1031 {D3/1/229}; Coyne 1/7.38 {D2/1/138}.
[291] GPOC/35.2 {C3/1/13}; Outline Allegations/14.6 {C1/2/14}.
[292] Coyne 2/5.404(e) {D2/4/234}. See also JS2/14.4 {D1/2/42}.
[293] Coyne 1/7.39 {D2/1/138}.

restrictions on this imposed by the business process, rather than any technical constraints in Horizon.[294]

F6. Horizon Issues 5 and 15 – Comparison of data

314. These two issues can conveniently be taken together, as they overlap.

Horizon Issue 5 – Automatic comparison against transaction data from other sources

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

315. The experts agree the following:

"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 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 volumes of transactions, the comparison had to be automated."[295]

316. The experts also agree, although this is not within Horizon Issue 5, that there then follows a manual process that is carried out by Post Office outside Horizon. That manual process may result in a Transaction Correction being issued. As a manual process, it is subject to the usual risks of human error.[296]

Horizon Issue 15 – Horizon processing of Transaction Corrections

(15) How did Horizon process and/or record Transaction Corrections?

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[294] Coyne 2/5.404(e) {D2/4/233}.
[295] Worden 1/892 {D3/1/199}. Mr Coyne agrees at Coyne 2/5.367-368 {D2/4/222}.
[296] Worden 1/892 {D3/1/199}. Mr Coyne agrees at Coyne 2/5.367-368 {D2/4/222}.

317. Mr Coyne sets out the process by which Transaction Corrections are generated, sent to branches and processed by SPMs at Coyne 1/6.50-6.60.[297]

318. The experts state that the flowchart agreed at the Common Issues Trial reflects their understanding of the processes for disputing transaction corrections.[298]

319. The disagreement between the experts relates not how Horizon processes or records Transaction Corrections but to what extent manual reconciliation and investigation processes within Post Office might have caused erroneous Transaction Corrections to be issued (or result in one not being issued when it should have been). That is not the subject matter of Issue 15.

320. In any event, Dr Worden's view on this issue (as noted above) is that error in Transaction Corrections is necessarily a second-order effect (requiring first an attempt to correct an error and, second, an error in that correction process). On his calculations, errors in Transaction Corrections could account for a tiny proportion of shortfalls.

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SIMON HENDERSON

OWAIN DRAPER

REBECCA KEATING

One Essex Court and 4 Pump Court

4 March 2019

[297] {D2/1/121}.
[298] JS2/14.5 {D1/2/42}.

G. ANNEX

G1. The Horizon Issues

DEFINITIONS FOR THE PURPOSE OF THIS LIST OF ISSUES

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

BUGS, ERRORS AND DEFECTS IN HORIZON

Accuracy and integrity of data

(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?

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

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

[GPOC §23 and 24; Defence §§49 to 56]

Controls and measures for preventing / fixing bugs and developing the system

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

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

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

a. data entry errors;
b. data packet or system level errors (including data processing, effecting, and recording the same);
c. a failure to detect, correct and remedy software coding errors or bugs;
d. errors in the transmission, replication and storage of transaction record data; and
e. the data stored in the central data centre not being an accurate record of transactions entered on branch terminals?

[GPOC §§5,**14-15, 24.1, 24.1A, 94A, 95;**
Defence §§**35(2), 36, 38(1), 50(1), 52-54;**
Reply §**411]**

OPERATION OF HORIZON

Remote Access

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

[Defence §7; **Reply §91]**

Availability of Information and Report Writing

(8) What transaction data and reporting functions were available through Horizon to Post Office for identifying the occurrence of alleged shortfalls and the

causes of alleged shortfalls in branches, including whether they were caused by bugs, errors and/or defects in the Horizon system?

**[Defence §7;
Reply §9]**

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

a. identifying apparent or alleged discrepancies and shortfalls and/or the causes of the same; and
b. accessing and identifying transactions recorded on Horizon?

[GPOC §§14.2-14.3, 17 and 19.3;

Defence §§38(2)(b), 38(3), 46(2);

Reply §15.2-15.3]

Access to and/or Editing of Transactions and Branch Accounts

(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.

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

[GPOC §§21.3, 23, 25; Defence §§48(3), 50, 57]

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

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

[GPOC §§21.3, 23, 25; Defence §§48(3)(c), 57]

Branch trading statements, making good and disputing shortfalls

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

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

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

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

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

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

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

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

[Defence §§42-46; Reply §§17.1-17.2, 211

Transaction Corrections

(15) How did Horizon process and/or record Transaction Corrections?

[Defence §§12, 39-40, 45-46; Reply §211

G2. List of Acronyms

The purpose of this Annex is to set out the key acronyms and abbreviations. This is not intended to be an exhaustive list, although this list has been compiled by reference to the expert reports of both Dr Worden and Mr Coyne.

Term	Meaning
AP	Automated Payment (for e.g. a utility bill)
APADC	Used by Mr Coyne to refer to a scripting mechanism that allows POL to define what additional data is captured during a transaction.
APOP	Automated Payment Out-pay Database
APS	Automated Payment Service
ARC	Used by Dr Worden to refer to large scale IT architecture.
ATM	Automated Teller Machine
BAL	Branch Access Layer, part of the servers in Horizon Online.
BAU	Business as Usual
BFC	Used by Dr Worden to refer to bug finding and correction.
BIF	Business Impact Forum, a joint Fujitsu and Post Office forum for discussing changes to Horizon.
BIM	Business Incident Management, the process that generates reports to Post Office, often where there is an exception flagged by Fujitsu automated reporting systems.
BMS	Business Management System
BP	Balancing Period, the weekly periods within a Trading Period.
BRDB	Branch Database, the main database on which transaction and other data is held in Horizon Online.

Term	Meaning
BT	Balancing Transaction, being a transaction generated using the Transaction Correction Tool in Horizon Online.
BTS	Branch Trading Statement
CA	Cash Account, the forerunner to the BTS prior to 2005.
CAP	Cash Account Period, the weekly accounting period for branches and the forerunner to the Trading Period introduced in 2005.
CCD	Contract Controlled Document
CCTV	Closed-circuit Television
CESG	UK government cyber security service
CMMI	Capability Maturity Model Integration
CNT	Counter
CP	Change Proposal
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check, a control mechanism to ensure the accuracy of data within Horizon.
CSR+	Core System Release Plus
CTS	Client Transaction Summary
DBA	Database administrator
DBMS	Database Management System
DBTN	Disputed Banking Transaction Notice
DCS	Debit Card System
DDS	Used by Dr Worden to refer to generic, data-driven software.
DEA	Used by Dr Worden to refer to double entry accounting
DEP	Used by Dr Worden to refer to defensive programming.
DRS	Data Reconciliation Service
DUE	Used by Dr Worden to refer to early detection of user errors.
DVLA	Driver and Vehicle Licencing Agency

Term	Meaning
DWH	Data Warehouse
DWP	Department of Work & Pensions
EBBT	Enquiry Based Banking Transaction
EBT	Electronic Banking Transactions
EFTPOS	Electronic Funds Transfer Point of Sale
EMV	Used by Mr Coyne to refer to Europay MasterCard Visa standard for financial smart cards.
EPOSS	Electronic Point of Sale Software
EPS	Electronic Point of Sale Service
ERP	Enterprise Resource Planning
ETU	Electronic Top Up
FAD	The unique identification code allocated to each branch.
FSC	Post Office's Financial Services Centre
FTMS	File Transfer Management System
F99	Used by Mr Coyne to refer to an F99 transaction which is a transaction state that indicates that a reconciliation error has been reported but POL has advised that the issue has subsequently been resolved.
GPOC	Generic Particulars of Claim
HLD	High Level Design
HNG or HNG-X	Alternative name for Horizon Online.
HRSAP	Post Office's Human Resources IT system
HSD	Horizon Service Desk
HSH	Horizon System Helpdesk
ICL	International Computers Limited, the forerunner to Fujitsu.
IS	Infrastructure Services
ISO	International Standards Organisation
ITIL	Information Technology Infrastructure Library
JSN	Journal Sequence Number, the sequential number added to each basket by a counter in branch and used to identify missing or duplicated basket.

Term	Meaning
KEL	Known Error Log
LFS	Logistics Feeder Service
MDM	Master Data Manager
MD5	Technique for creating a hash code for some piece of data, which would change if the data was altered in any way.
MI	Major Incident
MID	Used by Dr Worden to refer to manual inspection of data.
MIS	Management Information System
MoD	Ministry of Defence
MSC	Managed Service Change, a ticket generated to record changes to Horizon.
MSU	Management Support Unit, part of Fujitsu that supports Horizon and in particular monitors automated reports for discrepancies.
MTBF	Mean Time Between Failures.
NB	Network Banking
NBE	Network Banking Engine
NBSC	Network Business Support Centre, the operational helpline operated by Post Office.
NBX	Used by Mr Coyne to refer to the replacement architecture of network after removal of NBE.
NFR	Non-functional requirements
NS&I	National Savings and Investments
OBCS	Order Book Control Service
OCP	Operational Change Proposal, a ticket generated to record changes to Horizon and the forerunner to MSCs.
OCR	Operational Change Request, a ticket generated to record minor changes to Horizon.
OSD	ICL Pathways Operation Services Division
OTI	Open Tele service Interface
OTT	Operation Test Team

Term	Meaning
OWA	Operational Working Agreement
P&BA	Product and Branch Accounting, a team within Post Office that is part of FSC.
PAF	Postcode Address File
Pathway	ICL division created for Horizon, which later became part of Fujitsu
PCI	Payment Card Industry
PDL	Process Definition Language (an example of reference data)
Peak	The system used by SSC to track support activity for Horizon.
PIN	Personal Identification Number
PinICL	The forerunner system to Peak.
PM	Used by Mr Coyne to refer to a subpostmaster.
PO	Post Office
POA	Post Office Account
POCA	Post Office Card Account
POCL	Post Office Counters Ltd (previous name of Post Office but the same legal entity)
PODG	Used by Mr Coyne to refer to Post Office Data Gateway. A generic reference-data driven system that is used to deliver file-based information between two end points (internal or external).
POL	Post Office Limited
POL FS	Earlier name for POLSAP, from 2004 - 2010
POLMIS	Management Information Service for Post Office Limited
POLSAP	PO's central finance system.
PONB	Post Office's Network Banking Unit
POS	Point of Sale
Powerhelp	Forerunner system to TFS.
PTF	PEAK Targeting Forum
PRINCE2	Project Management Methodology
QCC	Used by Dr Worden to refer to quality and change control.

Term	Meaning
RAC	Real Application Cluster
RDDS	Reference Data Delivery Service
RDMC	Reference Data Management Centre
RDMS	Reference Data Management System
RDS	Used by Dr Worden to refer to redundant data storage and computing.
remming	The process or sending cash or stock to or from a branch.
RHW	Used by Dr Worden to refer to reliable and redundant hardware.
Riposte	Software product from Escher at the core of Legacy Horizon.
ROC	Used by Dr Worden to refer to robust data communications.
SAP	An industry leading resource planning and accounting system.
SAP-IS	Used by Mr Coyne to refer to SAP Industry Solution.
SAP ADS	SAP applied to administrative data services
SCP	Supplier Change Proposal
SEC	Used by Dr Worden to refer to security.
SEK	Used by Dr Worden to refer to secure kernel hardware and software.
SLA	Service Level Agreement
SLT	Service Level Target
SMC	Fujitsu's System Management Centre
SPM	Subpostmaster
SPOF	Single Point of Failure
SQL	Structured Query Language
SSC	Fujitsu's Software Support Centre
SSH	Secure Shell
SU	Stock Unit, a set out sub-accounts within the main branch accounts.
TA	Transaction Acknowledgement
TC	Transaction Correction
TDES	Triple - Digital Encryption Standard

Term	Meaning
TEM	Tivoli Enterprise Manager
TES	Transaction Enquiry Service
TFS	Triole for Service, the ticketing system used by Fujitsu for calls to the HSD.
TGP	Used by Dr Worden to refer to testing good practice.
TIN	Used by Dr Worden to refer to transactional integrity and recovery.
TIP	Transaction Information Processing
TIPAIS	Transaction Processing Interface Specification
TP	Trading Period
TPS	Transaction Processing Service, which transfers data out of Horizon and on to other external systems.
UEC	Used by Dr Worden to refer to later correction of user errors.
VPN	A Virtual Private Network is a secure channel that appears to be private despite being carried on a public network, typically the Internet.
WOR	Used by Dr Worden to refer to manual workarounds.
WSPOS	Web Services POS
XML	Extensible Message Language

G3. Procedural History

1. The purpose of this Annex is to set out, in summary form, the key procedural history in relation to disclosure, witness statements and expert reports. It is not intended to provide a comprehensive account of all correspondence in relation to these issues.

DISCLOSURE ORDERS AND REQUESTS

Summary

2. Following a hearing on 2 February 2018, the Court ordered that disclosure should be given "*on an issue by issue basis…in accordance with Model C and the draft Practice Direction*": see para. 5 of the Second CMC Order.[299].

3. In accordance with that direction for Model C disclosure, it was incumbent on Cs to identify (i) the issues in relation to which disclosure was sought and (ii) the narrow category or categories of documents requested for disclosure in relation to each issue.

4. Following discussion and substantial agreement between the parties, extensive orders for disclosure were made in the Third CMC Order which touched on issues for both the Common Issues Trial and the Horizon Issues Trial.[300] In addition, by para. 7 of that Order,[301] Cs were to submit requests for disclosure of up to 100 technical documents from Fujitsu's "Dimension" system based on an index already provided.

5. The Horizon Issues were identified in Schedule 1 to the Consent Order dated 23 March 2018.[302]

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[299] {C7/11/2}
[300] See para. 2 {C7/12/2}.
[301] {C7/12/3}.
[302] {C7/14/2}.

6. By the Fourth CMC Order (following a hearing on 5 June 2018), the Court ordered disclosure of extensive categories of documents by 17 July 2018.[303] As with the Third CMC Order, these categories had been discussed between the parties and a significant measure of agreement reached. There were some differences – principally in relation to the appropriate custodians – but these were resolved at the Court's direction by discussions between the parties following the hearing.

7. Separately, prior to the 5 June 2018 hearing, Cs' expert, Mr Coyne submitted his own "*Request for Directions*" dated 18 May 2018, purportedly pursuant to CPR 35.14. This was a wide-ranging request both for information and documents. It appeared that Cs had not coordinated with Mr Coyne to ensure that the requests for documents were Model C requests, and that there had been no attempt to limit the extent of overlap between requests made by Mr Coyne and those made by Cs.

8. By paras 8 and 9 of the Fourth CMC Order, the parties' experts were ordered jointly to compile a list of information which either or both considered was required in order properly to opine on the Horizon Issues and to identify which information both experts required and which was only required by one expert.[304]

9. Mr Coyne essentially re-presented his requests for information and disclosure in a further document entitled "*Experts Requests for Information*" (dated 26 June 2018 although sent on 12 July 2018). Dr Worden's general position, as recorded in that document, was that his current requirements for information were being met by the 110,000 documents that had already been provided to the experts.

10. By the Fifth CMC Order – ordered by consent – the parties agreed a mechanism to resolve their differences in relation to Mr Coyne's requests for information and further documentation.[305] It was agreed and ordered that, in respect of each request, Post Office would by 8 August 2018 provide the information requested or set out an objection in writing. If having considered the objection Cs wished to pursue the request, they were to respond within 10 days (i.e. by 18 August 2018)

[303] See para. 3{C7/18/2}.
[304] {C7/18/3}.
[305] {C7/22/1}.

explaining in writing: (i) the relevance of the request to the determination of the Horizon Issues; (ii) why the request was reasonable and proportionate; and (iii) why it fell within CPR 35.9.

11. Post Office provided its responses on 6 August 2018 and updated this on 8 August 2018. Cs did not serve any notice on or by 18 August 2018.

12. On 19 September 2018, Cs sent a schedule from Mr Coyne which set out requests that he considered needed to be answered, along with brief reasons. There was no explanation why Cs had disregarded the requirements of the Fifth CMC Order. There was also no attempt to provide the particulars required by that Order. By Post Office's response dated 25 September 2018, Cs were asked to provide this information. Cs did not reply to this request.

13. In or around December 2018, Cs started to make wide-ranging requests for further disclosure. The scale of Cs' requests is best seen from Post Office's 27-page letter dated 11 February 2019 which responded to a clutch of these disparate requests.[306]

14. On 14 December 2018, Cs sent a new version of Mr Coyne's request for information, asking that to the extent that documents were sought, the letter be treated as a formal request for disclosure under Model C.[307] No explanation was provided for the failure to comply with the Fifth CMC Order and the details required by that Order were again not provided. Moreover, the document requests were nothing like Model C requests. Notwithstanding these failings, Post Office responded substantively to this on 17 January 2018.[308]

15. The upshot is that Cs have not followed either the Court's orders for Model C disclosure or the agreed mechanism for pursuing any requests from Mr Coyne.

16. Post Office's letter of 11 February 2019 sets out the relevant background and goes on to identify the (fairly extensive) further disclosure that Post Office was able to give even at that late stage, notwithstanding the lack of any reasonable

[306] {H/196}.
[307] {C5/28}.
[308] {C5/32}; {C5/33}.

explanation for why Cs had adopted the approach that they had.[309] In that letter, Post Office noted, amongst other things, the following:

16.1 Many of the documents that Cs sought had already been provided, such that Cs were effectively requiring Post Office to carry out work in locating documents that Cs should themselves have undertaken.

16.2 Many of the requests for disclosure were drafted in the form "*documents relating to*", which was inconsistent with Model C disclosure and unhelpful.

16.3 In the absence of proper Model C requests, Post Office had itself been required to scope the disclosure and devise appropriate search terms.

16.4 If there were to be any allegation that Post Office had failed to comply with any of the disclosure orders, this should be made clear (with particularity).

17. Notwithstanding the problems with Cs' approach to seeking late disclosure, Post Office has been able to satisfy many of Cs' requests, whether in whole or in a modified form that is more consistent with Model C disclosure and/or is capable of being provided in the timescale available.

KELs

18. KELs were disclosed 9 May 2018. When it became apparent that the disclosure given on 9 May 2018 was not a full extract of all KELs which existed since there were also some deleted KELs, these were also disclosed (on 17 January 2019) and at the same time KELs produced between 19 March 2018 (when the last export had been run) and 10 December 2018, were also disclosed.

Peaks

19. As part of his RFI dated 4 June 2018, Mr Coyne asked for access to the Peak system and the capability to extract specific requested Peaks for later review.[310] Pursuant to paragraph 6 of the Fourth CMC Order[311] Post Office made

[309] {H/196}.
[310] {C5/11/4}.
[311] {C7/18/2}.

arrangements for the experts to be given joint access to inspect the Peak system at Fujitsu's offices at Bracknell on 15 June 2018.

20. On 8 August 2018 WBD sent a response[312] to Mr Coyne's RFI[313] and to a separate email from him dated 20 July 2018[314]. WBD said that Post Office was working with Fujitsu to see if some mechanism could be created to provide Mr Coyne with direct access to the 220,000 Peak entries. This was not a straightforward process. Mr Coyne was invited to attend a second day of Peak inspection at Bracknell but he did not take up this invitation.

21. On 27 September 2018 disclosure was provided of 218,366 Peaks which were not responsive to a privileged search term. On 25 October 2018 disclosure was provided of a further 3,885 Peaks (which had been responsive to a privileged search term) after they had been manually reviewed for privilege.

MSCs and OCPs

22. As part of Mr Coyne's email on 20 July 2018, disclosure was sought of any Master Service Change ("**MSC**"), Operational Corrective Requests ("**OCR**") or Operation Control Procedures ("**OCP**") "*where the data to be changed has had a financial impact on Post Office or where they relate to fixing a peak*".[315] On 1 August 2018, Post Office sought clarification of this request,[316] in particular why the MSCs, OCRs and OCPs were relevant to the Horizon Issues and what was meant by "financial impact on Post Office". No response was received to this request for clarification.

23. Pursuant to the mechanism set out in paragraph 1 of the Fifth CMC Order,[317] on 8 August 2018 Post Office objected to the request for disclosure of the MSCs, OCRs and OCPs on the basis that it would be necessary for Fujitsu to carry out a

[312] {C5/21}.
[313] {C5/8}.
[314] {C5/22}.
[315] {C5/22/2}.
[316] {C5/17}.
[317] {C7/22/1}.

retrospective analysis to attempt to locate the documents which would fall within the disclosure request since the information had not been pooled or collated as part of ordinary working practices. If the Cs wished to continue to pursue these requests then they were required by 18 August 2018 to provide the explanation and particulars required by paragraph 2 of the Fifth CMC Order.[318]

24. Cs did not reply until 19 September 2018[319] when Freeths wrote to WBD explaining that Mr Coyne had considered Post Office's responses to his RFIs and asked Post Office to reconsider its objection to the disclosure of the MSCs, OCRs and OCPs.

25. On 25 September 2018, [320] further information was sought by WBD from Cs as to why these requests for disclosure were relevant to the determination of the Horizon Issues.

26. On 14 December 2018, [321] Mr Coyne provided a revised RFI which contained those outstanding requests which he believed were of the most significance to his preparation of his supplemental report. The revised RFI requested disclosure of the MSC, OCRs and OCPs, gave a brief response to the clarification sought on the meaning of financial impact and then merely stated "*Request still valid*".

27. Disclosure of the MSCs was given on 21 December 2018. [322] On 17 January 2017,[323] WBD explained that Fujitsu had developed and tested a solution to extract the OCPs and disclosure of the OCPs and OCRs was given on 24 January 2019.[324]

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[318] {C7/22/1}.
[319] {C5/25}.
[320] {C5/27}.
[321] {C5/28}; {C5/29}.
[322] {H/155}.
[323] {C5/33/9}.
[324] {H/179}.

WITNESS STATEMENTS

28. It was made clear from the outset that the Horizon Issues Trial was to be focussed on expert evidence and that factual evidence was to be kept to a minimum and was to be generic (in the sense of being relevant to the Claims and the Horizon Issues generally, rather than individual cases).

29. The Court emphasised this at the CMC on 22 February 2018: see the transcript at pages 16D-E[325] and 54C-F[326]. In the latter passage, the Court said:

> *...what I was going to be doing in march was to deal with expert issues that were present on the pleadings concerning Horizon. I wanted the parties to agree or to each propose an isolated number of issues on the pleadings related to Horizon that would involve expert evidence but not evidence of individual cases.*
>
> *... My intention is in March to resolve the Horizon Issues that observe the following three criteria* [:] *Issues regarding the Horizon system that arise on the pleadings, that is the first one; second, that can be resolved on the expert evidence; third, do not require evidence of fact or if they do require* [it] *the very barest evidence of fact.*

30. The Consent Order dated 23 March 2018 that identifies the Horizon Issues includes the following, reflecting the Managing Judge's indications:[327]

> *The following proposed issues are confined to issues that concern the Horizon system…and which (a) arise on the parties' generic statements of case, (b) can be resolved by IT expert evidence, and (c) require limited, if any, evidence of fact.*

31. Para.10 of the Fourth CMC Order made provision for "*witness statements of any witness of fact whose generic evidence (in distinction to claimant-specific evidence) they wish to rely upon for the purposes of determining the Horizon Issues*" (emphasis added).[328]

32. Notwithstanding this, Cs served on 28 September 2018 9 witness statements, 6 of which were plainly claimant-specific evidence from current or former SPMs. The statements are as follows:

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[325] {C8.4/4/16}.
[326] {C8.4/4/54}.
[327] {C7/14/3}.
[328] {C7/18/3}.

32.1 Adrees Latif (SPM).[329]

32.2 Anup Patny (SPM).[330]

32.3 Aakash Patny (son of an SPM and assistant in his father's branch).[331]

32.4 Angela Burke (SPM).[332]

32.5 Jayesh Tank (SPM).[333]

32.6 Setpal Singh (SPM).[334]

32.7 Richard Roll (former Fujitsu employee).[335]

32.8 Ian Henderson (Director of Second Sight).[336]

32.9 Charles McLachlan (IT Expert).[337]

33. Mr Coyne does not rely on any of the SPM evidence to explain his reasoning or to demonstrate a chain of evidence linking a particular experience to an identified KEL or Peak. Nor does he refer to the evidence of Professor McLachlan or Mr Henderson.

34. Cs have since agreed not to call Mr Singh and Professor McLachlan. A second witness statement from Mr Roll was served on 16 January 2019.[338]

35. Out of an abundance of caution and under protest, Post Office responded to Cs' claimant-specific evidence in its supplemental evidence: see, paras 28-110 of Angela Van Den Bogerd's second witness statement.[339] Ms Van Den Bogerd, Mr

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[329] {E1/1}.
[330] {E1/3}.
[331] {E1/2}.
[332] {E1/4}.
[333] {E1/6}.
[334] {E1/8}.
[335] {E1/7}.
[336] {E1/5}.
[337] {E1/9}.
[338] {E1/10}.
[339] {E2/5/10}.

Johnson and Mr Godeseth also commented on the witness statements from Mr Henderson and Professor McLachlan.

36. Post Office's witness evidence falls into three categories:

36.1 Factual evidence from Fujitsu witnesses relating Horizon's operations, audits and data extractions. This evidence is given by Mr Godeseth,[340] Mr Parker,[341] Mr Membery[342] and Mr Dunks.[343]

36.2 Factual evidence from Post Office witnesses addressing various operational procedures that interact closely with Horizon, e.g. the procedure for disputing shortfalls (Ms Phillips' statement)[344] and an outline of the functions of Horizon Online (Mr Johnson's statements).[345] This evidence also includes statements from Tracy Mather[346] and Paul Smith.[347]

36.3 Responsive evidence from Ms Van Den Bogerd,[348] as noted above, addressing the SPM evidence adduced by Cs and responding to certain of the points raised in Mr Henderson's evidence.

37. At the PTR on 14 February 2019, Post Office objected to much of Mr Henderson's evidence on the basis that it was, in substance, opinion evidence for which no permission had been given. The Court made it clear that the trial would not be allowed *"to be sidetracked into a satellite set of issues as to whether the Second Sight conclusions were, or were not, correct"*[349] and ruled that[350]:

> *"in so far as Mr. Henderson's factual evidence seeks to portray the conclusions of the Second Sight report as being correct, it is not going to be necessary to form a view on that in order for me to answer the Horizon issues in Schedule 1."*

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[340] Godeseth 1 {E2/1} and Godeseth 2 {E2/7}.
[341] Parker 1 {E2/11}and Parker 2 {E2/11}.
[342] {E2/21}.
[343] {E2/10}.
[344] {E2/3}.
[345] Johnson 1 {E2/4} and Johnson 2 {E2/6}.
[346] {E2/8}.
[347] {E2/9}.
[348] {E2/5}.
[349] Judgment at PTR on 14/2/19, para 11 {C7/41/4}.
[350] Judgment at PTR on 14/2/19, para 10 {C7/41/4}.

EXPERT REPORTS

38. By the Third CMC Order,[351] the following directions were given:

    38.1 Cs to serve a provisional outline document setting out the nature of their allegations by 18 July 2018;

    38.2 first joint statement of experts by 31 August 2018;

    38.3 Cs' expert report by 14 September 2018;

    38.4 Post Office's expert report by 2 November 2018;

    38.5 supplemental reports by 18 January 2019; and

    38.6 second joint statement of experts by 20 February 2019.

39. The rationale behind the sequencing in this Order was that, in the absence of a fully pleaded case on bugs and errors in the generic pleadings, Cs would at least set out their outline case at a fairly early stage; the experts would reach such agreement as they could based on the outline case and their initial work; Cs' expert would then put forward his views; Post Office's expert would respond; there would be an opportunity for supplemental reports; and then a further joint statement.

40. The first joint statement was filed on 4 September 2018.[352]

41. By the Fourth CMC Order,[353] the dates of some of these steps were pushed back. In addition, the parties were directed to exchange witness statements of any witness of fact whose generic evidence was to be relied on.[354] The parties were also given permission to serve supplemental witness statements "*in response to factual matters that are referred to or relied on by either parties' IT expert*" – Post Office by 16 October 2018 and Cs by 14 December 2018.

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[351] {C7/12}.
[352] {D1/1}.
[353] {C7/18}.
[354] See para. 10 {C7/18/3}.

42. Following these changes, the intention was still that the experts' supplementary reports would be the last stage in the evidence (other than the second joint statement) and would set out the experts' views in light of the supplementary witness evidence. It was to be expected that, in the ordinary way, this final round of expert evidence would be relatively brief and help to identify further common ground and/or elucidate and build upon existing areas of disagreement.

43. Against this background, it is regrettable that Coyne 2 represents a significant recasting of Cs' case. It is 258 pages long (plus appendices), and it is apparent that Mr Coyne carried out substantial additional work following service of Coyne 1.

44. The second joint statement was filed on 25 February 2019.[355]

45. Having done its best to assimilate and understand the issues raised by Coyne 2, Post Office believes that the parties and the Court would be assisted by some supplementary evidence addressing certain points raised in Coyne 2. Accordingly, on 28 February 2019, Post Office served short supplemental witness statements for which it does not have permission.[356] These are in additional to a supplemental witness statement by Mr Parker which was served on 29 January 2019, for which Post Office did not have permission but which Cs accepted into the trial bundle.[357]

[355] {D1/2}.
[356] {H/230}.
[357] {E2/12}.