OPUS 2

INTERNATIONAL

Alan Bates & Others v Post Office Limited

Day 14

June 4, 2019

Opus 2 International - Official Court Reporters

Phone: 0203 008 6619
Email: transcripts@opus2.com
Website: https://www.opus2.com

1   Tuesday, 4 June 2019

2 (10.30 am)

3 MR DE GARR ROBINSON: May it please your Lordship, can

4 I start by thanking you for kindly agreeing to adjourn

5 this hearing on Wednesday of next week to suit my

6 personal circumstances.

7 MR JUSTICE FRASER: Not at all.

8 MR DE GARR ROBINSON: I would also like to thank my learned

9 friend who I know has difficulties the following week as

10 a result. I would like that to be put on record because

11 I'm most grateful.

12 MR JUSTICE FRASER: Can I therefore check. We are sitting

13 four days this week, which is all going to be the

14 claimants' expert being cross-examined by you, and then

15 we are sitting the three days next week identified in

16 the email of yesterday?

17 MR DE GARR ROBINSON: My Lord, I believe so, yes.

18 MR JUSTICE FRASER: And that is Dr Worden being

19 cross-examined by Mr Green.

20 MR DE GARR ROBINSON: Yes.

21 MR JUSTICE FRASER: The dates, times etc for closings etc

22 remain unaffected?

23 MR DE GARR ROBINSON: Yes.

24 MR JUSTICE FRASER: Thank you.

25 MR DE GARR ROBINSON: My Lord, one other matter I should

1 mention. Dr Worden's supplemental statement, there has

2 been no substantive engagement between the experts on

3 that statement, as I understand it.

4 MR JUSTICE FRASER: Which statement?

5 MR DE GARR ROBINSON: I should say his report. The report

6 that was sent to your Lordship a couple of weeks ago if

7 your Lordship recalls.

8 MR JUSTICE FRASER: But you are not making an application?

9 MR DE GARR ROBINSON: I have no application to make and

10 I was going to tell your Lordship that.

11 MR JUSTICE FRASER: Well, that's one of the points which --

12 I know you suggested there was nothing unconventional

13 about what Dr Worden had done but his covering email

14 explained what application you would or would not be

15 making. I don't know if you have seen that covering

16 email, it is the one that was forwarded on by the court.

17 MR DE GARR ROBINSON: I am sure I have seen it, my Lord, but

18 not recently.

19 MR JUSTICE FRASER: All right. But the situation is you are

20 not making an application?

21 MR DE GARR ROBINSON: I have no application to make.

22 MR JUSTICE FRASER: Understood. Is there anything else that

23 you would like to mention?

24 MR DE GARR ROBINSON: My Lord, no.

25 MR JUSTICE FRASER: There is something I have to mention, it

1 has probably been somewhat lost in the mists of time

2 given the circumstances of March, but you were in the

3 middle of doing a privilege redaction review.

4 MR DE GARR ROBINSON: Yes.

5 MR JUSTICE FRASER: Has that now been completed?

6 MR DE GARR ROBINSON: My Lord, yes. There were documents

7 were sent over to Freeths a number of weeks ago now in

8 accordance with your Lordship's deadline.

9 MR JUSTICE FRASER: I wonder if at some point, not now, you

10 could just give me a summary -- I think there were 30

11 documents you were looking at?

12 MR DE GARR ROBINSON: I certainly will, my Lord.

13 MR JUSTICE FRASER: If you could just give me a summary of

14 the number of documents there were, which went into

15 which category and which were disclosed, I would be very

16 grateful.

17 MR DE GARR ROBINSON: I will have to go back and review --

18 MR JUSTICE FRASER: I expected you would so I was not

19 expecting an answer.

20 MR DE GARR ROBINSON: Would your Lordship like that done

21 this week? Perhaps we could do it on Friday after --

22 MR JUSTICE FRASER: It doesn't have to be this week.

23 MR DE GARR ROBINSON: I'm grateful.

24 MR JUSTICE FRASER: The best thing actually, why not if it

25 could just be distilled into writing and then maybe send

1 an email on Monday.

2 MR DE GARR ROBINSON: My Lord, yes, that will be done.

3 MR JUSTICE FRASER: Then the other thing, which is for both

4 the parties, not just you. I'm producing judgment

5 number 5, which is the written reasons for all of the

6 rulings last week. It is substantially finished. It

7 resolves the outstanding point on the order about

8 detailed assessment. I'm hoping to send it out by the

9 end of today, depending on how long it takes me finally

10 to proof read it. If it is not at the end of today it

11 will be first thing tomorrow morning, and then based on

12 what that says I will just expect the order to be

13 produced in due course.

14   I do not think there's any other housekeeping,

15 unless you have got some, Mr Green?

16 MR GREEN: My Lord, no.

17 MR JUSTICE FRASER: Thank you very much,

18 Mr de Garr Robinson.

19 MR DE GARR ROBINSON: My Lord, there is one minor change to

20 the agreed reports between the experts.

21 MR JUSTICE FRASER: The joint statements?

22 MR GREEN: The joint statements. It is at {D1/5/10}.

23 MR JUSTICE FRASER: Which joint statement is this?

24 MR GREEN: This is the fourth joint statement of

25 4th March 2019.

1   MR JUSTICE FRASER: Yes.
2   MR GREEN: In the light of considering some further
3   documents the experts have agreed that at 11.1, where it
4   says "evidence from several PEAKs indicates that
5   whenever Fujitsu", it should be "usually", qualifying
6   that. And we will produce for your Lordship a revised
7   statement of that sentence that the experts are happy
8   with that makes --
9   MR JUSTICE FRASER: They have both agreed that, though?
10 MR GREEN: They have agreed that orally this morning, so
11   that's why we don't have a written updated version, but
12   we will produce a written version reflecting that
13   agreement as soon as we can.
14   My Lord, may I now call Mr Coyne.
15 MR JUSTICE FRASER: Yes.
16   MR JASON PETER COYNE (sworn)
17   Examination-in-chief by MR GREEN
18 MR JUSTICE FRASER: Have a seat, Mr Coyne, if you would.
19 MR GREEN: My Lord, there are hard copies of Mr Coyne's
20   statement arriving shortly. He is without them at the
21   moment, for which we apologise, but they will be here
22   shortly. He says he is content to proceed with them on
23   the screen.
24   Mr Coyne, you have made two reports?
25 A. Yes, that is correct.

5

1   Q. The first appears to be at {D2/1/1}.
2   A. Yes.
3   Q. If we go to page {D2/1/167} of that report, is that your
4   signature?
5   A. Yes it is.
6   Q. And do you believe the contents of that statement to be
7   true?
8   A. Yes, I do.
9   Q. Then you served a revised version of your supplemental
10   report?
11 A. Yes, I did.
12 Q. And if we look at {D2/4.1/1}.
13 A. Yes.
14 Q. If we go please to page {D2/4.1/266} of that report, is
15   that your signature?
16 A. It is indeed.
17 Q. Does that reflect the corrections that you made on
18   6th March?
19 A. Yes.
20 Q. Subject to those corrections now included in that
21   revised report, do you believe the contents to be true?
22 A. I do.
23 Q. There are also four joint reports.
24 MR JUSTICE FRASER: Joint statements.
25 MR GREEN: Joint statements which are at {D1/1/1}.

6

1   A. Yes.
2   Q. And {D1/2/1}.
3   A. Yes.
4   Q. {D1/4/1}.
5   A. Yes.
6   Q. And {D1/5/1}.
7   A. Yes, that is correct.
8   Q. Could we just look, please, at {D1/5/10}, at 11.1.
9   A. Yes.
10 Q. You will have heard the qualification. Is that
11   something that you have spoken to Dr Worden about?
12 A. Yes, I have spoken to him this morning just before the
13   start of court.
14 Q. And what have you agreed about that?
15 A. We have agreed that the word "whenever" overstates the
16   position and it would be better to say "usually".
17 Q. I'm very grateful. Subject to that, is there anything
18   in those reports that you would wish to change or depart
19   from?
20 A. No.
21 MR GREEN: I'm most grateful. My Lord, I have no further
22   questions.
23 MR JUSTICE FRASER: Mr de Garr Robinson.
24   Cross-examination by MR DE GARR ROBINSON
25 MR DE GARR ROBINSON: Mr Coyne, if I could ask you first of

7

1   all to go to bundle {C1/1/1}. This is a list of the
2   Horizon Issues.
3   A. Yes, I have that.
4   Q. And the first set of issues are headed "Bugs, errors and
5   defects in Horizon", for shorthand I will call them
6   bugs.
7   A. Yes.
8   Q. I would like to look at four issues in particular.
9   Issue 1:
10   "To what extent was it possible or likely for bugs
11   ..."
12   Of the nature alleged at certain paragraphs of the
13   generic particulars of claim and referred to in certain
14   paragraphs of the generic defence.
15   "... to have the potential to cause apparent or
16   alleged discrepancies or shortfalls relating to
17   subpostmaster's branch accounts or transactions, or ...
18   to undermine the reliability of Horizon accurately to
19   process and to record transactions as alleged ..."
20   In certain paragraphs of the generic particulars of
21   claim. You see the references there to the generic
22   pleading?
23 A. Yes.
24 Q. I take it you read the relevant paragraphs of those
25   pleadings?

8

1 A. Yes.
2 Q. Issue 3, if we could just read that:
3   "To what extent and in what respects is the Horizon
4   System 'robust' and extremely unlikely to be the cause
5   of shortfalls in branches."
6   At the bottom there's more references to paragraphs
7   of the generic pleadings. You have read those as well,
8   haven't you?
9 A. Yes, I have.
10 Q. In order to clarify what these issues actually mean?
11 A. In order to provide the context of the questions.
12 Q. I'm grateful. Then paragraph (4):
13   "To what extent has there been potential for errors
14   in data recorded within Horizon to arise in (a) data
15   entry, (b) transfer or (c) processing of data in
16   Horizon?"
17   Then over the page at {C1/1/2} at issue (6):
18   "To what extent did measures and/or controls that
19   existed in Horizon prevent, detect, identify, report or
20   reduce to an extremely low level the risk of ..."
21   Those specified errors.
22   I am sure you will agree the issues I have just read
23   out are very important issues for the purposes of these
24   proceedings?
25 A. Yes.

9

1 Q. Would you agree they are probably the most important
2   issues for the purposes of these proceedings?
3 A. I'm not sure whether they are the most important but
4   they certainly are --
5 Q. They are of central importance, yes?
6 A. Yes.
7 Q. I would like to look briefly at the context that you had
8   regard to when interpreting them. Could I ask you now
9   to go to the pleadings bundle which is at bundle
10   {C3/1/1}. These are the generic particulars of claim
11   and I'm going to go to a few paragraphs. First of all,
12   page {C3/1/8} of that document and paragraphs 22 to 24.
13   22:
14   "Prior to disclosure and expert evidence, the
15   Claimants are unable to provide detailed particulars of
16   bugs, errors or defects which were or may have been the
17   cause of any discrepancies or alleged shortfalls
18   attributed to them by the Defendant, but will be able to
19   plead further thereto following disclosure or the
20   provision of information relating thereto by the
21   Defendant."
22   Skipping over the last sentence.
23   Then 23:
24   "However, the Claimants aver that there were a large
25   number of software coding errors, bugs or defects which

10

1   required fixes to be developed and implemented. There
2   were also data or data packet errors. There was a
3   frequent need for Fujitsu to rebuild branch transaction
4   data from backups, giving rise to the further risk of
5   error being introduced into the branch transaction
6   records."
7   Then there is a reference to the known error log.
8 A. Yes.
9 Q. Then various specific things are relied upon in
10   paragraph 24 which I would ask you to just cast your eye
11   down so you can see what's being alleged.
12 A. Mm. Yes.
13 Q. {C3/1/9}.
14   So the context in which these issues arise is the
15   overall question as to whether the problems which are
16   alleged here affected the claimants, created false
17   shortfalls in their accounts, would you agree with that?
18 A. Yes.
19 Q. If we can then move on to the generic defence and that's
20   at bundle {C3/3/1}, behind divider 3.
21   If we can go to page {C3/3/21}. Picking it up at
22   paragraph 50, just in the individual subparagraphs, this
23   is what the defendants are saying in response to that
24   case. (1):
25   "All IT systems experience software coding errors or

11

1   bugs which require fixes to be developed and
2   implemented. As is noted in paragraph 53 and 54 below,
3   there are robust measures in place in Horizon for their
4   detection, correction and remediation."
5 MR JUSTICE FRASER: I think we jumped forward a bit quickly.
6   Can we go back a page, please.
7 MR DE GARR ROBINSON: It's paragraph 50.
8 MR JUSTICE FRASER: Yes, you were reading from 50 and
9   page 21 was on the screen, but before you finished
10   reading we jumped to page 22.
11 MR DE GARR ROBINSON: I see. I'm grateful, my Lord. I'm
12   sorry, I was not looking.
13 MR JUSTICE FRASER: That's understood, don't worry.
14 MR DE GARR ROBINSON: Then it says at (2):
15   "All IT systems involving the transmission of data
16   over the internet experience data or data packet errors
17   during transmission and such systems routinely have
18   protective measures in place to prevent such errors
19   creating any difference between the data transmitted and
20   the data received and retained by the recipient.
21   Horizon has robust controls making it extremely unlikely
22   that transaction data input in a branch would be
23   corrupted when being transferred to, and stored in, Post
24   Office's data centre in a manner that would not be
25   detected and remedied."

12

1　　　So you will see that here Post Office are not saying
2　　it didn't happen, but what they are saying is there is
3　　a risk of it happening but for each occasion on which
4　　data is input it is extremely unlikely that the data
5　　would be corrupted. Do you see that?
6　A.　I do see that.
7　Q.　If we could move on to page {C3/3/22} now, picking it up
8　　at paragraph 53, it is said:
9　　　" ... it is a truism that errors or bugs in an IT
10　system and data or data packet errors have the potential
11　to create errors in the data held in that system.
12　However Horizon has at all material times included
13　technical control measures to reduce to an extremely low
14　level the risk of an error in the transmission,
15　replication and storage of the transaction record data.
16　　　Then there is a list of the current measures.
17　Again, not saying that it didn't happen. There is
18　a risk but in any given case that risk is extremely low,
19　do you see that?
20　A.　I can see the words that are being said, yes.
21　Q.　So robustness -- we can move on to paragraph 54 on page
22　　{C3/3/23}:
23　　　" ... in addition to the technical controls referred
24　to above, there are several operational procedures and
25　practices conducted by Post Office and subpostmasters

13

1　　that serve to increase the reliability of the data
2　stored in the central data centre as an accurate record
3　of the transactions entered on branch terminals.
4　　　Then there is a list of those. So you will see that
5　what's being said is that the robustness of the system
6　is said to be affected both by technical measures and by
7　human measures. Do you see that?
8　A.　Yes, I can see that. That is what is said, yes.
9　Q.　Then over the page at {C3/3/24} and paragraph 55:
10　　" ... Post Office admits that, like all other IT
11　systems, Horizon is not a perfect system which has never
12　had any errors or bugs. However, as indicated in
13　paragraphs 53 and 54 above, it has robust systems in
14　place to identify them, fix them and correct their
15　consequences (if any)."
16　　　Were those the paragraphs that you looked at when
17　you were deciding how to interpret the issues that we
18　have read to each other?
19　A.　Yes.
20　Q.　Before you decided on the approach that you would adopt,
21　you reflected on the issues thrown up by those
22　paragraphs, yes?
23　A.　Yes.
24　Q.　They made it clear, didn't they, that the critical issue
25　was not whether it is possible or likely for bugs to

14

1　　have the potential to cause false shortfalls in branch
2　accounts over the life of Horizon, that was in fact
3　admitted. The critical issues were the extent to which
4　it was and is likely that bugs cause false shortfalls in
5　any given set of accounts. Do you accept that?
6　A.　I don't really see the difference between the two
7　statements that were made there. The question was
8　whether it was possible or likely and the extent to
9　which it was possible or likely.
10　Q.　Well, let's -- given that it is admitted that there have
11　been occasions where these things have happened in the
12　life of Horizon, to ask is it possible or likely that it
13　has happened within the life of Horizon is a rather
14　uninteresting question, isn't it?
15　A.　But along with the statement that defects were
16　acknowledged was a statement that there has only been
17　three defects.
18　Q.　No, Mr Coyne. I ask you to address my question, please.
19　If you could focus on what I asked you.
20　　　Given it was admitted that there have been occasions
21　when these things have happened, to answer the question:
22　is it possible or likely that these things have happened
23　by saying "yes" isn't a very helpful answer, is it?
24　A.　If the answer was just simply "yes" and with no further
25　context then I agree that that would ...

15

1　Q.　The critical issue that's raised by the four issues that
2　I have read to you is the word "extent" and the word
3　"likelihood" and the word "risk", isn't it?
4　A.　They certainly are critical elements that would need to
5　be reviewed, yes.
6　Q.　What you were being asked to do by those issues is to
7　give your opinion to the court on the extent to which it
8　was and is likely that bugs caused shortfalls in any
9　particular set of accounts?
10　A.　Well, across the accounts of subpostmasters, yes.
11　Q.　The extent to which various measures in place reduce
12　the risk faced by any given subpostmaster when doing
13　a transaction or when producing a particular set of
14　accounts, yes?
15　A.　Yes.
16　Q.　That's the critical question on which the court needs
17　your assistance, would you agree?
18　A.　It is one of the critical questions, yes.
19　Q.　Could you identify a question which you say is more
20　critical than that in the context of these proceedings?
21　A.　I haven't taken a view on -- I have taken each of the
22　Horizon Issues that's put to me with equal priority.
23　I haven't set out to decide a prioritisation for them.
24　Q.　Very well, I understand. But you will then at least
25　agree with me this far: that in asking you to give your

16

1   opinion on the issues we have read, what you're being

2   asked to do is to advise the court on the extent to

3   which problems had happened -- or problems were likely

4   to happen in relation to any given situation, the extent

5   to which those problems were likely to have been caught

6   by countermeasures in that situation, and the overall

7   question of the extent to which Horizon is robust and

8   extremely likely to be the cause of a shortfall in that

9   given situation. Would you agree with that?

10   A.   I don't believe countermeasures were asked in the

11   questions, but broadly with what you say, yes --

12   Q.   When I say countermeasures, you can take me as saying

13   controls and measures if you want --

14   A.   Okay.

15   Q.   Subject to that correction, you would agree that that

16   was the essential question being raised in the four

17   issues that I read to you?

18   A.   I believe they were the questions that were asked and

19   I believe that in providing my reports I seek to address

20   those. I have answered those.

21   Q.   Very good. So you accept these issues are of practical

22   importance to this trial?

23   A.   Yes.

24   Q.   So that the court's judgment in this case, when the time

25   comes later on to try claims by particular claimants,

<center>17</center>

1   that the accounting shortfalls which he or she is

2   complaining about was actually caused by Horizon?

3   A.   Sorry, could you put that question again, please.

4   Q.   I may have made a grammatical mistake in my question.

5   MR JUSTICE FRASER: I'm not really sure that's a question

6   for the expert anyway.

7   MR DE GARR ROBINSON: Very good. But important questions

8   are: when a claimant did a transaction in the period

9   covered by a particular set of accounts containing

10   a disputed shortfall, what risk did he face of Horizon

11   creating errors in the recording, transmission or

12   storage of records of those transactions, and how likely

13   was it that Horizon calls a false shortfall in those

14   accounts? Would you agree that those questions, the

15   Horizon Issues I have read to you, the resolution of

16   those issues will be of assistance in deciding that

17   question?

18   A.   No, I don't believe that that's something that we have

19   been asked to calculate or assess.

20   Q.   No, I'm not asking you, Mr Coyne -- I'm not suggesting

21   to you that you have been asked to decide on whether any

22   particular claimants' claim is right or not, what I'm

23   suggesting to you is that the context in which these --

24   given the context in which these issues arose -- were

25   drafted, and given the pleadings by reference to which

<center>18</center>

1   they were drafted, it was obvious that the purpose of

2   those issues was to assist the court so that it could

3   use the judgment that will be produced in this trial as

4   a basis for making ultimate decisions in ultimate breach

5   claims by claimants?

6   A.   In a later trial?

7   Q.   Yes.

8   A.   Yes, I was aware of that.

9   Q.   Isn't that the main reason why we are here?

10   A.   Well, it is certainly a reason why we are here, yes.

11   Q.   To enable the court to make useful findings as to the

12   general likelihood of any transaction being wrongly

13   recorded in a particular case?

14   A.   Yes.

15   Q.   And as to the general likelihood of any particular set

16   of accounts containing false shortfalls because of

17   Horizon?

18   A.   I don't believe either of those two statements appeared

19   in the issues for the technical experts, did they?

20   Q.   So you don't believe that when you were asked in the

21   Horizon Issues -- let me see if I can find them -- at

22   {C1/1/1}:

23   "To what extent was it possible or likely for bugs

24   [and so on] to have the potential to cause apparent or

25   alleged discrepancies or shortfalls?"

<center>19</center>

1   A.   Yes.

2   Q.   You don't think you were being asked to give an opinion

3   as to the extent of the likelihood of that happening in

4   any given case?

5   A.   Yes, but I have not placed any focus on any particular

6   branch accounts for any subpostmasters or claimants.

7   Q.   But you weren't focused on the entire life of Horizon.

8   There are two ways that one could construe the question

9   "To what extent was it possible or likely for bugs" and

10   so on. One is was it possible or likely for bugs to

11   have done that thing at any time during the life of

12   Horizon? And I think we have already agreed that the

13   answer to that is trivial because we know it already.

14   A.   Sorry, I do not think I agree with that. I think

15   because we are talking of situations, bugs, errors and

16   defects that occurred throughout the life of Horizon,

17   you do have to look at the entire life cycle from when

18   it was first used by subpostmasters all the way up to

19   the near current date.

20   Q.   I'm not suggesting that you don't have to look at

21   whether bugs have arisen during the life of Horizon.

22   What I'm suggesting to you is the practical purpose of

23   these issues, the question you are being asked, is to

24   what extent is it likely that those bugs are going to

25   cause shortfalls in any given case?

<center>20</center>

1 A. Yes, I agree with that.
2 Q. Thank you. So the focus was not just on the number of
3   bugs in Horizon, the focus was on bugs which were likely
4   to affect branch accounts, yes?
5 A. Yes.
6 Q. And also on whether there were -- I'm going to call them
7   countermeasures, I hope that's not controversial, which
8   were likely to catch and correct their impact, yes?
9 A. Yes.
10 Q. Either straightaway or after some time?
11 A. Typically if you were going to design a countermeasure
12   you would want to have it finding the defect
13   straightaway. If it was only going to find it some time
14   later it would be of limited value.
15 MR JUSTICE FRASER: Mr de Garr Robinson, just on your term
16   "countermeasures".
17 MR DE GARR ROBINSON: Yes.
18 MR JUSTICE FRASER: I understood that to have a specific
19   meaning within the IT world. Are you using it in
20   a technical meaning or are you using it as a generic
21   term?
22 MR DE GARR ROBINSON: I'm using it as a term to refer to
23   measures and controls in existence, both technical and
24   human measures and controls, which are designed or have
25   the effect of identifying bugs in Horizon or identifying

                                21

1   the consequences of bugs in Horizon so that they can be
2   looked at and fixed.
3 MR JUSTICE FRASER: So that's the way counsel is going to
4   use the term "countermeasures".
5 A. Thank you, my Lord.
6 MR DE GARR ROBINSON: And this trial, the issues that we
7   have been discussing, are designed to enable the experts
8   to grapple with that question, yes? Whether
9   countermeasures are likely to catch and correct the
10   impact of any bugs that may have arisen in the system?
11 A. Agreed.
12 Q. And countermeasures aren't limited to a process of
13   stopping the bug as soon as it appears. Sometimes
14   countermeasures only catch the symptoms or the
15   consequences of a bug, you would accept that, wouldn't
16   you?
17 A. Typically countermeasures are a design aspiration. When
18   you sit down to design a computer system and what
19   controls are in place, then you would consider what
20   controls are required, where to position them. Should
21   it be the case that the controls fail do you have
22   a human aspect doing a secondary check? It could go all
23   the way to employing auditors to re-check figures. You
24   could go on ad infinitum with --
25 Q. So you accept, then, that these controls or

                                22

1   countermeasures, whatever you would like to call them,
2   some of them have the effect of stopping the bug in its
3   track. Well, some of them have the effect of stopping a
4   bug arising in the first place?
5 A. The best way of dealing with defects is to ensure that
6   they don't arise in the first place --
7 Q. And --
8 A. Sorry, if you would allow me to just finish.
9 Q. Sorry.
10 A. So what you would do is throughout your testing regimes
11   you would flush out all of the defects at that point in
12   time, and you would put in controls to ensure that if
13   a defect does trigger, there is a way that you are
14   alerted to it and it is fixed as soon as possible.
15 Q. Yes. So one of the objectives is to have a testing
16   regime which picks up as many bugs as possible?
17 A. Indeed.
18 Q. But I think you accept that it is impossible to have
19   a testing regime that picks up all of them?
20 A. It is impossible to have a testing regime that picks up
21   all of them and that is why you have a process of
22   categorisation and you would allow a product to go live
23   if -- one of the terms that's used -- all severity 1 and
24   severity 2 defects have been dealt with. Severity 3
25   might be largely cosmetic and you would allow a system

                                23

1   to go live with cosmetic defects.
2 Q. That's not quite what I'm asking you. You accept there
3   are going to be bugs which arise in the operation of any
4   IT system which would simply evade any test that any
5   human being can devise?
6 A. There's always going to be bugs that are unknown to be
7   within the system at the point that you go live and they
8   are only discovered sometimes weeks afterwards,
9   sometimes years afterwards.
10 Q. Yes. And then -- so that's one line of defence. Then
11   there are other lines of defence when a bug does arise
12   because it hasn't been tested for. There are principles
13   such as defensive programming, and so on, which try and
14   stop the bug working its way through the system and
15   producing false results at the end?
16 A. Defensive programming is typically to stop the bug ever
17   occurring. It isn't the trigger mechanism; what happens
18   after the bug is triggered.
19 Q. Isn't one of the aspects of defensive programming having
20   little units of programmes which require data to be
21   transferred from one programme to another programme to
22   another programme, and every time you transfer from one
23   unit to the other checks are done to ensure the figures
24   are correct?
25 A. Yes, to ensure that a bug doesn't have an impact on the

                                24

1   user --
2 Q. So one aspect of defensive programming is not just to
3   prevent bugs, it is to ensure the bug doesn't
4   propagate --
5 A. Yes.
6 Q. -- when it manifests itself and produces an error in
7   data, yes?
8 A. Yes.
9 Q. So we have one set of measures which is designed to
10   prevent bugs occurring in the first place?
11 A. Mm.
12 Q. We have other measures which are designed to prevent
13   bugs causing problems in data at the user end, if I can
14   put it that way. But again no system of countermeasures
15   is perfect, there will always be bugs that get through?
16 A. Agreed. I completely agree.
17 Q. Then you have other measures which are designed to pick
18   up the problems which have been caused at the user end.
19   You have measures that are designed to assist in the
20   identification of the fact that there is a problem in
21   data such that it needs to be looked at and corrected if
22   it is wrong?
23 A. Yes, that's typically called impact management. So you
24   understand what the impact might be of the bug that you
25   have seen and you work out a process of resolving the

25

1   consequential impact of it.
2 Q. That's precisely -- and of course I'm reminded that many
3   of those countermeasures also pick up and correct for
4   user errors as well. They can sometimes have a dual
5   effect?
6 A. Yes, you can design the software in such a way that it
7   reduces the amount of user errors or the potential user
8   errors. One such that's appeared in this case is about
9   double typing high value cheques when they are remmed
10   into the system. So if it is a high value, potentially
11   you should type that in twice rather than in once.
12 Q. All of these things that we have just been discussing in
13   general terms is precisely what the concept of
14   robustness addresses, isn't it, in the IT industry?
15 A. Yes.
16 Q. That a system isn't merely reliable when conditions are
17   normal -- I think the technical term is nominal -- but
18   robust performance takes over if and when conditions are
19   abnormal or off nominal, when they become adverse and
20   errors are created, yes?
21 A. Yes, you would want a system to fail safely. So it is
22   acknowledged that there could be failures and it is what
23   you do when that system fails.
24 Q. So robustness is the very concept which underlies the
25   issues we have been discussing for the last half hour,

26

1   yes?
2 A. Yes.
3 Q. I think that's what you agree in the joint statement.
4   If we could go to the joint statement, it is at bundle
5   {D1/1/8}. This is paragraph 2.3, issue 3.
6   This is what you agreed with Dr Worden before any
7   reports were produced at all:
8   "There are different dimensions of robustness, such
9   as robustness against hardware failure, software defects
10   and user error. The robustness of the system also
11   depends on the process around it.
12   "Robustness does not mean perfection; but that the
13   consequences of imperfection must be managed
14   appropriately."
15 A. Yes.
16 Q. Then over the page {D1/1/9} you suggest your own
17   interpretation of robustness. You say:
18   " ... I have applied the following definition of
19   robustness:
20   "'... namely, the ability of a system to perform
21   correctly in any scenario, including where invalid
22   inputs are introduced, with effective error handling.'"
23   So those adverse conditions you refer to, that would
24   include bugs in the system itself, wouldn't it?
25 A. Yes.

27

1 Q. So withstanding them would include managing their
2   consequences appropriately, yes?
3 A. Yes.
4 Q. I think that's also what you say in the third joint
5   statement that was agreed some time later. That is at
6   {D1/4/2}. It is the second paragraph:
7   "From our experience of ..."
8 A. Sorry, I do not think I have the right --
9 Q. Sorry, it is {D1/4/2}.
10 MR JUSTICE FRASER: If you look at your screen you will see
11   what the witness is seeing.
12 MR DE GARR ROBINSON: It is {D1/4/2}.
13   At the bottom of the page, do you see that?
14 A. Yes, I do.
15 Q. Second sentence of the second paragraph:
16   "We agree that 'robust' does not mean infallible and
17   therefore horizon has and will continue to suffer
18   faults. Robustness limits the impact of those faults
19   and other adverse events."
20 A. Yes.
21 Q. If you go over the page to page {D1/4/4},
22   paragraph 3.13, third box down, third row down:
23   "Countermeasures work by limiting the impact of
24   Horizon bugs/error and defects on branch accounts.
25   "Countermeasures do not always eliminate the effects

28

1   of adverse events (they are not perfect) ..."

2   Do you agree with that?

3   A.   Yes.

4   Q.   No IT system ever has perfect countermeasures?

5   A.   I agree.

6   Q.   But they are often effective in the area where they are

7   deployed and that's why they become basic elements of

8   practical IT system design.

9   Incidentally, isn't that what Dr Worden was saying

10   in the first statement? If we can go back to the first

11   joint statement, which is {D1/1/9}, and look at page 9

12   of that statement, you will see in the bottom half of

13   the screen we have got Dr Worden's comments?

14   A.   Yes.

15   Q.   So you indicate your definition of robustness in the

16   top, and below he says:

17   "The definition of 'robust' proposed above by

18   Mr Coyne is not adequate for reasons given below. The

19   term 'robust' is not, as implied in para 3.1 of the

20   outline, either ill-defined or a piece of IT public

21   relations. Robustness (which is closely related to

22   resilience) is an engineering objective, and large parts

23   of project budgets are devoted to achieving it."

24   Would you agree with that?

25   A.   Yes.

<center>29</center>

1   Q.   "it receives its meaning in the phrase 'robust against

2   ... [some risk or threat]' ..."

3   Would you agree with that?

4   A.   Yes.

5   Q.   "... and there are a large number of risks that business

6   IT systems need to be robust against - such as hardware

7   failures ..."

8   If we go over the page {D1/1/10}:

9   " ... communications failures, power cuts,

10   disasters, user errors or fraud. These are the

11   dimensions of robustness."

12   Do you agree with that?

13   A.   Yes.

14   Q.   "In all these dimensions, robustness does not mean 'be

15   perfect'; it means 'address the risks of being

16   imperfect'. The extent of robustness is to be

17   interpreted as: in how many dimensions was Horizon

18   robust? And: in each dimension, how large were the

19   remaining risks?"

20   Would you agree with that?

21   A.   That is a little imprecise. I don't really understand

22   the reference to the dimensions. The dimensions aren't

23   defined.

24   Q.   He talks about dimensions before, hardware failures --

25   he talks about different risks that are faced by the

<center>30</center>

1   system. But let's not get bogged down in dimensions.

2   The critical question, could I suggest to you, in

3   robustness, is how large were the remaining risks after

4   the relevant countermeasures have been brought into

5   account? Would you agree with that?

6   A.   I'm not sure I would agree that that is the critical

7   question, no. Certainly consideration does need to be

8   given to how, once a risk triggers, it is dealt with.

9   Q.   Let me get this straight. You are not agreeing that

10   when determining whether a system, an IT system, is

11   robust that a critical question is how large are

12   the risks remaining after you have had regard to the

13   countermeasures?

14   A.   But when you talk about how large are the risks, that

15   quantification is something which I don't believe is

16   possible. It is not possible to quantify risk in such

17   a way.

18   Q.   So please explain, Mr Coyne, how else would you grapple

19   with the question of robustness? You agree robustness

20   is an important concept?

21   A.   Yes.

22   Q.   You agree it is deployed very frequently in the IT

23   industry?

24   A.   Yes.

25   Q.   It is a subject of academic study, isn't it?

<center>31</center>

1   A.   Yes.

2   Q.   And there are university courses on it?

3   A.   There may well be, I'm not aware --

4   Q.   Yes. So given that, and given that the essential

5   purpose of this doctrine is to determine how well

6   systems guard against problems caused by -- it could be

7   human error, it could be bugs, it could be any adverse

8   conditions of that sort, isn't it obvious, doesn't it

9   follow as night follows day, that the ultimate question

10   being wrestled with by the concept of robustness is how

11   well are the risks faced by a system guarded against?

12   In other words, what are the risks remaining after you

13   have taken the countermeasures into account?

14   A.   Yes, and typically that analysis, what you talk about

15   there, is conducted in the design process of a system at

16   the start where you would then go to build a system

17   after you are satisfied that it has all the design

18   characteristics and control measures in place. So it

19   achieves a particular level that you are satisfied with

20   and then you go to actually build the solution. That is

21   different to then having a system already in place and

22   looking back at it and trying to decide what its level

23   of robustness was.

24   Q.   Sorry, I'm not sure I understand what you are saying,

25   Mr Coyne. Are you saying it is possible to define

<center>32</center>

1   a level of robustness that you want when you are
2   designing the system, but it is not possible to decide
3   whether you have achieved that level after you've built
4   it?
5 A. What I'm saying is when you set out to build the system
6   and you have the design processes and control measures,
7   you will take a view whether you are satisfied with the
8   level of risk within that build. It won't have
9   a number, it will be subjective, but there will be
10   a decision on whether there is the appropriate level of
11   robustness -- to use the phrase that we have termed
12   here -- and if everybody is agreed at that level of
13   robustness the build will then take place. But it is
14   a subjective view.
15 Q. I'm interested in your suggestion, Mr Coyne, that there
16   won't be any numbers. You say you are a qualified
17   PRINCE2 practitioner, yes?
18 A. Yes.
19 Q. I have seen a number of PRINCE2 documents and we can
20   take you to some tomorrow if this is necessary. But
21   what those documents make very clear is that in engaging
22   in the process of determining the risks -- managing the
23   risks to a given project, you do absolutely attach
24   numbers to particular risks. You have graphs, don't
25   you? You draw graphs up and you assign values to

33

1   particular risks?
2 A. Typically each risk will have an impact rating, often
3   between 0 and 5 but it could be different, and there is
4   a likelihood of that impacting, and typically you would
5   multiply one by the other and that gives you a number.
6   But that is far too simplistic for something at the
7   level of analysis that we are talking about here.
8 Q. What I'm suggesting to you, Mr Coyne, is previously you
9   said when you are designing a system and considering
10   the risk to which you wanted the system to be subject,
11   the level of risk which you were willing to accept, it
12   is a subjective view and it doesn't involve any numbers.
13   What I'm suggesting to you, Mr Coyne, is it absolutely
14   does involve numbers and indeed the very process you
15   have just described shows it involving numbers. Would
16   you agree with that?
17 A. Right, so what I set out with regard to numbers there
18   was a very simplistic way of measuring isolated aspects
19   of risk. That is used in PRINCE2. But you can't
20   necessarily scale up looking at simple isolated risks
21   and apply it to something retrospectively such as
22   Horizon.
23 Q. You are raising two completely different issues. The
24   first issue is the retrospective issue.
25 A. Right.

34

1 Q. And the second issue is numbers.
2 A. Right.
3 Q. You accept, don't you, that when designing a system you
4   absolutely do -- you identify the risks which you want
5   the system to guard against and you assign numbers to
6   the adequacy of the risk to which the system is guarding
7   against and you perform calculations with a view to
8   ascertaining whether the system is the kind of system
9   that you want, yes?
10 A. No, not really. When you are talking about
11   countermeasures or controls, they will be functional
12   design aspects and there will typically be a list of all
13   functional design aspects and nonfunctional design
14   aspects.
15   The types of risks that are monitored through the
16   design and implementation of an IT project are often
17   things such as delay, the lack of resources, the failure
18   of hardware, and it is those aspects that you would
19   attribute a numerical value, and then also a numerical
20   value which is likelihood.
21   So yes, they are both in the same area as risk, but
22   one is dealing with very simplistic isolated elements
23   and the other is dealing with the whole operation of
24   a system.
25 Q. You have not said that before, so far as I'm aware. You

35

1   are suggesting that PRINCE2 can only involve simple
2   calculations, it doesn't involve quite elaborate
3   calculations involving a wide array of risk
4   calculations?
5 A. I'm not saying that you can't make PRINCE2 more
6   elaborate. Typically in my experience people will
7   measure risk within PRINCE2 between 0 and 5, so it is
8   not very granular, but there's nothing to say that you
9   couldn't have some more scientific way of doing it.
10 Q. Are you suggesting that doesn't happen in practice,
11   because I would like to suggest to you it does, and
12   there are quite complex projects where there are quite
13   elaborate calculations made. Would you accept that?
14 A. I am sure there may well be.
15 Q. Just to very briefly talk about your retrospective
16   point. If you are brought in to design a new element to
17   a system, around an existing system, and you are being
18   asked to calculate the risk of that system not operating
19   accurately in collaboration with the legacy system
20   that's remaining, when performing that calculation risk
21   you will look at the past, won't you? You will look at
22   how the legacy system operates, how reliable the outputs
23   are out of the legacy system, all sorts of things which
24   are based upon looking back at retrospective events,
25   yes?

36

1 A. Yes, I would certainly look if there has been any
2 historic defects within the system, because in the
3 example that you are giving it is a system that is
4 already live that is being extended. So I would look
5 back at how the good the testing has been in the past,
6 whether bugs have escaped the testing. I would look at
7 how many defects there have been in any given launch or
8 release. I would look at how, when bugs are detected,
9 they are dealt with, what the mitigation of those would
10 be. There would be an assemblance of all of those
11 elements.
12 Q. Thank you. So what you describe as an assemblance would
13 be an examination, a review, of the data relating to
14 past performance --
15 A. Yes.
16 Q. -- with a view to ascertaining a risk that you face in
17 the future, yes?
18 A. It would certainly help set the context. It might well
19 be that simply looking backwards at a project, whilst it
20 might be helpful to set the context, it might well be
21 that the way you are going to approach this new project
22 is different, it might have different vendors that are
23 involved, the supporting mechanism might be completely
24 different, which might be a factor in the scenario. We
25 have Atos that were involved in certain aspects of the

37

1 support, we have Fujitsu that were involved in certain
2 aspects of the support. Post Office had a supporting
3 function and had a reconciliation function but that may
4 well have changed over time. So it is important to
5 understand what processes were in place at various
6 times.
7 Q. Yes. And forming that understanding, can I suggest to
8 you that invariably you will be looking at past
9 performance?
10 A. Yes.
11 Q. Even, for example, if you are bringing in a new system
12 that is designed to be compatible with an old system, as
13 well as looking at the data relating to the past
14 performance of the old system you would also look at the
15 data relating to the past performance of the new system
16 if there is some, wouldn't you?
17 A. Yes.
18 Q. So quite often when performing what you describe as
19 a prospective risk analysis you would often look at
20 historical data and look at historical performance,
21 wouldn't you?
22 A. Yes.
23 Q. I'm very grateful.
24 If we can now move to bundle {D3/1/11}, this is
25 Dr Worden's first report. If I could pick it up at the

38

1 bottom of the page, paragraph 48. Dr Worden has just
2 listed three of the issues that we have just been
3 discussing, and then he says in paragraph 48:
4 "In my opinion the most important of these is
5 issue 3 which encompasses a large and mature area of
6 modern IT practice."
7 Do I apprehend from the evidence you have already
8 given that in your opinion the most important of these
9 issues is not issue 3?
10 A. I don't see any as being more important than others.
11 Q. You would accept, though, that issue 3 encompasses
12 a large and mature area of IT practice, yes?
13 A. Yes.
14 Q. Then he says:
15 "Nearly all business IT systems need to be robust --
16 as the business depends on them -- and there is a large,
17 mature and tested set of techniques for achieving
18 robustness."
19 Do you agree with that?
20 A. Yes. It is a generic statement of the industry rather
21 than this particular project.
22 Q. Then if we could move on to page {D3/1/96} in the same
23 document. Paragraph 374. He sets out there -- I will
24 ask you to read it to yourself -- points that are
25 similar to the points that we have seen in the first

39

1 joint statement and he adds at the end:
2 "Robustness of IT systems is a large and mature
3 topic."
4 And I understand you would agree with that?
5 A. Yes.
6 Q. So what this all shows is that there is a well
7 understood body of practice and learning on how to
8 achieve robustness, yes?
9 A. Say that again, please?
10 Q. There is a well understood body of practice and learning
11 on how to achieve robustness in IT systems?
12 A. Yes.
13 Q. And it is possible to benchmark a system by reference to
14 other comparable systems which are deployed in the
15 industry, yes?
16 A. Yes.
17 Q. You say that I think in your first statement. Perhaps
18 if we could look at that {D2/4.1/154}, page 154,
19 paragraph 5.99.
20 A. Yes.
21 Q. I'm so sorry, Mr Coyne, I'm taking you all over the shop
22 and I'm wasting time. I do apologise. Something seems
23 to have gone wrong in my note. Could you give me one
24 moment?
25 A. Certainly. (Pause)

40

1 Q. Yes, let's go back to {D2/1/78}. It is page 78, as
2   I indicated first of all, and it is paragraph 5.91. You
3   say -- this is in your first report:
4   "... I have estimated the likely level of the
5   robustness of Horizon and benchmarked this against
6   industry standards based upon a review of the evidence
7   available including the known error log (KEL) and PEAK
8   system."
9 A. Yes.
10 Q. Your conclusion, having done that benchmarking exercise,
11   is that Horizon is robust, isn't it?
12 A. I said relatively robust, yes.
13 Q. Well, let's look at exactly what you say. It is bundle
14   {D1/4/2}, paragraph 3.1:
15   "From our experience of other computer systems ..."
16   This is at the top of the second paragraph.
17 A. Yes.
18 Q. "... Horizon is relatively robust."
19 A. Yes.
20 Q. So that's your considered view about the Horizon system,
21   isn't it?
22 A. Yes.
23 Q. On the basis of all the evidence that you had seen?
24 A. Yes. In my first report I stated that. In my second
25   report I explained that in light of the evidence that

41

1   had been disclosed between the two reports, that the
2   Horizon system wasn't as robust as I initially
3   considered.
4 Q. But your overall view after that process is set out in
5   the passage we just looked at?
6 A. It is.
7 Q. Your view is Horizon is relatively robust, and I would
8   like to explore that if I could. We agreed that
9   robustness is a mature topic which is the subject of
10   academic study and has well understood practical
11   principles. Would you agree?
12 A. Yes.
13 Q. You say that from your experience of other systems
14   Horizon is relatively robust. So you are saying that
15   you have considered comparable systems of which you have
16   experience?
17 A. Yes.
18 Q. These are systems with which you are familiar?
19 A. Indeed, yes.
20 Q. And you have compared Horizon's robustness with the
21   robustness of those systems, and compared with those
22   systems Horizon is relatively robust, yes?
23 A. Yes.
24 Q. Let me tell you what I think you are saying here and you
25   will correct me if I'm wrong. It has a good level of

42

1   robustness compared with some systems?
2 A. Yes.
3 Q. In the top quartile, maybe?
4 A. That's not the assessment that I believe I have made.
5 Q. Certainly in the top half, would you agree?
6 A. No, I don't think I want to be drawn on where it is
7   positioned.
8 Q. If I were to tell you that when I go running I'm
9   relatively fast, isn't that what I would be saying, that
10   I'm faster than most people I run with?
11 A. Yes. For context, I have worked on a number of systems
12   in banking, in manufacturing, and Horizon compares well
13   with those systems, with the context that we have added
14   here that it is not free from defects and the impact of
15   those defects is very important to consider but it is
16   relatively robust --
17 Q. So --
18 A. Sorry, if I could just add to that.
19 Q. Yes, of course.
20 A. What must be considered is that we are talking about
21   Horizon as it is today and the processes that are in
22   place today, but there has been quite a long journey to
23   get to the position that it is now --
24 Q. I'm going to ask you about that later, Mr Coyne, but you
25   have made the point and I understand it.

43

1 A. Okay.
2 Q. If I understand you correctly, you are saying that if
3   there is a spectrum of comparable systems in the world
4   today from 0 to 10, Horizon is towards the upper end.
5   You don't want to commit yourself to whether it is in
6   the top 25%, but it is towards the 10 end rather than
7   the 0 end?
8 A. Yes, but what you have got to take care -- and
9   benchmarking against systems that are in similar
10   contexts. There are of course systems that are dealing
11   with flag management, I used to work at
12   British Aerospace looking at their military aircraft
13   programming. There was a whole different spectrum of
14   robustness that was required there. I have also worked
15   in health care where you are talking about life critical
16   systems. Horizon doesn't compare anywhere near those
17   sorts of systems. What I'm talking about is Horizon
18   when benchmarked against systems of similar context, so
19   in retail, in banking and things like that.
20 Q. And these are systems where there are large numbers of
21   users?
22 A. Yes.
23 Q. And a great complexity in the transactions being
24   performed?
25 A. Yes.

44

1　Q. And these are systems which have measures and controls
2　　 to achieve robustness?
3　A. That aim to achieve robustness, yes.
4　Q. Could you just define which sectors you are talking
5　　 about as being comparable for the purposes of your
6　　 judgment?
7　A. So point of sale systems, something where a transaction
8　　 is taking place over the counter, is certainly
9　　 comparable. Banking has elements of it, where automated
10　 payments are being transferred to different
11　 organisations, so that is certainly comparable as well.
12　 Stock control, things like that.
13　Q. And you are talking about large businesses with lots of
14　 users and lots of complexity, yes?
15　A. Yes, at a similar scale to what is seen in Horizon.
16　Q. We have been talking about measures and controls or
17　 countermeasures. Dr Worden identified 18 of them in his
18　　 first report, didn't he?
19　A. Mm.
20　Q. You will see that he says he has defined three letter
21　 acronyms for each of them?
22　A. Yes.
23　Q. And he says specifically, doesn't he, that most of these
24　 acronyms are not commonly used in the industry?
25　A. I think he did say that, yes.

45

1　Q. But in your second report you suggest that he might be
2　　 giving the false impression that they are commonly used
3　　 in the industry, do you remember saying that?
4　A. Certainly in my report I point out that they aren't used
5　　 in the industry.
6　Q. Let's see what you actually say. It is at bundle
7　　 {D2/4.1/141}, paragraph 5.67:
8　　　 "Whilst Dr Worden acknowledges these acronyms are
9　 mostly not used in industry, he has used them throughout
10　 his report which gives the impression they have a
11　 standard meaning and scope."
12　　　 Do you think that is a fair thing to say? He
13　 specifically says in his report that they don't.
14　A. Well, I actually think that if you do attribute acronyms
15　 to things there is a danger that the perception is that
16　 they are read as being industry standard terms.
17　Q. Even in circumstances where he specifically says that's
18　 not the case on at least two occasions in his report?
19　 I mean why did you feel it necessary to say that,
20　 Mr Coyne, in circumstances where Dr Worden had already
21　 made it clear?
22　A. I'm not sure.
23　Q. Anyway, you go through his 18 countermeasures over the
24　 page {D2/4.1/142}, there is a table that goes on, and it
25　 is fair to say you disagree whether one of them is

46

1　　 a standard countermeasure, you disagree that manual
2　　 workarounds count as a standard countermeasure?
3　A. Yes, I don't believe that a manual workaround can be
4　　 a --
5　Q. But for others you accept they are typical standard
6　　 features in IT systems design?
7　A. Yes, certainly when you are designing a system, some of
8　　 the aspirational features that you want to build in
9　　 there would be contained within these controls.
10　Q. Mr Coyne, you have used the word "aspirational" several
11　 times now and I'm just wondering whether you're trying
12　 to drum home a theme. If you want to make a point about
13　 aspiration I don't want to stop you making it, but you
14　 do throw this word in quite a lot to your answers and
15　 I'm wondering what point you're trying to make by the
16　 word "aspiration"?
17　A. I'm just pointing out that when you start a project and
18　 you build something, you go through a workshop typically
19　 of setting out what your design aspirations are. That
20　 is just a term I use when I'm conducting workshops with
21　 people going through things.
22　Q. I see. Your judgment on the robustness of the Horizon
23　 system takes all these countermeasures that Dr Worden
24　 refers to -- with the possible exception of
25　 workarounds -- into account, doesn't it?

47

1　A. Yes.
2　Q. It is necessary to do so to form a judgment on
3　　 robustness, isn't it?
4　A. I'm not sure that you need to consider -- I'm not sure
5　　 that you need to decide that this is the subset of
6　　 factors that you are going to consider before you come
7　　 up with a calculation of robustness.
8　Q. Mr Coyne, didn't one of the Horizon Issues specifically
9　　 ask you to consider whether controls and measures in
10　 Horizon reduced certain problems to an extremely low
11　 level of risk?
12　A. It certainly -- yes, it did.
13　Q. And I think we have established, it has taken an hour to
14　 do this, I think we have already established that when
15　 making an overall judgment of robustness you both
16　 consider how the system operates and then consider how
17　 the countermeasures designed into the system also
18　 operate?
19　A. Yes.
20　Q. With a view to coming to an overall decision as to the
21　 robustness of the system?
22　A. Yes.
23　Q. Thank you. So in forming a judgment about robustness it
24　 is necessary to form a judgment also, isn't it, about
25　 how the countermeasures, what Dr Worden calls the

48

1   robustness countermeasures, how those countermeasures
2   were designed and operated in practice, yes?
3 A. Yes.
4 Q. A key element of robustness is considering how a system
5   limits the extent of the impact in this context, in the
6   context of the Horizon system, and the issues we are
7   considering, namely, does Horizon cause shortfalls in
8   branch accounts. A key element of the robustness
9   question is considering how the Horizon system limits
10   the extent of any impact on branch accounts, yes?
11 A. Yes. Certainly you need to establish what the impact is
12   and, secondly, you should take steps that if it is ever
13   going to happen again you reduce that impact.
14 Q. So in forming a judgment on robustness you have first of
15   all to see -- let's take a bug. A bug happens and the
16   first question you ask is: did that bug or could that
17   bug have had an impact on branch accounts?
18 A. Yes.
19 Q. Then you form a judgment on whether and to what extent
20   the countermeasures in place in the Horizon system would
21   have enabled that impact to be identified and fixed,
22   yes?
23 A. No, I think you would look at whether it did -- whether
24   any countermeasure or control did prevent it from having
25   a consequential impact, not whether it should have.

49

1 Q. Well, whether it would have?
2 A. Or whether it would have.
3 Q. You don't consider whether it would have, you consider
4   whether it did?
5 A. Well, if it did there would be evidence that it did. It
6   would be documented.
7 Q. But in some cases it will be blindingly obvious, won't
8   it, Mr Coyne? Let me give you an example, remming.
9   A Post Office example. Remming in and remming out.
10   Money is sent from Chesterfield to a branch.
11   Chesterfield has a record of the money it sends over.
12   The branch receives the money and types in -- or usually
13   it is a barcode actually, but it records on the Horizon
14   system how much money the branch has received.
15   You are aware, aren't you, that there is
16   an automatic system that checks Chesterfield's figures
17   against the branch's figures?
18 A. Yes.
19 Q. Are you suggesting that every time over the last
20   20 years there has been a discrepancy between
21   Chesterfield's figures and the branch's figures, are you
22   suggesting that it is necessary for you to see the
23   evidence of what happened next, of whether a transaction
24   correction was sent and what the evidence was in
25   relation to that branch? Are you really suggesting

50

1   that's necessary?
2 A. No, because in a typical scenario where the systems
3   operate as they should, as they are designed, then the
4   positioning of the countermeasures that you have put in
5   place would pick up on that so that would work
6   absolutely fine. In the scenario where the system
7   doesn't operate as expected there is a bug, error or
8   defect or communication fault, then a different set of
9   scenarios will likely be encountered and it is
10   understanding then what happens that is important.
11 Q. Let me get this straight. You are suggesting that there
12   are cases when you can take it as read, the situation is
13   such that you can take it as read that a problem will be
14   identified and it will be fixed. But you are suggesting
15   there are other situations where you can't take it as
16   read where specific evidence is needed, is that right?
17 A. Yes.
18 Q. Okay. But nonetheless, although you say that is
19   necessary, it is your considered opinion that the
20   Horizon system that you now see is robust, yes?
21 A. Relatively robust, yes.
22 Q. Thank you.
23   If I could look at the third joint statement again
24   which is at -- let's go to your first report, actually,
25   which is {D2/1/26}. At paragraph 3.7 you say:

51

1   " ... whilst the present-day version of Horizon,
2   supported by manual human support may now be considered
3   as relatively robust in the spectrum of computer systems
4   used in businesses today it has undergone major
5   modifications ..."
6   And in forming that judgment, if I can go down to
7   paragraph 3.9, you say:
8   "Fundamental in determining the robustness of
9   Horizon is gaining an understanding of the Post Office
10   (and Fujitsu) manual business processes applied when
11   determining and handling the effects of bugs ..."
12   So may I take it that the judgment that you record
13   in paragraph 3.7 is based upon an understanding that you
14   have gained of the processes you describe in
15   paragraph 3.9?
16 A. Well, one of the challenges is that we do have
17   an understanding of business processes for many parts of
18   the Horizon support system, we don't have it for all,
19   and one of the key elements is when it comes to
20   reconciliation, so the recovery of a situation that
21   occurs when a bug, error or defect has had an impact on
22   branch accounts, there is a need for reconciliation and
23   we don't have that part. So the closed loop, we are
24   unable to close that loop.
25 Q. I'm finding it difficult to understand what you are

52

1   saying. Are you saying that you are in a position to

2   make a judgment that Horizon is robust or are you saying

3   that you aren't?

4 A. I'm saying that based on the information that's

5   available it is relatively robust.

6 Q. Thank you.

7 A. What I'm also saying is subject to other documentation

8   or other parts of the process that has not been

9   disclosed at this stage, the situation may improve or it

10   may well be a worse situation.

11 Q. Mr Coyne, if I can suggest to you that makes no sense

12   whatsoever. You have made a judgment. You have already

13   confirmed I think more than once --

14 A. Yes.

15 Q. -- that it is your considered opinion that the Horizon

16   system as it exists at the moment, with all its

17   countermeasures, is robust?

18 A. Yes.

19 Q. In those circumstances you can't be suggesting, can you,

20   that there's evidence out that there that you haven't

21   seen that may mean that that judgment is completely

22   wrong?

23 A. I don't see why that can't be the position. There may

24   well be documentation and there is documentation that

25   must exist with regard to reconciliation within

53

1   subpostmasters' accounts after a bug, error or defect

2   has occurred and outstanding the outcome of that will

3   have an impact on the statement of robustness.

4 Q. Mr Coyne, when you talk about reconciliation you are

5   talking about the reconciliation that occurs between

6   transactions as transferred from the Horizon system into

7   Post Office systems and those transactions then being

8   compared with the transactions that are recorded by

9   banks, financial institutions and other Post Office

10   clients, is that what you are talking about?

11 A. No, sorry, specifically what I'm talking about here is

12   when a bug, error or defect occurs, as we have seen

13   here, there is the identification of a discrepancy on

14   a postmaster's account, and that's in the evidence.

15   What we then don't see is how, if at all, that was dealt

16   with.

17 Q. Just to be absolutely clear, you are not suggesting that

18   you think that when a bug was identified and

19   discrepancies were spotted in accounts, you are not

20   saying you think the accountancy discrepancies were not

21   dealt with, you are not saying that, are you?

22 A. No, I'm not saying that. What I'm saying is they were

23   identified typically by Fujitsu, and I don't know what

24   the process was, and Fujitsu will say that they don't

25   know because it appears in all the documents, they don't

54

1   know what Post Office does to correct that. That is a

2   missing part of the evidence. So I'm not saying I think

3   Post Office do nothing about it, I'm simply saying

4   I don't know what that process was.

5 Q. Right. You are not suggesting that you think, on the

6   basis of documents you have seen, that it is likely that

7   Post Office do nothing about it? You are not saying

8   that, are you?

9 A. No, I'm saying the opposite. It is likely that they do

10   something about it. I'm saying there is no evidence

11   available to --

12 Q. I'm grateful. Then that explains what I was trying to

13   explore with you. That explains why you feel able to

14   judge, as you do in paragraph 3.7, that Horizon is

15   relatively robust. On the basis of the evidence you

16   have seen --

17 A. Yes.

18 Q. -- including the evidence you have seen of the Fujitsu

19   processes and other documents including Post Office

20   processes, you are happy, and it is your considered

21   view, that Horizon is relatively robust?

22 A. Yes.

23 Q. Thank you. Now let's get back to what it means --

24 MR JUSTICE FRASER: Mr de Garr Robinson, we are going to

25   have a break at some point. Is now a good time?

55

1 MR DE GARR ROBINSON: It is a perfect time.

2 MR JUSTICE FRASER: We will come back in at 11.55 am.

3   Mr Coyne, you are in the middle of giving your

4   evidence. I am sure you have heard me say this before.

5   You are not to speak to anyone about the case and this

6   applies throughout the week because you are going to be

7   there all week. I know you know it, I might bore you

8   senseless by repeating it every time we stop. You don't

9   have to stay in the witness box but don't talk to

10   anybody else about the case.

11   We will come back in at 11.55 am.

12 (11.51 am)

13   (A short break)

14 (12.00 am)

15 MR DE GARR ROBINSON: Mr Coyne, getting back to what it

16   means for Horizon to be relatively robust. You have

17   described the systems which you say are comparable to

18   which you have compared Horizon. The systems that you

19   are talking about, they are usually in the private

20   sector, I apprehend?

21 A. No. No, across --

22 Q. Okay, across both. But the kind of businesses you are

23   talking about, banking, retail, those are private

24   sector?

25 A. Yes.

56

1   Q. Those sorts of systems have quite exacting requirements

2   of robustness, don't they?

3   A. Yes.

4   Q. No system can be perfect, everyone agrees that, but the

5   large and complex businesses that use these sorts of

6   systems, they don't have much tolerance for widespread

7   errors in data entry, processing or storage, do they?

8   A. No, that is right. They certainly strive to remove that

9   wherever possible.

10   Q. Given the number of transactions and the importance of

11   handling and accounting those transactions properly,

12   those businesses require the overwhelming majority of

13   their transactions to be handled and accounted for

14   properly, don't they?

15   A. They do indeed, yes.

16   Q. They can only afford for a tiny proportion to suffer

17   from lasting errors, yes?

18   A. Yes.

19   Q. Air traffic control and medical machines, frankly they

20   can't afford any errors at all.

21   A. Indeed.

22   Q. But the kind of systems we are talking about, their

23   tolerance for errors is very low, yes?

24   A. Certainly it will be fractions of a percent of the total

25   transaction, whatever the transaction might be, yes.

1   Q. Any significant level of non-transient errors would be

2   quite a serious threat to their businesses, wouldn't it?

3   A. Yes.

4   Q. It would be a threat to their customer base, a threat to

5   their manageability, a threat to their manpower

6   requirements, having to run around dealing with

7   problems, a threat to their operating costs, a threat to

8   their profitability, and given that businesses operate

9   in a competitive world where other businesses are happy

10   to displace them, it could be a threat to their very

11   survival, would you agree?

12   A. It could be. They are quite generic statements but

13   I don't disagree with any of them.

14   Q. Those are the businesses to which you have compared

15   Horizon, yes?

16   A. Yes.

17   Q. So when you say the Horizon system is relatively robust,

18   you are saying that in the overwhelming majority of

19   cases where conditions are both normal and adverse it

20   works reliably, yes?

21   A. Yes, the vast majority of all the transactions that flow

22   through the Horizon system will work successfully.

23   Q. And although there are occasions when it doesn't, those

24   represent only a tiny proportion of the work that it

25   does, correct?

1   A. Yes, it will be a small fraction of the work that it

2   does, yes.

3   Q. Even within that tiny proportion, a large majority of

4   the problems thrown up are picked up and corrected by

5   the various systems in place that are designed to do

6   precisely that?

7   A. Certainly many of the ones that go wrong for one reason

8   or another appear to be picked up. There are examples

9   where they don't appear to have been picked up and

10   examples which appear to have an impact.

11   Q. That is a very important opinion, isn't it, in the

12   context of this case?

13   A. Yes.

14   Q. For the purposes of this trial?

15   A. Yes.

16   Q. That being the case, Mr Coyne, I wonder why you haven't

17   actually spelt out that in your reports or your joint

18   statement?

19   A. I believe that I have. Have I not?

20   Q. It may be unfair, Mr Coyne, but my sense is that in both

21   your reports you tried to give a rather different

22   impression, an impression of a system which is beset by

23   problems, the sheer volume of which means it cannot

24   sensibly be regarded as reliable. Would that not be

25   fair?

1   A. I don't believe that that's fair, no.

2   Q. Let's have a look at your first report. If we could go

3   to bundle {D2/1/25}. This is the report -- your first

4   report that you produced in mid-October. And if we look

5   at paragraph 3.1 --

6   MR JUSTICE FRASER: I do not think we are on the right page

7   on the common screen.

8   MR DE GARR ROBINSON: {D2/1/25}.

9   A. Yes.

10   Q. You recite the agreement in paragraph 3.1 contained in

11   joint statement 1?

12   A. Mm.

13   Q. You say in paragraph 3.2:

14   "Each discovered bug ... could have remained

15   unresolved in Horizon for varying periods of time."

16   And you add that there is a possibility of other

17   bugs.

18   A. Mm.

19   Q. Then you say this in 3.3:

20   "The sheer volume of known error logs and

21   reconciliation reports confirm the wide-ranging extent

22   of the impact of such bugs ... This evidence

23   demonstrates that such bugs ... would undermine the

24   reliability of the Horizon system to accurately process

25   and record transactions."

1   That seems quite an ominous statement to make given
2   the propositions that you have just agreed with me
3   a minute and a half ago, Mr Coyne. Do you not see
4   a tension?
5 A. Yes, I think I do actually. At that point in time we
6   had a document set that consisted primarily of known
7   error logs. I think the PEAKs had only just been
8   disclosed a few days --
9 Q. Weeks?
10 A. Sorry?
11 Q. Would it not be weeks?
12 A. I don't know exactly how many.
13 Q. I'm sorry, I interrupted you. Please carry on.
14 A. Perhaps if we establish what the date was. I think we
15   do mention it in the reports.
16 Q. Yes. Please carry on. I interrupted you and
17   I shouldn't have.
18 A. So what we are saying there is the full picture was yet
19   to be revealed and that it may well undermine the
20   reliability of Horizon.
21 Q. So are you suggesting, Mr Coyne, that when you produced
22   your first statement you were doubtful about whether it
23   was robust?
24 A. Mm.
25 Q. And it is when you produced your second statement, when

61

1   you had more opportunity to look at the PEAKs and so on,
2   that you formed the impression that it was robust after
3   all?
4 A. I had a different concern when it came to create my
5   supplemental report because there was the discovery of
6   far more defects than it was originally said existed.
7   When putting together my first report I thought the
8   analysis had already been done to establish that there
9   were only three defects. I discovered a fourth defect
10   but then shortly afterwards discovered many more. It
11   was also the case that I had seen a number of reports
12   about improvement of the processes that was in place.
13   But then it transpires that when we saw some of the
14   witness statements that those processes, those
15   improvements in processes, hadn't been adopted.
16   So there was a number of other factors that were
17   brought in place that confirmed that there was large
18   elements of unreliability. That doesn't take away my
19   overriding statement that the Horizon system is
20   relatively robust.
21 Q. Mr Coyne, one of us is confused and it might be me.
22   I had taken you to paragraph 3.3 and suggested to you
23   that the impression, the strong impression given by
24   paragraph 3.3 was that Horizon wasn't very robust at
25   all. My understanding of your answer, and it may have

62

1   been a false understanding on my part, was you said,
2   well, at that stage we only had the PEAKs for a few
3   days, and the impression I got was you were saying it
4   was only later I realised that Horizon was relatively
5   robust. So I suggested -- I asked you about that. And
6   then what you actually said was, no, no, in my later
7   report I thought Horizon was less robust.
8   So at the time of this report your view as to the
9   robustness of Horizon was at its zenith, was it?
10 A. Could you clarify what you mean when you say zenith.
11 Q. It was at its peak. This was at a time when you thought
12   Horizon was very robust and it is only later that you
13   then downgraded it to relatively robust?
14 A. There's different aspects of it. This is the
15   complication with robustness, it isn't an entity that
16   can be measured by one simple set of criteria.
17 Q. All I'm trying to ascertain with you, Mr Coyne, is why
18   on the one hand you were saying at the time of this
19   report you thought that Horizon was relatively robust,
20   you felt able to include -- to say what you said in
21   paragraph 3.3, which gives a completely different
22   impression. I would like you to explain how you felt it
23   appropriate to do that.
24 A. What I said there is correct, that the bugs, errors and
25   defects that we see, when they trigger they would

63

1   undermine the reliability of Horizon and did undermine
2   Horizon's reliability.
3 Q. What you say is -- look at the first sentence:
4   "The sheer volume of known error logs and
5   reconciliation reports confirm the wide-ranging extent
6   of the impact of such bugs ..."
7 A. Yes.
8 Q. So first of all you say that there is a huge volume of
9   KELs showing bugs with branch impacts, do you?
10 A. Typically the KELs show that PEAKs exist that have had
11   branch impacts, but the KEL is the knowledge document.
12 Q. You appear to be saying there, Mr Coyne, and it may be
13   that I'm not being clear enough. Let me be absolutely
14   clear. You appear to be saying there that there is
15   a large volume of KELs which demonstrate bugs in the
16   Horizon system which had branch impacts. Is it the case
17   that at the time you wrote this report you had seen
18   a large number of KELs showing bugs with branch impacts?
19 A. Right, it is important to understand -- in order to
20   answer that, it's important to understand the
21   relationship between KELs and PEAKs. A KEL is
22   a document which is often updated with new knowledge
23   that will enable Fujitsu's support department to better
24   support the users as and when they find a particular
25   defect on the system. Contributing to that KEL is

64

1　　a number of PEAKs. There might only be one occurrence
2　　of a PEAK that leads to a KEL, there might be twenty or
3　　thirty different PEAKs that contribute to a KEL. So the
4　　fact that we had the KELs at that point in time and
5　　those KELs indicated problems, and there were a number
6　　of PEAKs that hadn't yet been fully examined and I set
7　　out that in my report, but of the PEAKs that had been
8　　examined there were PEAKs that suggested impact on
9　　branch accounts.
10　Q. Let me ask my question again but I will do it in
11　　a different way. Let's cross out the word "and
12　　reconciliation reports" in the first sentence so it now
13　　reads:
14　　　"The sheer volume of [KELs] … confirm the
15　　wide-ranging extent of the impact of such bugs …"
16　　　So you are referring to a large volume. It's not
17　　just a number, a significant number, you're saying
18　　a large volume. It's a substantial body of KELs --
19　A. Yes.
20　Q. -- confirming the wide-ranging extent of the impact of
21　　bugs.
22　A. Yes.
23　Q. Is that the case, that you had seen a large volume of
24　　KELs indicating the wide-ranging extent of the impact of
25　　bugs?

65

1　A. Yes.
2　Q. How many?
3　A. A number are listed in this report but I don't know
4　　precisely what the number is.
5　Q. And when you say impacts, you are talking about branch
6　　impacts, aren't you?
7　A. Yes.
8　Q. So you are saying there was a large number of KELs which
9　　you had already seen at the time of this report that
10　　confirmed that there were bugs, wide-ranging bugs -- or
11　　confirmed bugs which had a wide-ranging impact on branch
12　　accounts?
13　A. Yes. Certainly within the KELs there was reference to
14　　discrepancies which appeared to be on branch accounts.
15　Q. Mr Coyne, I would like to suggest to you that in the
16　　whole of this report that goes on for over 200 pages,
17　　you refer to very few KELs that actually confirm the
18　　existence of branch impacts?
19　A. There is a table I believe at the back of this report
20　　that sets out the number of KELs.
21　Q. What page would that be? I may not have it in hard
22　　copy.
23　A. Appendix G.
24　Q. What page?
25　A. 200, I believe.

66

1　MR JUSTICE FRASER: {D2/1/213} is appendix G. Could you
2　　give me one second, please. (Pause)
3　　　Go ahead, they are just going to sort out my
4　　screens. The common screen is fine, it's my custom
5　　screens.
6　MR DE GARR ROBINSON: Mr Coyne, I have looked at the bug
7　　table in the second joint statement of the experts.
8　A. Yes.
9　Q. The bug table in joint statement 2 is a table which sets
10　　out the bugs that you have identified which you believe
11　　show evidence of branch impacts, yes?
12　A. Yes.
13　Q. That table, if my calculations are correct, only refers
14　　to four bugs that you had identified in your report in
15　　addition to the three bugs that had been accepted by --
16　　already disclosed by Post Office.
17　　　Now, what I would like to understand is do you
18　　accept in principle that that's the position?
19　A. I don't I don't know if that's the number. That is a
20　　number you have calculated, haven't you?
21　Q. Yes.
22　A. I haven't done the calculation.
23　Q. There are 29 bugs in the bug table.
24　A. Yes.
25　Q. Many of those bugs were only identified either by

67

1　　Dr Worden in his report or by you in your second report,
2　　yes?
3　A. I believe Dr Worden only identified the three bugs that
4　　had already been identified.
5　Q. That's not -- perhaps we will come to that in due
6　　course, Mr Coyne. In fact, Dr Worden -- I think the
7　　number may be nine, something like nine bugs he had
8　　identified in his first report that are now to be found
9　　in the joint statement. Did you not appreciate that was
10　　the case?
11　A. I don't know whether that's correct or not.
12　MR JUSTICE FRASER: But the KELs you were being asked about
13　　volume, they are the ones listed in appendix G?
14　A. Yes.
15　MR DE GARR ROBINSON: What I'm suggesting to you, Mr Coyne,
16　　is very few of these KELs have turned up -- or the bugs
17　　to which you say these KELs relate, very few of them
18　　have turned up in the joint statement bug table.
19　A. Right, okay. I'm not sure that is correct.
20　Q. I'm suggesting to you, Mr Coyne, that you had not seen
21　　a large volume of KELs showing branch impact -- showing
22　　bugs with branch impacts at the time you wrote this
23　　report?
24　A. Well, I believe a number of these KELs that are
25　　contained within this appendix have impact.

68

1   Q. Are you suggesting that all of these KELs relate to bugs
2   which had branch impact?
3   A. Many do, but what you have to remember about the KEL is
4   the KEL doesn't specifically relate to the branch.
5   That's typically the PEAK.
6   Q. Let's not talk about -- I'm just trying to analyse what
7   you said in paragraph 3.3 of your report. You said the
8   sheer volume of KELs confirm the widespread branch
9   impact. And I'm suggesting to you, Mr Coyne, that you
10   had not seen a huge volume of KELs which confirmed
11   branch impact at the time. You just hadn't.
12   A. That paragraph would be better if it said: the large
13   number of KELs that I have reviewed and a portion of the
14   PEAKs that have recently been disclosed and I have
15   reviewed dot dot dot, and carry on with that paragraph.
16   That would be nearer --
17   Q. If we look at page 214, for example, it starts with "Pin
18   pad", pin pad errors. So you have six pin pad errors.
19   {D2/1/214}
20   A. Yes.
21   Q. You are not suggesting those pin pad errors had branch
22   impact, are you? Those pin pad errors meant the branch
23   couldn't do business with a particular customer. They
24   didn't actually create an error in branch accounts, did
25   they?

69

1   A. It is possible they might. We would have to go through
2   and look at the detail.
3   Q. So you are suggesting that there are errors in pin pads
4   which are covered by KELs which have created branch
5   impacts, are you?
6   A. Yes.
7   Q. Because what's curious is I don't believe there are any
8   of those in the bug table in JS2.
9   A. Yes, I believe there was the scenario where it was
10   remembering the account of the last person that should
11   have been paid. So was it the allpay defect? The
12   payment that should have gone to other beneficiaries was
13   all sent to allpay instead because of a defect?
14   Q. I will have to look at that later.
15   Going back to page 25, paragraph 3.3, you explained
16   that you think you had seen already, by the time of your
17   first report, a large volume of KELs showing widespread
18   branch impact {D2/1/25}, and you say that it is not the
19   KELs so much as the PEAKs that refer to them, is that
20   how you put it?
21   A. KELs indicate that there was a defect and it is
22   typically the PEAKs that record the particular branch
23   impact. So by looking at either you can tell there was
24   a problem, but it is only when you look at both the KEL
25   and the related PEAKs that you understand the scope of

70

1   the problem.
2   Q. Wouldn't it be fair to say though that when you look at
3   a KEL, generally speaking the KEL which deals with it --
4   and KELs deal with all sorts of things, including things
5   that are not bugs at all. But when you look at a KEL,
6   generally the KEL will explain what the impact of the
7   problem is, the nature, the practical consequence of the
8   problem that has to be dealt with, would you accept
9   that?
10   A. Yes. It might, for example, say there is a bug and we
11   believe this is going to cause a discrepancy and we have
12   spotted it in eight branches, but it won't tell you what
13   the impact on those eight branches is. For that you
14   have to go to the particular PEAK.
15   Q. Generally speaking then, if there is a KEL that
16   addresses a bug that has a branch impact, generally it
17   will tell you?
18   A. Generally speaking.
19   Q. On the vast majority of occasions, yes?
20   A. I'd prefer to stick with generally speaking. I don't
21   know if it is the vast majority.
22   Q. Okay. You then say in paragraph 3.3 -- let's cross out
23   "known error logs", you now say:
24   "The sheer volume of ... reconciliation reports
25   confirm the wide-ranging extent of the impact of such

71

1   bugs ..."
2   So you are suggesting here that reconciliation
3   reports are good evidence of bugs in Horizon which had
4   branch impacts, are you?
5   A. Yes, there was a response to a question that I asked
6   about reconciliation, I don't know exactly how it was
7   phrased, but I asked for the number of reconciliation
8   problems that required manual intervention, and the
9   answer I was given was that it was hundreds of thousands
10   per week, I think was the --
11   Q. 10,000 a week that have to be F99ed, do you remember
12   that?
13   A. Yes.
14   Q. What is a reconciliation report?
15   A. Where there has been a problem within the system for one
16   reason or another and the transaction has not proceeded
17   to completion as it would originally have expected.
18   Q. Let me put to you what a reconciliation report is just
19   to save some time. When a transaction is done in
20   Horizon and the basket is committed to the system, the
21   transaction goes into the branch accounts, yes? That
22   transaction goes into the branch database.
23   A. Mm.
24   Q. And then copies of those transactions are then
25   transmitted through systems such as the TPS system,

72

1   could you explain what the TPS system is?
2   A.   Transaction processing system.
3   Q.   What is the TPS system? What does it do?
4   A.   It sends -- well, it decides what payments need to go to
5   what particular beneficiaries.
6   Q.   Is that right? Doesn't it transmit information relating
7   to these transactions that had been committed to the
8   BRDB to Post Office's back-end systems?
9   A.   That is right.
10   Q.   And isn't it Post Office's back-end systems, like
11   POLSAP, like Credence and so on, isn't it those systems
12   that then do the steps that are needed to ensure that
13   payments are made by financial institutions and so on,
14   is that right?
15   A.   Yes, there is a harvesting process which will pick up
16   various transactions and will put them in certain
17   buckets, and then there are various processes that goes
18   on with those.
19   Q.   And the harvesting process is a process by which --
20   well, what happens is transactions go into the TPS
21   system and they are then propagated into POLSAP and
22   other management information systems that are maintained
23   by Post Office, yes?
24   A.   Records of those will do, but then a number of the
25   transactions will then go on to -- for example, if it is

73

1   a bill that's being paid it will go on to agree that
2   payment with whoever the party is.
3   Q.   What happens then is -- generally the financial
4   institutions making payments have received messages
5   direct from things like the pin pad?
6   A.   Yes.
7   Q.   And what then happens is the financial institution has
8   its own record of the transactions it thinks are being
9   done?
10   A.   That is right.
11   Q.   And Post Office has its record of the transactions it
12   thinks are being done?
13   A.   Yes.
14   Q.   Those records are maintained on Post Office's systems?
15   A.   Agreed.
16   Q.   And then there is a reconciliation process by which
17   those systems are automatically reconciled to see
18   whether they agree with each other?
19   A.   They should be automatically reconciled, yes.
20   Q.   That is what you describe as reconciliation, and that
21   process generates reconciliation reports, doesn't it?
22   A.   Yes.
23   Q.   And when there are exceptions, then in those
24   circumstances there are reports indicating transactions
25   where some of the information which Post Office has

74

1   about them, it differs from some of the information that
2   the financial institution has about them?
3   A.   Yes, something has gone wrong with the process.
4   Q.   Yes. And it might be that some attributes are missing
5   that have nothing to do with the basic transaction
6   details?
7   A.   It could be any aspect of it --
8   Q.   It could be time stamps, it could be anything.
9   A.   It could be value, it could be anything.
10   Q.   It could even be that there has been a delay in the
11   financial institution or POLSAP receiving the necessary
12   information, couldn't it?
13   A.   It could. I think it is safe to say that something has
14   gone wrong, the process hasn't operated as it was
15   designed, and an intervention needs to take place to
16   correct the transaction.
17   Q.   What happens is a reconciliation process is
18   automatically undertaken, exception reconciliation
19   reports are generated which demonstrate where there are
20   exceptions that need to be looked at?
21   A.   I'm not sure a reconciliation process is automatically
22   undertaken.
23   Q.   Mr Coyne, when you have 3 million transactions that are
24   on the Bank of Ireland's books and 3 million
25   transactions that are on Post Office's books, you don't

75

1   have a human being comparing those two sets of
2   transactions, do you?
3   A.   No, but that's when it is working as expected. When
4   something has gone wrong this is the reconciliation
5   process that I'm talking about there.
6   Q.   We are getting bogged down in a way that I'm finding
7   quite surprising. The process by which lists of
8   transactions are reconciled is automatic, isn't it? It
9   is electronic?
10   A.   Yes, when everything is working fine it is automated.
11   Nobody needs to get involved.
12   Q.   The process of reconciliation is the process of
13   comparison between the two sets of data?
14   A.   Yes.
15   Q.   That process is electronic, isn't it?
16   A.   Yes.
17   Q.   And then what happens is there is a report generated on
18   a regular basis which identifies reconciliation
19   exceptions where for some reason, for the reasons we
20   have already discussed, there isn't a full
21   reconciliation and something has to be looked at?
22   A.   Yes.
23   Q.   We have discussed some of the reasons for that?
24   A.   Yes.
25   Q.   And that's where a manual element can become involved?

76

1   A. Yes.
2   Q. Sometimes there can be one error which explains 1,000 or
3   2,000 reconciliations exceptions?
4   A. Possibly, yes.
5   Q. And there will be a delay in the transaction getting
6   through to the bank, or it will be when it did go
7   through to the bank there was a time stamp missing so
8   the two didn't match. There could be something like
9   that that could explain an awful lot of them?
10   A. There could be a range of different things that are
11   wrong with the transaction.
12   Q. And that's when someone has to go and look to see if
13   there is a problem?
14   A. Yes, and that is the number that I'm referring to
15   because it was suggested that that was in the many
16   thousands.
17   Q. But I don't understand, Mr Coyne, why you think that the
18   existence of reconciliation reports confirms the
19   wide-ranging extent of the impact of bugs in Horizon
20   which are having an impact on branch accounts?
21   A. I have worked and designed banking systems, stock
22   broking systems. I have never seen the need for tens of
23   thousands of transactions per week to have a human
24   intervention. That suggests that something is going
25   wrong. It is working outside of process on a larger

                            77

1   scale than I would have expected.
2   MR JUSTICE FRASER: Can I just ask you, at {Day14/77:17} of
3   today's transcript you said "it was suggested" that it
4   was in the many thousands. Can you just tell me, "it
5   was suggested" doesn't really help me because I don't
6   know who suggested what to whom.
7   A. Sorry, my Lord. I asked the question as part of
8   a request for information.
9   MR JUSTICE FRASER: Yes.
10   A. And the response that I was given by Post Office's
11   lawyers was -- I believe it was ten thousand.
12   MR JUSTICE FRASER: So that is what you are referring to?
13   A. Yes.
14   MR JUSTICE FRASER: All right.
15   MR DE GARR ROBINSON: Now Mr Coyne, there are many, many,
16   many possible explanations for reconciliation exceptions
17   that have nothing to do with bugs in Horizon causing
18   shortfalls in branch accounts, aren't there?
19   A. There could be, yes.
20   Q. There's no reason to think -- the fact that there are
21   any scale of reconciliation exceptions does not
22   demonstrate, does not show or confirm, that there are
23   any bugs which have an impact on branch accounts, does
24   it?
25   A. It certainly could do if the system is having that level

                            78

1   of failure to reconcile then there is something wrong.
2   It is operating outside of the process it should
3   operate --
4   Q. Well, I will -- how is it that you are able to judge
5   that, Mr Coyne? Do you know what range the system was
6   designed for?
7   A. No, but I have experience of similar systems and I don't
8   believe that such a high level of manual reconciliation
9   would be tolerated or should be expected.
10   Q. But the possible causes of those reconciliation
11   exceptions could involve all sorts of things such as
12   phone lines from the Post Office to the financial
13   institutions, or the financial institutions' own
14   operating systems, couldn't they?
15   A. So that means that that is going wrong each week.
16   Q. The reason why I'm asking you about this is you are
17   suggesting that the fact that there are reconciliation
18   reports, large numbers of reconciliation exception
19   reports, let's call them, is itself confirming that
20   there are bugs in Horizon which have an impact on branch
21   accounts, and my suggestion to you, Mr Coyne, is that
22   doesn't confirm anything of the sort?
23   A. Well, it suggests rather than confirms.
24   Q. And where there is a reconciliation exception which is
25   looked into, what happens -- and a view is taken --

                            79

1   a view will then be taken by Post Office and the
2   financial institution as to what the correct position
3   would be?
4   A. Mm.
5   Q. If the view is taken that the correct position is that
6   the branch account should be corrected, what happens
7   then?
8   A. What should happen is a transaction correction should be
9   created by --
10   Q. And would you accept that when a transaction correction
11   is sent it is more likely than not that the transaction
12   correction will correct an error that's happened rather
13   than create one, yes?
14   A. It is more likely. There certainly have been scenarios
15   where transaction corrections have caused a problem but
16   it is certainly more likely that it would correct it,
17   yes.
18   Q. What I suggested to you about paragraph 3.3, Mr Coyne,
19   is this paragraph seems designed to give an impression
20   that Horizon isn't robust, whereas on the very next page
21   you say that it is. What do you say to that suggestion?
22   A. Well, I'm setting the context before providing my
23   summary that it was relatively robust.
24   Q. What I'm finding difficult to understand, Mr Coyne, is
25   you say -- you refer to a wide-ranging extent of the

                            80

1   impact on branches of bugs, and then over the page you
2   say but Horizon is relatively robust, and I would just
3   like you to explain how is it you felt able to do that?
4 A. Because as I have agreed with Dr Worden, robust doesn't
5   mean that there won't be an impact. The two aren't
6   mutually exclusive.
7 Q. You have also agreed with me, Mr Coyne, that in the
8   context in which you are using the term relatively
9   robust in paragraph 3.7, it means that there's only
10   a tiny number, a tiny proportion --
11 A. I didn't say tiny.
12 Q. Really? Is that not precisely what we were discussing
13   before?
14 A. I don't believe I'm using --
15 Q. When we were talking about using comparable systems and
16   how they have a low risk tolerance?
17 A. I wouldn't characterise it as tiny. I probably said
18   a fraction of a percentage.
19 Q. Okay.
20 MR GREEN: My Lord, the evidence -- the word "tiny" was put
21   and he said a small fraction. That's what the
22   transcript says.
23 MR DE GARR ROBINSON: Yes. And do you think -- my
24   suggestion to you, Mr Coyne, is that in paragraph 3.3
25   you're actually trying to give an impression which is

                              81

1   seeking to undermine actually what is a very helpful
2   conclusion that you have set out in paragraph 3.7?
3 A. That certainly wasn't the way it was written. It was
4   constructed to set the context for it.
5 Q. Let me also suggest, Mr Coyne, that in this report you
6   also tried to give the impression that the concept of
7   robustness has no meaning and it's impossible to
8   measure, would you agree with that?
9 A. I do agree that it is impossible -- it is very
10   subjective and it is impossible to come up with
11   a quantifiable measurement, yes.
12 Q. Now let's go back to the joint statement you made
13   shortly before you produced this report. It is at
14   {D1/1/8}, I'm going to page 8.
15   Now, I think you have maintained in the evidence you
16   have just given that paragraph 3.3 where you talk about
17   the sheer volume of things happening is consistent with
18   Horizon being relatively robust as compared with its
19   comparators, yes?
20 A. Mm.
21 Q. So the fact that there is such a sheer volume is not
22   inconsistent with it being relatively robust, is that
23   right?
24 A. Yes.
25 Q. Okay. Well, we have already read what the experts

                              82

1   agreed in paragraph 2.3. If we could go over the page
2   to the disagreement boxes on page {D1/1/9}, there at the
3   top you have got your definition of robustness.
4 A. Yes.
5 Q. Then just below that you say:
6   "in consideration of the likelihood of Horizon to be
7   the cause of shortfalls in branches, Horizon is not
8   determined to be robust in this regard because:
9   "(a) It contained high levels of bugs ... which
10   created discrepancies in the branch accounts."
11   So now I'm really confused, Mr Coyne. On the one
12   hand your judgment on 16th October was that actually
13   Horizon is relatively robust and a very small proportion
14   of transactions go wrong as a result of bugs, but here
15   you appear to be saying the opposite. Did you have
16   a change of mind between agreeing joint statement 1 and
17   your first report?
18 A. Joint statement 1 was constructed before the end of the
19   first report.
20 Q. Joint statement 1 was on 4 September.
21 A. Yes.
22 Q. Your report was on 16th October. I will be corrected if
23   those dates are wrong.
24 A. Right.
25 Q. Did you change your mind between 4 September and

                              83

1   16th October?
2 A. What I did is that whilst looking at the factors in the
3   round I considered Horizon to be relatively robust,
4   whereas my initial opinion was that it was not robust.
5 Q. So you did change your mind, is that right?
6 A. Yes.
7 Q. And what made you change your mind, please?
8 A. It was just a consideration of all aspects in the round.
9 Q. Well, Mr Coyne, in your -- a joint statement is
10   an important document, you have given evidence many,
11   many times before, haven't you?
12 A. Yes.
13 Q. And you will appreciate this is as important in many
14   ways as an expert report, correct?
15 A. It was a very early document, it was when we were
16   finding our way around the evidence that was available.
17 Q. Well, you wouldn't express an opinion unless it was your
18   considered opinion, is that right, in a joint statement?
19 A. That is true.
20 Q. So if, for example, you felt that things didn't look
21   good but you hadn't looked at all the evidence and you
22   wanted to withhold judgment, you wouldn't express
23   an opinion at that stage, would you? Or if you did, you
24   would express it in a very provisional and equivocal
25   way, wouldn't you?

                              84

1   A.   Yes.

2   Q.   But that's not what you do here, Mr Coyne, is it? And

3   I would like you to explain why, please.

4   A.   Well, I mean the reasons for that are set out below in

5   (a) to (f).

6   Q.   So you had seen all these things. You had seen a high

7   level of bugs which created discrepancies in branch

8   accounts, had you, already by that stage?

9   A.   We had certainly seen the KELs at this stage. I'm not

10   sure whether the PEAKs had been disclosed to us at this

11   point in time.

12 Q.   No, they hadn't. So you had seen the KELs, and from the

13   KELs alone you felt able to judge, did you, that there

14   was a high level of bugs that created discrepancies in

15   branch accounts?

16 A.   Well, the KELs have a reference within them to the

17   PEAKs.

18 Q.   Which you hadn't seen at that stage?

19 A.   No, but we had seen that there's references to PEAKs.

20 Q.   What's the significance of that in the context of my

21   question?

22 A.   Because it is the KEL that would indicate how many,

23   often, of that defect that led to the KEL being created

24   had surfaced.

25 Q.   So you accept that KELs are actually good -- a KEL will

85

1   be good evidence of whether there is a bug that creates

2   a branch impact. That's your view, is it?

3   A.   It is an indicator but you can't use that document

4   alone. You have to look at the PEAKs as well.

5   Q.   But Mr Coyne, it seems to me that in paragraph (a) you

6   are using that document alone. You hadn't seen any

7   PEAKs at that stage, had you?

8   A.   No, we hadn't seen the PEAKs, but we knew that PEAKs

9   must have existed and that there are references to them.

10 Q.   So what? Why does the fact that you know there are

11   PEAKs you haven't seen enable you to make a judgment

12   that you would not be able to make simply by looking at

13   the KEL?

14 A.   The KEL talks about how the situation that occurs with

15   the bug, error or defect should be dealt with, and by

16   reading that you get an indication that there is or

17   there must be or there likely is a defect within the

18   system. And if the KEL refers to, for example, ten

19   different PEAKs then that is an indication, although you

20   can't be certain, that there has been ten occurrences of

21   that.

22 Q.   So what you are saying is that if you see a KEL which

23   refers to a bug, you will be able to tell from that KEL

24   in the main whether the bug has an impact on branch

25   accounts or not?

86

1   A.   There will be sometimes an indication whether there is

2   an impact on branch accounts. We typically will not

3   know what branch it is.

4   Q.   You say "sometimes"; what I'm suggesting to you,

5   Mr Coyne, and I think you know what I'm suggesting to

6   you, is KELs are actually a good source of seeing

7   whether there is a bug which has branch impact. You may

8   not know the details of branch impact but it is a good

9   way of telling -- if there is a bug that is considered

10   in a KEL that has a branch impact it is likely to say

11   that, isn't it?

12 A.   It will often say there might be a discrepancy, yes.

13   The way that these documents are created is somewhat

14   inconsistent. You can read a KEL and it will give you

15   all the information that you need. It will relate to

16   a branch, it will point out the discrepancy, and that

17   KEL on its own might be helpful. You will read another

18   KEL and there's very little information within it. You

19   will need to go to the five PEAKs that relate to it to

20   even start to understand what the impact was. So I'm

21   not saying that KELs aren't helpful documents. I'm

22   saying that they need to be read in context.

23 Q.   Let's move on from that subject.

24 MR GREEN: My Lord, I didn't want to interrupt.

25 MR JUSTICE FRASER: Are you going to the joint statement?

87

1   MR GREEN: Yes. They have agreed on page 26 {D1/2/26} at

2   0.3 what the shortcomings of those documents are, so it

3   is surprising to hear a different --

4   MR JUSTICE FRASER: I'm aware of that, but if

5   Mr de Garr Robinson wants to spend his time exploring

6   it, I'm not going to stop him.

7   MR DE GARR ROBINSON: Mr Coyne, at this stage you had only

8   seen the KELs and you were in a position to make

9   a judgment that there were a high level of bugs that

10   created discrepancies, were you? That was your

11   considered view then just on the basis of seeing KELs?

12 A.   As I pointed out, whilst I had only seen KELs I had seen

13   references to a number of PEAKs as well.

14 Q.   Then after 4 September PEAKs were disclosed?

15 A.   Some PEAKs were disclosed.

16 Q.   A large number of PEAKs were disclosed?

17 A.   Yes.

18 Q.   Something like 200 and something thousand, is that

19   right? I'm not sure there were any other material

20   documents disclosed between 4 September and 16th October

21   that are relevant to the this question. Can you think

22   of any?

23 A.   I'm not sure. I did try and map out all the various

24   disclosures that have taken place but that doesn't

25   appear --

88

1 Q. The ones that I'm aware of are the PEAKs.

2 A. Right.

3 Q. Clearly you had a change of mind between 4 September and

4   16th October. Would I be right in thinking that on

5   seeing the PEAKs, that caused you to change your mind?

6 A. Certainly the PEAKs do help to set the context about how

7   problems are dealt with. So they would help, yes.

8 Q. You have plainly had seen something good between

9   4 September and 16th October and what I'm trying to

10   explore with you, Mr Coyne, is what that good thing was.

11   What had you seen that made you change your mind?

12 A. Certainly the PEAKs would be part of that,

13   an understanding better of the processes that are in

14   place.

15 Q. So would you accept you were rather hasty in expressing

16   the judgment you express here on page 9? {D1/1/9}

17 A. I'm certainly content with my opinion as expressed in my

18   report. Yes, it would probably be better for me not to

19   have expressed that particular opinion there so early.

20 Q. Do you think it would have been helpful in your report

21   to have explained why you changed your mind? It was

22   a very surprising volte-face. Do you think it might

23   have been helpful to allow everyone to understand what

24   it was that was good about the system that allowed you

25   to form the view that Horizon was robust?

89

1 A. "Relatively robust" was the term.

2 Q. Yes, relatively robust.

3 A. Yes, I mean --

4 Q. The reason why I ask is you see in joint statement 1 you

5   are resolutely negative about Horizon. In your report

6   on 16th October you say Horizon is relatively robust but

7   the rest of your report says negative things about

8   Horizon. There's very little that's said that is good

9   about Horizon.

10   It is difficult to resist the impression, Mr Coyne,

11   that in your first report you were trying to say bad

12   things about Horizon and you were not interested in

13   saying anything that was good.

14 A. I reject that.

15 Q. Would that be fair?

16 A. No.

17 Q. What is it that was good about Horizon that caused you

18   to change your mind and where do you describe that,

19   where do you consider that in your first report?

20 A. What was helpful was to understand the support process

21   in more detail to understand how things such as fault

22   determination is done, albeit it is only

23   an understanding of how it is done within Fujitsu, to

24   understand that process more. So that was an improving

25   position for me.

90

1 Q. I see. And your judgment on reviewing the PEAKs was

2   that Fujitsu actually had quite a good support process,

3   is that right?

4 A. Yes, I mean the support process that Fujitsu operate,

5   and again this changes over time so it is very difficult

6   to pick a point in time and understand what obligations

7   they had, what roles and responsibilities they

8   fulfilled, but certainly by the time they become aware

9   that somebody believed there was a problem, so it hit

10   SSC, the support centre, third line support, the process

11   they had of determining whether there was a fault

12   appears to be a reasonably good process. So there's

13   obvious weaknesses, how does the fault get to them in

14   the first place? And that's --

15 Q. When you say obviously weaknesses, why is it obvious

16   that there were such weaknesses?

17 A. No, no, what I'm saying is the obvious weakness in the

18   opinion is we don't know what happens before it gets to

19   Fujitsu, but then once it comes into Fujitsu and they

20   determine that, yes, there has been a problem, or there

21   has not been a problem, and they believe there is

22   a discrepancy, you will see quite often that there is

23   a line at the bottom of the PEAK saying, hand this back

24   to Post Office for them to do whatever they need to do

25   to branch accounts. So the process is then handed over.

91

1   So we don't know happens afterwards and we don't

2   know what happens before but the process with Fujitsu,

3   certainly SSC, appears to be a reasonably good process.

4 Q. So what you found when you read the PEAKs was that when

5   a call got referred to the SSC, either because it is

6   a subpostmaster call, or perhaps it might be automatic,

7   it might be from the MSU because of a reconciliation

8   issue, your view was that Fujitsu was quite good at

9   spotting if there was a problem in Horizon, is that

10   right?

11 A. Yes.

12 Q. And it was quite good at making sure that problem was

13   fixed, yes?

14 A. Yes.

15 Q. And it was quite good at identifying the consequences of

16   a problem and informing Post Office as to what those

17   consequences were, yes?

18 A. I don't know whether they informed Post Office. In

19   their own records you would often see comments such as

20   corrections will need to be made. There is a number of

21   references to say we do not know what Post Office's

22   process will be to deal with this but it does need

23   dealing with.

24 Q. But it is fair to infer, isn't it, and I suggest that

25   you have inferred from all the PEAKs you have seen, that

92

 1   where there is a bug that has been identified that
 2   appears to have had an impact on branch accounts,
 3   Fujitsu are quite good at identifying the branches that
 4   had been affected by that bug?
 5 A. They are quite good. They will often take quite a long
 6   time in identifying which branches are affected. Such
 7   as Dalmellington, Fujitsu were not asked to get involved
 8   in that for a number of years after it had been
 9   impacting a branch account. When they did get involved
10   they quite quickly established all the historic impact
11   of that.
12 Q. Just to go back to my question. Fujitsu are quite good
13   at identifying the branches that have been affected by
14   those kind of bugs?
15 A. In the main, yes.
16 Q. Thank you. And it is fair to infer that Fujitsu then
17   tells Post Office what those effects are?
18 A. Well, that's the bit that I don't know because I don't
19   know what the process is. I do not think we have had
20   sight. There was some very, very -- there was some
21   disclosure made only very recently which are the BIMS
22   documents, and I think the BIMS documents are in part
23   a communication between Fujitsu and Post Office, setting
24   out what the likely impact might be. There's also OCR
25   and OCP documents.

93

 1 Q. That's not relevant to this, though, is it?
 2 A. It is a communication between Fujitsu and Post Office --
 3 Q. I see.
 4 A. -- saying that changes were going to be made. So it may
 5   well be relevant to this.
 6 Q. But it is right, isn't it, that Fujitsu, from what you
 7   have seen of the PEAKs, will work out the branches which
 8   have been affected by any bug that they identify, yes?
 9 A. That is what they set about to do, yes.
10 Q. And you don't assume -- you don't infer, do you, that
11   having identified those branches Fujitsu then keep that
12   information to themselves? You infer that that
13   information is passed onto Post Office don't you?
14 A. I think so. There is certainly one reference in a PEAK
15   where it says I suggest we don't tell the branch about
16   this, but I'm not sure whether that's we won't tell
17   Post Office about it, it is more keeping it from the
18   branch rather than Post Office --
19 Q. And that's the only PEAK of any kind that you have ever
20   found of that sort, isn't it?
21 A. Yes, I believe so.
22 Q. So we have one PEAK over 20 years that says something
23   like that. In those --
24 A. Sorry, we should be careful. I haven't had eyes on all
25   of the 200,000 PEAKs.

94

 1 Q. Yes. So all of those things that we have been talking
 2   about you consider, and you considered by the time of
 3   your 16th October report, were quite good?
 4 A. Yes.
 5 Q. What I don't understand, Mr Coyne, is why you didn't say
 6   any of that in your report. Would it not have been
 7   a balanced thing to do?
 8 A. Perhaps. Looking back at the report, possibly.
 9 Q. Would it not have been helpful to explain the good
10   aspects that you had spotted in the system as well as
11   the bad ones?
12 A. Possibly.
13 Q. Did you have a reason for wanting to keep it back?
14 A. No, not at all.
15 Q. The impression I get, Mr Coyne, I'm sorry to put this to
16   you, is that your first report was designed to give
17   a very poor impression about Horizon --
18 A. No.
19 Q. -- and that if you had included what you've just
20   described to me it would have given a much less poor
21   impression of Horizon.
22 A. I mean, as I say in my report, we'd been asked to
23   identify specific bugs, errors and defects and the
24   nature of that type of assignment is to drill in and
25   find occurrences of that. Talking about all the good

95

 1   things that could and should happen, either generically
 2   in the industry or that Post Office might do this year
 3   as a result of various improvements in place, doesn't
 4   really in my opinion provide much assistance.
 5 Q. But isn't it a necessary part of the judgment you make
 6   as to whether Horizon is robust? How can you make
 7   a judgment about that without taking it into account?
 8 A. I think you can take it into account, but to spend pages
 9   of text talking about all the various good things,
10   I don't see there's any value in that.
11 Q. Well, Mr Coyne, can I ask you -- put it this way, what's
12   the value of doing this: saying in your joint statement
13   on 4 September that Horizon really isn't robust because
14   it has a high level of all sorts of bad things, six
15   weeks later producing a report by which time your view
16   has changed diametrically, and not mentioning what it
17   was that you had seen in the intervening time that
18   caused you to change your mind? Wouldn't it be obvious
19   that you needed to explain that to the court to help it
20   make its own determination?
21 A. Firstly, I don't believe that my opinion has changed
22   diametrically. It is a spectrum of robustness, as
23   I tried to explain this morning, and I believed that
24   Horizon has gone further up on the spectrum. There's no
25   complete change of direction here.

96

1 Q. I see. Just looking at page {D1/1/9} you say:
2   "... Horizon is not determined to be robust in this
3   regard because:
4   "(a) it contained high levels of bugs ... which
5   created discrepancies in the branch accounts ..."
6   At that stage -- we are going back to 4 September --
7   how many bugs had you identified which created
8   discrepancies in branch accounts?
9 A. More than the three that had been originally brought to
10   my attention.
11 Q. But three is not high level and nor is four. You say
12   "high levels of bugs". What did you mean by the
13   expression "high levels of bugs"?
14 A. Certainly in the tens.
15 Q. In the tens?
16 A. Yes.
17 Q. So we are talking about a system which has operated over
18   20 years, yes?
19 A. Mm.
20 Q. Which undertakes something like 47 million transactions
21   a week. So we are talking about 49 billion transactions
22   over a 20-year period, something like that. It is the
23   right ballpark, isn't it?
24 A. Mm.
25 Q. We are talking about two different versions of Horizon,

97

1   and you are saying that a number of bugs in the tens
2   over that period is properly to be characterised as
3   "high levels of bugs"?
4 A. Well, that is what had been identified at this point in
5   time, but you have got to remember my expectation was
6   set that I was investigating the three defects that had
7   occurred by people that had been involved in the
8   investigation with this system for a long time. So to
9   move from three to a larger number than that initially
10   suggested that there must be some quite poor processes
11   in place if they can't identify bugs, errors and defects
12   which, for myself, being involved in the process for
13   only a number of weeks, quickly identified them --
14 Q. I'm really sorry, I'm sorry to stop you, Mr Coyne, but
15   I really need to ask you, first of all, did anyone ever
16   tell you there were only ever three bugs that had ever
17   occurred in Horizon? Has anyone ever said that to you?
18 A. I think it was said -- I think in part of the pleadings,
19   part of the legal documents, I believe it was pointed
20   out that there was three defects which had impacted
21   branch accounts.
22 Q. Has anyone ever told you there were only three defects,
23   that those were the only? Defects because I suggest to
24   you that no one has ever said that to you, including in
25   the pleadings.

98

1 A. That was certainly my original expectation when
2   I started.
3 Q. I see. Then as a result of looking at these KELs you
4   realised there were more than three?
5 A. Yes.
6 Q. And I think you have suggested that at this time you
7   took the view that there were in the range of tens of
8   bugs, is that right?
9 A. Yes. There was certainly a large number of KELs that
10   warranted further investigation because they were
11   indicative of having an impact on branch accounts.
12 Q. So hold on. You had seen some KELs that might be
13   consistent with branch impacts but you were not sure
14   yet, is that right?
15 A. Yes. As I explained before, KELs relate to PEAKs, and
16   really in order to confirm the position you need to read
17   the PEAKs.
18 Q. So these were not KELs that you knew created branch
19   account discrepancies, so let's lay those to one side,
20   shall we. You are making a claim here that there is
21   a high level of bugs that created discrepancies in
22   branch accounts and I would like you, if you can
23   remember, to tell me, at that time on 4 September, what
24   was the level of bugs you had found that created
25   discrepancies in branch accounts?

99

1 A. That would be in the tens.
2 Q. In the tens?
3 A. Yes.
4 Q. I mean, Mr Coyne, looking at your bug table, and it may
5   be that my approach to it is all wrong, in the bug table
6   in JS2, 29 bugs are identified, correct?
7 A. Yes.
8 Q. And of those 29 a very considerable number were only
9   identified either in Dr Worden's report or in your
10   second report, and the number that remain in JS2 from
11   your first report is a relatively small number, far less
12   than ten?
13 A. Right, okay. I haven't done the maths so I don't know
14   if that calculation is actually correct, but it is
15   certainly the case that with the additional context with
16   the provision of the PEAKs that a number of KELs that
17   I initially thought led to branch accounts then appeared
18   not to, and there was additional PEAKs that indicated
19   branch account impact so we brought them back in again.
20   And that's the importance of reviewing the documents
21   side by side.
22 Q. So are you saying -- and this is the last question I
23   will ask before we break for lunch -- that at the time
24   you made this report you thought there were more bugs,
25   branch account affecting bugs in Horizon than you

100

 1   thought at the time you made your first joint statement,
 2   or less?
 3   A. No, I think the number is probably around the same.
 4   I think I ended up with 28 or 29 ...
 5   Q. That's your second joint statement. I'm asking you
 6   about your first joint statement. Between 4 September
 7   when you produced joint statement 1 and your first
 8   report in the middle of October, had your view as to how
 9   many branch affecting bugs there were gone up or gone
10   down?
11   A. No, it had gone down.
12   Q. Because of the PEAKs that you saw?
13   A. Yes.
14   MR DE GARR ROBINSON: Thank you. My Lord, is this
15   a convenient moment?
16   MR JUSTICE FRASER: Yes, we will come back at 2.05 pm.
17   Remember what I said, Mr Coyne.
18   (1.04 pm)
19   (The short adjournment)
20   (2.05 pm)
21   MR DE GARR ROBINSON: Mr Coyne, we have been looking at your
22   first statement of 4 September and I would like now to
23   move on properly to 16th October. This is the time of
24   your first report.
25   Can we look at {D2/1/1} which is the front page of

                              101

 1   your report. You say by this time you had examined
 2   a number of KELs and PEAKs which had recently been
 3   disclosed?
 4   A. Yes.
 5   Q. Just looking at page 1 of your report, I see that you
 6   were assisted by four people?
 7   A. Yes.
 8   Q. Could you explain who those four people are?
 9   A. They are all members of my team that helped me with
10   various projects, both contentious and non-contentious
11   projects.
12   Q. They work for IT Group, do they, your company?
13   A. Yes.
14   Q. What are their qualifications, their specialities within
15   IT Group?
16   A. So Siobhan Forster specialises in databases. She
17   graduated after doing a forensics -- a technology
18   forensics degree from Preston and has worked with me for
19   a number of years. Chris Raske is more to do with the
20   roles and responsibilities side of my business, so he
21   understands what various parties do do or should do.
22   Jamie Smith is one of the researchers that we often use
23   on projects, and that's the same for Patrick Grant.
24   Patrick Grant has worked as an implementer of a number
25   of different computer systems, a programmer, and he has

                              102

 1   worked for us for a couple of years now.
 2   Q. So in relation to the preparation of your reports, what
 3   roles did they play? What did they do for you?
 4   A. They were operating typically as a researcher. So
 5   because of the volume of documents, I was asking them to
 6   identify certain themes. They would review -- I would
 7   parcel up a number of the documents that I would search
 8   for in the disclosure platform and they would try and go
 9   through and identify whether there was any potential
10   relevance in those documents so that I could have a look
11   at those and decide whether they should be included in
12   the report or not.
13   Q. Were these people working full-time leading up to the
14   preparation of the first report?
15   A. No. The majority of these people were brought in
16   towards the end when we were receiving the PEAKs,
17   towards the end.
18   Q. So they were engaged in searching the PEAKs and
19   presumably searching other documents as well, were they?
20   A. Yes, all of the documents were on a disclosure review
21   platform, very similar to the one that we see here. We
22   all sit in the same office, so we would meet each
23   morning and I would ask for various categories of
24   documents to be searched for and found and gathered
25   together.

                              103

 1   Q. Would I be right in thinking -- you say they weren't all
 2   working full-time on the case for you, were some of them
 3   spending more of their time on the case than others?
 4   A. Yes, certainly Siobhan Forster worked on the case more
 5   often than not.
 6   Q. Would it be fair to say she spent most of her time on
 7   the case while you were --
 8   A. No, she certainly had other matters that she was dealing
 9   with, but she worked on it more often than not.
10   Q. What instructions did you give them? What did you tell
11   them to look for?
12   A. Typically I'd conduct the first tranche of searching
13   through the material and we would identify materials to
14   do with particular types of discrepancy that were being
15   discussed within the documents, and then I would sit
16   down with one of these chaps, we would go through the
17   PEAK or the KEL or whatever the document might be, and
18   I would ask them to try and assemble all of the other
19   documents that would be in that family. So it might be
20   other PEAKs that report the same thing, it might be the
21   KEL, we had a few of the BIMS documents, so to identify
22   them, to put together all the package of information.
23   That in itself was quite a task.
24   Q. Would it be fair to say that you were generally asking
25   them to find problems, to find evidence of problems in

                              104

1   Horizon, things that had gone wrong?

2 A. Yes. Well, sorry, I had already identified the theme

3   that I wanted them to look for but that was typically

4   around a specific type of defect that might be occurring

5   around a particular time and I was asking them to look

6   at documents around that time or that contained

7   a similar theme.

8 Q. So if we go back to the joint statement, having said we

9   could move on. If we can look at {D1/1/2}. We are back

10   on 4 September again. At this time were those four

11   working with you? Did you already have their

12   assistance?

13 A. No, I think it was just myself and Siobhan at this time.

14 Q. So the other three came in later?

15 A. They would have always been in my office.

16 Q. But for the purposes of --

17 A. Yes.

18 Q. If we look at the agreement. I'm sorry, let's move on

19   to page {D1/1/3}. It says:

20   "Each expert's approach to writing his report, and

21   to this joint memorandum ... could broadly be one of

22   three possible approaches:

23   "a) To focus mainly on negative points found in the

24   disclosed documents about where Horizon may have fallen

25   short.

105

1   "b) To focus mainly on those aspects of Horizon

2   which were intended to achieve robustness and

3   reliability, and the evidence implying that they

4   succeeded."

5   Or:

6   "c) To provide the court with a clear foundation for

7   understanding the design and operation of Horizon; then,

8   building on that foundation, to provide a balanced

9   assessment of the ways in which Horizon succeeded ..."

10 A. Mm.

11 Q. Now, that's what you agreed with Dr Worden. If I could

12   just then go down to what you describe as areas of

13   disagreement. Second sentence:

14   "The issues are about how Horizon and its

15   interactive components operated and the processes

16   employed by Post Office and Fujitsu in supporting these

17   systems and the data within.

18   "Whilst my report will take a balanced approach, it

19   is the case that many of the issues require a deep focus

20   on the occurrences of bugs ... as well as the potential

21   for modification of transactional data. Whilst context

22   will be provided as to how Horizon should work in

23   typical circumstances, it is the non-typical operation

24   where focus will be placed."

25   That is right, isn't it, that you focused on things

106

1   going wrong, that's what you were looking for?

2 A. Yes, I looked for things that have actually gone wrong

3   and then followed the process through to find out how

4   they were dealt with.

5 Q. When you engaged in that process, you have already

6   described the team of people that you had assisting you.

7   Did anyone else help you? Did anyone else put forward

8   documents for your consideration that might be included

9   in the report?

10 A. No.

11 Q. Did you speak to any individual claimants, for example,

12   and get any information from them?

13 A. No.

14 Q. Going back to you and your team, you obviously by

15   16th October couldn't review all the PEAKs you had been

16   given, you had been given over 200,000, so you used

17   intelligent search techniques, didn't you?

18 A. Yes.

19 Q. Presumably you used those techniques for the whole

20   corpus of documents, not just PEAKs, but the KELs and

21   other documents as well, is that right?

22 A. That is correct.

23 Q. What other documents did you search across, can you

24   remember, at that time?

25 A. I don't have a list of all the documents. There is

107

1   a list in my first report, but all the documents all

2   went into the same platform, so it will have been every

3   document that had been formally disclosed at that point

4   in time.

5 Q. Thank you. Your report says you are of IT Group, when

6   you describe yourself at the beginning.

7 A. Yes.

8 Q. Can I ask what your position there is?

9 A. Director.

10 Q. As I understand it, correct me if I'm wrong, IT Group

11   offers a disclosure and search capability, doesn't it?

12 A. It does indeed.

13 Q. I read from your website, it is not in the bundles:

14   "IT Group's powerful e-disclosure and digital

15   investigation solution, Intella Connect, removes that

16   headache by enabling you to intelligently search, filter

17   and review large volumes of electronic data with speed

18   and ease."

19   Is that a fair description of the service that

20   IT Group provides?

21 A. It is indeed.

22 MR JUSTICE FRASER: Forgiving the split infinitive.

23 MR DE GARR ROBINSON: I'm sorry, my Lord?

24 MR JUSTICE FRASER: I said forgiving the split infinitive,

25   "to intelligently".

108

1 MR DE GARR ROBINSON: I do not think it is possible to
2   forgive.   Others may disagree.
3   So is it right that you manage the e-discovery team
4   in IT Group?
5 A. Yes. I am the director that is responsible for that --
6 Q. So it is fair to say, isn't it, that you know quite
7   a lot about intelligent searching of documents?
8 A. Yes.
9 Q. And you have no difficulty, I'm not saying it is easy,
10   in searching through, for example, 200,000 PEAKs in lots
11   of very clever ways that I am sure I couldn't think of?
12 A. Yes.
13 Q. Would that also be true of your team of assistants?
14 A. Yes.
15 Q. And they would have used these intelligent search
16   techniques to go away and find the sort of documents
17   that you wanted them to find?
18 A. They would.
19 Q. At your daily meetings?
20 A. Yes.
21 Q. I imagine that your search facility is far more powerful
22   than searching for words and symbols within a certain
23   distance from each other? That's the kind of thing I'm
24   used to.
25 A. We didn't employ any artificial intelligence, we only

1   used the normal standard search techniques.
2 Q. Would I be right in thinking that with your experience,
3   you and your team have developed all sorts of tricks of
4   the trade with searches to find -- to unearth things
5   that the rest of us laymen might find more difficult to
6   find?
7 A. I'm not sure which tricks of the trade you are referring
8   to. We do see ourselves as being quite advanced in what
9   we can find within documents, yes.
10 Q. Could you give me an idea of some of the intelligent
11   searches that you would have used in a case of this
12   sort?
13 A. So typically we were looking at documents that were
14   talking about discrepancies, that would be talking about
15   errors, bugs, defects, imbalances, things like that.
16 Q. You and your team would search for these documents and
17   then they would be reviewed, would they?
18 A. Yes, we would typically try to understand -- because
19   often you will find one document but then you need to
20   understand where that document sits on the timeline, so
21   then you may have to go back a number of documents or
22   forward a number of documents -- we have the ability to
23   put them effectively in chronological order -- to try
24   and see who within the organisation was talking about
25   these themes.

1 Q. Presumably you would review the documents that you
2   found, but members of your team, when they found
3   documents that they thought you were looking for, they
4   would review them and then they would bring them to you
5   for your review as well if they thought they were good
6   ones?
7 A. Yes. It would be a process of them applying a tag to
8   a document. So essentially they were ruling out
9   irrelevant documents.
10 Q. Would they do their own reviewing and then provide you
11   with documents that they thought were suitable or did
12   you review everything that they tagged?
13 A. There was documents that, as the process went on, they
14   become better versed with spotting things that I may
15   find of interest within the document, but initially
16   I would ask them just to rule out documents that were
17   clearly irrelevant and I would review the balance of
18   that, but as things improved they were spotting themes
19   within documents, tagging it for my attention, and then
20   I would see the tag and would be able to go through
21   that, and then each day we would refine that process.
22 Q. Would it be fair to say that the total number of
23   documents that you and your team reviewed is larger than
24   the total number of documents that you reviewed?
25 A. Yes.

1 Q. I would be right in thinking, wouldn't I, that the
2   documents that you refer to in your report are all
3   documents that you yourself had reviewed?
4 A. Yes.
5 Q. Could you give me an indication -- the number of
6   documents the whole team reviewed was higher than the
7   ones you reviewed. Could you give me an idea of how
8   many documents your entire team would have reviewed in
9   this process?
10 A. I wouldn't have that number, I'm sorry.
11 Q. If we then go in the same document to {D2/1/83}, please?
12 MR JUSTICE FRASER: Do you want to stay in the first joint
13   statement?
14 MR DE GARR ROBINSON: I'm so sorry, I thought I was in JC1.
15   It is {D2/1/83}.
16   Just looking at paragraph 5.114, you say:
17   "Regarding the extent of potential errors within
18   Horizon I have analysed 5114 Horizon ... (KELs) to
19   determine the scope of potential bugs or 'PEAKs' ...   Of
20   these 5114, I have found that 163 contain PEAKs that
21   could be of significant interest and of these [67] are
22   referred to in the report."
23 A. 76.
24 Q. I'm so sorry, 76. So you personally looked at 5,114
25   KELs, did you?

1 A. KELs and PEAKs, is that not? Sorry, yes. Yes.
2 Q. So you looked at them, so your team would have looked at
3   more?
4 A. They may have looked at the same number but they
5   possibly looked at more, yes.
6 Q. On top of those KELs you looked at PEAKs, as well?
7 A. Mm.
8 Q. If we go back to paragraph 1.28 at page {D2/1/20}. It
9   may be you will agree with this without having to look
10   at it. At this stage on 16th October -- it is 1.28 on
11   page 20 and you say:
12   "Of the [218,000-odd] PEAKs disclosed by POL I have
13   in the interest of expediency, used intelligent search
14   techniques to initially review those that might
15   specifically relate to branch accounts. I have
16   therefore reviewed 1,262 in the limited timeframe
17   allowed since disclosure."
18   Would I be right in thinking that your team would
19   have reviewed a considerable number more than that?
20 A. Yes.
21 Q. Just to be clear, the focus of your search was what?
22   Was it branch account problems?
23 A. Yes.
24 Q. Were there any other problems?
25 A. The searches were surrounding discrepancies but, of

113

1   course, a search such as that will come up with lots of
2   things that are largely irrelevant. But yes, branch
3   account problems.
4 Q. And would that 1,262 PEAKs you referred to there be on
5   top of the 163 PEAKs that you found having regard to the
6   5,114 KELs you read?
7 A. Sorry, could you ask that question once more.
8 Q. If you remember back at paragraph 114, I'm asking this
9   question in a very maladroit way, you said: I looked at
10   5,000-odd KELs and I found that 163 contained PEAKs that
11   could be of significant interest?
12 A. Yes.
13 Q. I get the impression therefore that you looked at the
14   KELs and then, having regard to the KELs, you then
15   looked at the PEAKs referred to in those KELs?
16 A. Yes.
17 Q. And you found 163 that you thought were interesting and
18   you refer to 76?
19 A. Yes.
20 Q. The 163, was that part of the 1,262 that you regarded --
21   that you found that might specifically relate to branch
22   accounts?
23 A. It is likely to be a subset of that.
24 Q. Thank you.
25 A. Because what you find is when you look in a KEL and it

114

1   lists a number of PEAKs, you go to have a look at the
2   PEAKs. Sometimes it is a PEAK of interest but it
3   actually doesn't contain any of the words you were
4   originally searching for, but once you have read it you
5   understand why it is of interest.
6 Q. Yes. If we move forward three and a half months, so we
7   are now at the beginning of February, and you produce
8   your second statement which is very long and that's at
9   {D2/4.1/16}. If we could look at that document at
10   page 16, please. You say in paragraph 3.20:
11   "I have now reviewed more of these records using
12   text search criteria and filtering. This has enabled me
13   to address some issues more thoroughly and has enabled a
14   more in-depth analysis in relation to the extent of the
15   Horizon Issues and the overall robustness ..."
16   So would I be right in thinking that you had looked
17   at more KELs?
18 A. Yes.
19 Q. And I think it must be obvious you looked at more PEAKs,
20   as well?
21 A. Yes.
22 Q. Had you looked at more other documents as well?
23 A. Yes.
24 Q. Could you give some indication of the sort of other
25   documents you were looking at in the intervening time?

115

1 A. There was a number of OCRs and OCPs but I do not think
2   we had the full family of them at this point in time.
3   There was a number of the design documents, the process
4   documents. There was a lot of reports about how
5   feedback of the support of issues was being fed back to
6   Post Office. There was documents on many themes.
7 Q. How many more KELs -- it may be that you can only
8   estimate, it may be impossible to estimate -- do you
9   think you had looked at by this time?
10 A. It would be a crazy guess. I don't know. I honestly
11   don't know.
12 Q. What about PEAKs? How many more PEAKs do you think you
13   had reviewed by this time? I would suggest it is likely
14   you looked at a lot of them but that may be unfair.
15 A. It will be a lot of them. There wasn't a linear review
16   where I sat and started and went next, next, next. That
17   wasn't how it happened. But after searching for
18   a document, deciding it was of interest, and then
19   picking out some of the themes and then searching for
20   those themes, you might identify conceivably another
21   five hundred documents of which you might flick through
22   those very, very quickly just to see whether they are of
23   any interest, they are in the right date range.
24 Q. Did your team, the four people that's mentioned that we
25   have discussed, did they help you at any time during

116

 1 this three and a half month period?

 2 A. Any members of the team? Sorry?

 3 Q. Did the whole team, all four members, help you at any

 4 time?

 5 A. Running up to Coyne 1, the first report, then it was the

 6 team members that you see there. For the second report

 7 it was just Siobhan Forster.

 8 Q. Did she spend a great deal of her time helping you

 9 during that period?

10 A. Yes.

11 Q. She was doing intelligent searches as well?

12 A. Yes.

13 Q. And she was reviewing PEAKs and other documents as well?

14 A. In order to bring them to my attention. The process was

15 very similar all the way through really.

16 Q. I see. Would I right in thinking that the focus during

17 that period was again PEAKs and KELs and other documents

18 indicating problems with branch accounts?

19 A. We were also looking at elements in Dr Worden's report.

20 So there will have been searches trying to understand

21 more about themes surrounding his opinion.

22 Q. I see. Have you reviewed further documents since you

23 produced your second report on 1st February?

24 A. Yes, I think I'm right to say there has been documents

25 that have been disclosed since then. Yes.

<center>117</center>

 1 Q. Have you -- let's take it in stages, have you reviewed

 2 more PEAKs since then?

 3 A. I think there was a small disclosure of about 1,200

 4 PEAKs that have been reviewed.

 5 Q. What about OCPs and OCRs, have you reviewed a number of

 6 those?

 7 A. Yes.

 8 Q. Could you give an estimate of how many you have looked

 9 at?

10 A. It will be thousands but I don't know what the precise

11 number would be.

12 Q. MSCs as well, the three databases of MSCs, you've

13 reviewed a number of those as well, haven't you?

14 A. MSCs were a very significant challenge because they were

15 disclosed in three separate Excel sheets, none of which

16 appeared to marry up with each other, so it was a task

17 because there were literally millions of lines of code

18 in that. So I have searched within those documents.

19 Q. The OCPs and the OCRs and the MSCs, what have you

20 searched for? FAD codes, that kind of thing?

21 A. I have searched for the word "FAD", because that might

22 indicate that it is describing something for

23 a particular branch, but I have not searched for a FAD

24 code as such.

25 Q. So you have looked for FAD because that is a reference

<center>118</center>

 1 to a branch. Each branch has its own FAD code, doesn't

 2 it?

 3 A. FAD is an indicator that the document might be to do

 4 with a branch, but you do have to be very careful with

 5 that because simply searching for "FAD" returns hundreds

 6 of documents and you actually find that it is just

 7 a pro forma document with the word FAD in it and there

 8 is a space next to it and there's nothing in it.

 9 Q. Presumably this is where intelligent searches come in,

10 which I would be --

11 A. Absolutely.

12 Q. -- incapable of doing.

13 A. Absolutely.

14 Q. And what other things were you looking for when you went

15 through OCPs and OCRs and MSCs?

16 A. We used various searches for "subpostmaster" that would

17 indicate that there was potentially dialogue with the

18 subpostmaster, to see whether there was any advice given

19 to the subpostmaster or what type of information was

20 being requested from the subpostmaster. So all the

21 variations of subpostmaster were used as search terms.

22 Q. Thank you, Mr Coyne. We now have a sense of what you

23 looked at when you produced your first report and what

24 additional documents you looked at when you produced

25 your second report. We've already spent some time

<center>119</center>

 1 talking about your first report but there are some extra

 2 questions I would like to ask you about it.

 3 If we could go to {D2/1/26} paragraph 3.7 which is

 4 at page 26. You say:

 5 "With regards to Issue 3, whilst the present-day

 6 version of Horizon supported by manual human support may

 7 now be considered as relatively robust in the spectrum

 8 of computer systems used in businesses today it has

 9 undergone major modifications in its history. It is

10 likely that in 1999 when it was first commissioned, and

11 in 2010 when it was significantly upgraded (to Horizon

12 Online), it was less robust."

13 So you are saying there that the level of robustness

14 may have varied over time?

15 A. Yes.

16 Q. And you are focusing in particular on the early days of

17 Legacy Horizon and the early days of Horizon Online?

18 A. Yes.

19 Q. Why do you focus on those periods?

20 A. Because I believe it is an incontrovertible fact that

21 there was a larger number of problems after the launch

22 of the first version of Horizon and after the upgrade to

23 Horizon Online. Certainly I was in court when shortly

24 after the launch of Horizon Online there was talk about

25 the red alert or the red care situation, shortly after

<center>120</center>

Opus 2 International   transcripts@opus2.com

Official Court Reporters   0203 008 6619

1   Horizon Online, where it needed some intensive care
2   because of problems.
3 Q. Do you mean during the pilot project when only a very
4   small number of branches were actually using
5   Horizon Online? Is that what you are referring to?
6 A. Certainly there was problems during that period but it
7   was real branches that were being used. It wasn't
8   a testing environment or anything like that.
9 Q. Would I be right in thinking, Mr Coyne, that you have
10   chosen the wording of that paragraph quite carefully?
11 A. I would like to think that I choose all of my words
12   carefully.
13 Q. Very good. That's fair. I note that you are not saying
14   here that Horizon was definitely not robust at some
15   earlier time. That's deliberate, isn't it?
16 A. Yes.
17 Q. You are merely saying that it is relatively robust now,
18   it may have been less robust at some earlier dates, but
19   you are not saying it wasn't relatively robust on those
20   earlier dates, are you?
21 A. No, I'm not. That supports what I have attempted to
22   assist the court with all along. It isn't a binary
23   situation that it is either robust or not robust, it is
24   a spectrum, and throughout those periods it was less
25   robust further to the left of the spectrum.

121

1 Q. Even during those early periods in 1999/2000 when
2   Legacy Horizon was rolled out, and in 2010 when
3   Horizon Online was rolled out, would I be right in
4   thinking it is not your judgment that it was not
5   relatively robust even then?
6 A. I think that is quite a difficult question to answer
7   because that would require very specific focus on those
8   periods and a very specific benchmarking of the position
9   at those two periods which I haven't conducted
10   specifically.
11 Q. You say that you have conducted the benchmarking now?
12 A. Yes.
13 Q. Are you suggesting that you haven't conducted any
14   benchmarking in relation to any earlier period?
15 A. Certainly I have looked at the number of defects that
16   have been in existence and the number of requests to
17   support throughout the whole life of Horizon and there
18   are peaks -- sorry, that is a bad word.
19 Q. Spikes.
20 A. Spikes after the launch of the Legacy version of Horizon
21   and then after the upgrade to Horizon, and I completely
22   understand why with any new system and with any major
23   upgrade there's going to be an increase in problems.
24   That's why I have said during those periods the system
25   will have been less robust because there was problems

122

1   being ironed out both in the technology -- the
2   programming -- the networking and the support processes.
3   All these problems were being ironed out.
4 Q. So outside those periods, how long did those periods
5   last? Are we talking about 1999 to 2000 for
6   Legacy Horizon, is that the sort of period you are
7   talking about?
8 A. No, I mean the actual period extends, it is a curve that
9   slowly drops over the course of the next couple of
10   years. So, again, it is not a binary: it becomes stable
11   at some point in time, the faults stop at some point in
12   time.
13 Q. So you are suggesting -- you have a graph in mind which
14   you are using as a basis for forming this judgment. Is
15   there a graph somewhere that indicates what you are
16   talking about?
17 A. There's certainly two images, I think one in my report
18   and one in Dr Worden's report, that show -- that have
19   correlation of spikes of activity around those two
20   areas.
21 Q. Could you tell me where in your report we will find this
22   graph? I'm afraid I'm not in a position to suggest
23   a page number. Do you remember where it is?
24 A. There is one in my first report at -- it is page 193.
25 Q. Thank you. A graph. Is this your first report or your

123

1   second report?
2 A. This is my first report.
3 Q. My page 193 is a figure 3.
4 MR GREEN: It is bundle page 206, internal 193.
5 MR DE GARR ROBINSON: I'm looking at the wrong numbering.
6 MR JUSTICE FRASER: Are we looking at your page 193 in the
7   top right-hand corner?
8 A. Sorry, my Lord, yes.
9 MR GREEN: Page 193 top right.
10 MR DE GARR ROBINSON: 193 at the top and 206 in the bundle
11   {D2/1/206}.
12   I'm looking at that graph. What is this a graph of?
13 A. So this is a graph of BIMS.
14 Q. Could you explain what they are?
15 A. They are business impact statements that are made
16   between Fujitsu and Post Office.
17 Q. It looks as if the spike had more or less finished by
18   about 2011. So would it be fair to say that if you are
19   treating this as evidence of less robustness, from about
20   2011 it stabilises, would that be right?
21 A. I think it probably could be argued that it stabilises
22   around 2013 but it is the curve that I attempted to
23   describe before.
24 Q. So that's the basis upon which you form that judgment
25   that it was less robust during these early periods, is

124

1   that right?
2 A. That is one of the graphs that illustrates my opinion,
3   yes.
4 Q. Now, if we go back to -- and is there a similar -- have
5   you done a similar graph for Legacy Horizon or is there
6   nothing?
7 A. I believe Dr Worden has a similar graph that goes back
8   to Horizon.
9 MR JUSTICE FRASER: You said there were two, I think, one in
10   your report and one in Dr Worden's report.
11 A. Yes.
12 MR JUSTICE FRASER: You think he has got one as well?
13 MR DE GARR ROBINSON: This may be wrong but it may be at
14   {D3/1/187}.
15 MR JUSTICE FRASER: Let's have a look.
16 MR DE GARR ROBINSON: There is a table of loss amounts by
17   year. Do you see that? Is that the one you have in
18   mind?
19 A. No, I do not think it is. I think there is a different
20   one.
21 MR JUSTICE FRASER: Is it {D3/1/129}? I'm just doing this
22   to try and help Mr de Garr Robinson, I'm not
23   interfering. Have a look at D3/1/129.
24 MR DE GARR ROBINSON: Is that the bundle reference?
25 MR JUSTICE FRASER: That is the bundle reference. Could you

                              125

1   call that up on the common screen, please. 129.
2 MR DE GARR ROBINSON: It is the same graph as at 187.
3 MR JUSTICE FRASER: Oh, is it the same?
4 MR GREEN: I think it is the same.
5 MR JUSTICE FRASER: I won't try and help any more.
6 MR GREEN: It has a different title but it is the same
7   thing.
8 MR DE GARR ROBINSON: Do you think you can --
9 A. Yes, if you give me a moment I can go through these
10   paper copies.
11 Q. It might be the next page. If we go to the next page on
12   the screen, is that it? No sorry.
13 MR GREEN: {D3/1/130}.
14 MR DE GARR ROBINSON: Can we look at page 130, please, in
15   this document. {D3/1/130}. Thank you. Is that it?
16 A. I think it is that actually, yes, because that
17   illustrates the same peak/spike, that illustrates the
18   same spike around Horizon.
19 Q. But it doesn't indicate any spike around Legacy Horizon,
20   does it?
21 A. Not for KELs, no.
22 Q. I'm wondering, Mr Coyne, whether this judgment is really
23   based upon your experience, that your experience of when
24   you roll out a new system you are going to have teething
25   problems and then, once it is rolled out, the position

                              126

1   stabilises. Is that really what your judgment is based
2   on?
3 A. Part of my judgment is based on my experience but it is
4   certainly the case, and we might not have a graph for
5   this, but when you look at the number of PEAKs over the
6   period, there is a spike in the PEAKs at the start of
7   Horizon.
8 Q. So just to backtrack slightly. What you are saying is
9   Horizon is robust, relatively robust now. Do you accept
10   that it has been robust for a significant period or
11   would you not be prepared to say that?
12 A. It has been relatively robust apart from the early years
13   of the two launches, Horizon Legacy and Horizon Online.
14 Q. So both Horizon Online and Legacy Horizon have been
15   robust for most of their lives but there were initial
16   periods where they were less robust?
17 A. Yes.
18 Q. In relation to those initial periods -- and do correct
19   me if I'm wrong -- you are not saying they definitely
20   weren't robust during that period, you are simply saying
21   they were materially less robust, is that right?
22 A. Yes.
23 Q. Thank you. That's very clear.
24   Let's go back to section 3 of your first report. If
25   we can go to {D2/1/26}, paragraph 3.10. Perhaps I don't

                              127

1   need to ask you about that in the light of what you have
2   just told me. Instead what I would like to do is to go
3   to page {D2/1/77} of the same document, please. You
4   will recall that I suggested to you that there was
5   a danger of forming an impression from your first report
6   that although you clearly state that Horizon is
7   relatively robust, you don't say anything good about it.
8   What you tend to do is to say bad things about it.
9   I suggested to you that was because you were knowingly
10   giving a poor impression of Horizon. Would that be fair
11   or would that be unfair?
12 A. That would be unfair.
13 Q. Why didn't you then say more about the good aspects of
14   Horizon that led you to the conclusion that it was
15   relatively robust?
16 A. Because this -- because the question of robustness was
17   in the context of would that robustness prevent or
18   reduce the risk of bugs, errors and defects causing
19   discrepancies. So the many good things about Horizon,
20   and I suppose if you are going to start talking about
21   good things, how far do you go? I don't know where you
22   stop with them. This, as I understand it, is about
23   whether any of the failures that have occurred within
24   Horizon have led to defects or discrepancies.
25 Q. But in the first joint statement you indicated that you

                              128

1   were going to adopt a balanced approach. I fully
2   understand why you are looking at problems, and problems
3   which were relevant to branch account impact. I'm not
4   suggesting you shouldn't have done that. But if you are
5   engaging in a properly balanced approach you have to
6   explain the good things with as much care and clarity as
7   you explain the bad things. And what I would like to
8   suggest to you, Mr Coyne, is that you devoted much more
9   attention to talking about the bad things than you ever
10   did talking about the good things?
11 A. Yes, I will accept that is fair.
12 Q. And why did you do that?
13 A. Because my understanding of the instruction is to try
14   and identify the risks that are associated with bugs,
15   errors and defects, and there are many other issues, but
16   if they had an impact or could have had an impact on
17   branch account.
18 Q. But --
19 A. Sorry. So in order to do that you have to focus on what
20   actually happened, is my understanding, and then from
21   understanding what has actually happened understand what
22   the impact of it is.
23   Talking about all the nice things in Horizon that
24   happen in the high 90% of the time I don't believe
25   delivers any real value to my instructions.

129

1 Q. But in deciding whether or not a problem that arose in
2   Horizon actually had a branch impact, one of the things
3   that you have to consider is whether the countermeasures
4   that surround the Horizon system operate effectively or
5   not?
6 A. I absolutely agree with that --
7 Q. And you accept that, don't you? You accept that it is
8   relevant to the judgment of robustness as to how good
9   the countermeasures were?
10 A. Yes. But the way to do that is to identify the fault in
11   the first place and then have a look at the
12   countermeasures, whether they were positioned correctly,
13   whether they worked or not.
14 Q. Can I suggest to you, Mr Coyne, that that's not what you
15   did in your first report at all. Most of your first
16   report was devoted to problems that actually didn't
17   relate to branch impacts at all, and when you did talk
18   about problems that related to branch impacts you didn't
19   consider whether the full panoply of countermeasures
20   would have corrected or reacted to or identified the
21   branch impacts you were talking about?
22 A. That could well be to do with not having all of the
23   documents that was requested at the time.
24 Q. Well, you didn't do it in your second report either, did
25   you? You did the same thing. It was more of the same

130

1   in your second report, wasn't it?
2 A. I don't believe that's the case, no.
3 Q. So you are suggesting in your second report you did
4   consider how good the support process was and you did
5   consider, where you had identified a bug that may have
6   a branch impact, you did consider the extent to which it
7   was likely that that impact would have been identified
8   and sorted out?
9 A. I spend a large amount of the second report addressing
10   specifically the countermeasures that Dr Worden raises,
11   paragraph by paragraph.
12 Q. And your overall view of those countermeasures, bearing
13   in mind that your judgment now is that Horizon is
14   relatively robust, yes?
15 A. Mm.
16 Q. Your overall view of those countermeasures is that they
17   are relatively good, yes?
18 A. I think it is a danger looking at them in the overall
19   because there is a number of them that I don't believe
20   are good. But broadly, if the countermeasure is
21   positioned correctly, in the vast majority of occasions
22   they should work.
23 Q. What I would like to suggest to you, Mr Coyne, is that
24   it follows from your overall judgment that Horizon is
25   relatively robust now. It follows that overall your

131

1   assessment of the countermeasures that Dr Worden has
2   identified is also that they are relatively good. Would
3   that be fair?
4 A. Yes. Each of the countermeasures that Dr Worden has
5   suggested are in place and at some point in time have
6   been in place within Horizon. We don't know when they
7   were in place within Horizon on a number of occasions
8   but they have been in place.
9 Q. Please answer my question, and let me be clearer about
10   it because it is quite important. What I'm suggesting
11   to you is that it is part and parcel of your judgment,
12   your overall judgment that Horizon is relatively robust,
13   that the countermeasures operating together, the
14   countermeasures that are in operation in relation to
15   Horizon, that they are relatively good as well. It is
16   not your view that operating together, taken as a whole,
17   the countermeasures are of poor quality or that there's
18   anything wrong with them, is it?
19 A. No, it is not.
20 Q. I'm grateful for that frank answer. It is fair to say,
21   isn't it, that your overall judgment is that the
22   countermeasures together, there may be individual
23   instances where you are not so sure, but overall your
24   judgment is that those countermeasures work well in
25   Horizon?

132

1 A. Yes, but you can't disregard the fact that the system
2   has changed throughout the last --
3 Q. Just --
4 A. Sorry --
5 MR JUSTICE FRASER: Hold on a second, I would like to hear
6   the answer, and then you can either re-put the question
7   or follow on.
8   Go on, Mr Coyne.
9 A. We can't disregard the fact that the system has changed
10   over the course of the last 20 years and whatever the
11   countermeasures may be today, they will likely be
12   different in Horizon Legacy, different countermeasures,
13   possibly the same aspiration to catch defects at certain
14   point in time, but they will be different, they will be
15   constructed differently and they will be positioned
16   differently. So we can't --
17 MR JUSTICE FRASER: Mr Coyne, just pause there. All right.
18   Mr de Garr Robinson is going to re-put his question if
19   he wants to.
20 MR DE GARR ROBINSON: I am. I'm talking about the period of
21   time relating to the current configuration of Horizon
22   and going back in time until the point in time after the
23   initial teething problems were resolved. You understand
24   what I mean?
25 A. All the way back to --

133

1 MR JUSTICE FRASER: Can we use years?
2 MR DE GARR ROBINSON: Let's go back to 2012 for the sake of
3   argument to make it safe, because I think that is a year
4   you suggested. So from 2012 to 2019 your view is that
5   Horizon is and has been relatively robust, correct?
6 A. Yes, I would say that, but I would be very clear that
7   robust does not mean that it hasn't suffered
8   significant --
9 Q. Everybody is agreed that robustness doesn't mean
10   perfect.
11 A. That's fine then, yes.
12 Q. Which is the point you are trying to make, is that
13   right?
14 A. Yes.
15 MR JUSTICE FRASER: What word were you going to add after
16   "significant", just out of interest?
17 A. Defects that have continued throughout the period.
18 MR DE GARR ROBINSON: So during that period, 2012 to 2019,
19   your judgment is, and you feel capable of making the
20   judgment, that Horizon is and has been relatively
21   robust, correct?
22 A. Yes.
23 Q. Now that judgment includes a judgment not only about the
24   electronic systems and so on, it includes a judgment
25   about everything including the countermeasure processes

134

1   surrounding Horizon, correct?
2 A. Yes. There has to be a number of caveats about that and
3   I explained before that I don't really know what happens
4   within Post Office to correct defects if Fujitsu has
5   spotted them. So I can't comment really on what that
6   process would be.
7 Q. But in relation to the -- nonetheless you have
8   sufficient information to allow you to form an overall
9   judgment as to robustness and your judgment is that
10   during that period the system itself and the
11   countermeasures around it were relatively robust?
12 A. Yes.
13 Q. The reason why I ask you that -- and just to be clear,
14   the same is true of the period Legacy Horizon, shall we
15   say from 2001 to 2010, would that be a fair period?
16 A. Yes. Perhaps one year after that.
17 Q. Okay, 2002 to 2010. During that period your view is
18   that Horizon was relatively robust?
19 A. Yes.
20 Q. And that included the countermeasures surrounding it and
21   supporting it?
22 A. Yes.
23 Q. My question to you, Mr Coyne, and we will be coming to
24   countermeasures later, but it is quite a striking fact
25   that if you read the section of your report that

135

1   addresses countermeasures, your second report, it goes
2   over dozens and dozens and dozens of pages in your
3   section 5 -- and as I say, we will come to it -- there
4   is no hint of your judgment that overall the
5   countermeasures during those periods have operated --
6   have been relatively good. Why is that?
7 A. I don't know. It certainly wasn't a conscious decision
8   to leave anything out, and --
9 Q. Could I suggest to you -- I'm sorry, I'm interrupting
10   you.
11 A. Sorry. And because I have found bugs, errors and
12   defects throughout that period, that is an illustration
13   that however good the countermeasures were, that they
14   were overcome at various points.
15 Q. We will come to that, I will be asking you quite a few
16   questions about whether the countermeasures were
17   overcome by the bugs that you have identified. But my
18   question to you, Mr Coyne, remains that you are quite
19   happy to go on at great length about how much you
20   disagree with Dr Worden and about all the problems you
21   found in relation to countermeasures. Nowhere do you
22   actually say what you have very fairly said to me in the
23   last half hour, namely that the countermeasures actually
24   during those long periods of time have worked quite
25   well. Why would you not say that given that you want to

136

1   give a balanced view?
2   A.   I believe the view that I have given in the reports is
3   balanced --
4   Q.   Where -- I'm so sorry, I'm speaking too quickly. Please
5   carry on.
6   A.   I don't see that utilising many pages of text to talk
7   about the various aspects of Horizon's countermeasures,
8   which may well be similar to how Dr Worden set them out,
9   they may well operate in much different ways, we don't
10   really know, but we can observe that they are likely to
11   operate in those ways. I do not see there is a great
12   deal of value when it is a fact, and what I believe the
13   court was asking in the Horizon Issues was to address if
14   it is possible that they have failed. So it is the
15   failure side of it.
16   Q.   I see. So you regarded it to be your job to indicate to
17   the court whether there were occasions on which Horizon
18   had failed. That was the essential endeavour that you
19   were engaged in when addressing Horizon Issues 1, 3, 4
20   and 6, was it?
21   A.   I believe that a number of those Horizon Issues ask that
22   specifically.
23   Q.   Didn't those issues ask specifically how likely -- what
24   was the extent of the likelihood of problems occurring
25   in Horizon so as to cause problems in --

137

1   A.   Yes --
2   Q.   -- branch accounts?
3   A.   Yes, that is right, but that doesn't ask for me to point
4   out a list of all the possible countermeasures.
5   Q.   But isn't it relevant to the judgment as to overall
6   likelihood how well the countermeasures work? I mean
7   Dr Worden recognised that was the position, that's why
8   he spent so many pages of his report explaining the
9   architecture of Horizon, explaining how the systems
10   worked and explaining how they operated in relation to
11   each other. Then in your response, in your second
12   report, what you did -- what I suggest that you did is
13   you sat in your armchair and took pot shots at various
14   points that he made without giving any sense as to
15   an overall judgment as to whether he was right or not
16   that the countermeasures did work relatively well?
17   A.   No, I don't believe I did that. What I did was I looked
18   at the entire landscape of Horizon's operation,
19   identified the percentages were -- there were weaknesses
20   within the process, and then focused on that
21   specifically to find out whether there had actually been
22   any bugs, errors and defects, and then looked at why the
23   countermeasures or controls may or may not have worked
24   after that bug, error or defect had triggered. Because
25   the key is how the system operates when it doesn't

138

1   operate properly, not how to operates when it does
2   operate properly.
3   Q.   I have been side-tracked, I have allowed myself to be
4   side-tracked.
5   We were going to look at page {D2/1/77} of your
6   first report and I'm about to ask you a question about a
7   paragraph on this page. The starting point of the
8   question is that you agreed with me that your judgment
9   is that Horizon, both Horizon Online and indeed
10   Legacy Horizon, for much of its life has been relatively
11   robust?
12   A.   Mm.
13   Q.   If we go to paragraph 5.88, you say:
14   "In my position as an expert I am unable to estimate
15   the level of the Horizon system's robustness. Given the
16   size and age of Horizon, I would however make the expert
17   assumption (based upon systems of similar magnitude),
18   that there are not many people who could. The sheer
19   enormity of the task to garner a thorough understanding
20   of the code which would be required to estimate
21   robustness is, in my opinion, nearly impossible."
22   So here you seem to be saying that it is actually
23   not possible to assess whether Horizon is robust or not?
24   A.   No, to come up with a number. When I say the level, I'm
25   talking about a particular number or a percentage or

139

1   a ... (Pause)
2   Q.   So what you are suggesting is that you don't have -- in
3   order to make an absolute judgment, to give an absolute
4   number of robustness, you would need to look at all the
5   code and look at everything else, is that right?
6   A.   Yes, because there may well be a defect in the code on
7   one day which has a problem that eludes countermeasures,
8   and that code may then be fixed so it is in a different
9   position on day one than it is on day two.
10   Q.   And you are saying that kind of enquiry is necessary in
11   order to make an absolute judgment of robustness?
12   A.   In order to make an absolute judgment, yes.
13   Q.   But it is not required in order to make a relative
14   judgment of robustness?
15   A.   Yes.
16   Q.   I would like you to explain why that would be the case.
17   Why would it not also be needed for a relative judgment
18   to be made, to benchmark against industry standards?
19   A.   Because with a relative judgment you are considering all
20   factors in the round and it is still very subjective but
21   it is across multiple different factors that are
22   improving or getting worse.
23   Q.   I understand you when you suggest that to make
24   a judgment about robustness involves an overall
25   assessment. That I understand. But my question to you

140

1   is why is it necessary to look at the code and look at
2   absolutely everything to engage in an impossible task to
3   make an absolute assessment of robustness, when it is
4   not necessary to do that in order to make a relative
5   assessment of robustness? I would just like you to
6   explain that if you could.
7 A. There is a number of different ways of assessing
8   robustness. By looking at the code at any one point in
9   time you could establish whether there are any bugs,
10   errors or defects in there. It would be a near
11   impossible task but it could be done depending on how
12   big the code base could be.
13 Q. How would it be possible? Just as testing is never
14   perfect. You have a set of code and you are about to
15   release it into live operation but you have to test it
16   first, you can test it as many ways as you can but you
17   are never going to spot every problem in it.
18 A. No, but --
19 Q. Are you suggesting that for the purposes of determining
20   whether a code is robust you could look at the code and
21   perform that judgment?
22 A. Yes, you certainly could look at the code and perform
23   that judgment because what you can do, and this has
24   often happened in the aircraft industry, they have
25   multiple different operating systems that control

141

1   different devices. So if there is a catastrophic
2   failure of one piece of code another piece of code will
3   take over.
4   So if by looking at the code you can establish that
5   is in there, then you can give a view of that being
6   completely robust, because if it fails in its entirety
7   there is another solution that can take over. So that
8   is how I can illustrate the code example.
9 Q. This is the last question I will ask and then I will
10   move on. If you are forming a judgment as to the
11   robustness of a system, don't you need to have regard to
12   the way it operated in operation?
13 A. Yes.
14 Q. Isn't that what you should be looking at, not millions
15   of lines of machine code? You are looking at how it
16   operates in practice, looking at how the countermeasure
17   operates and forming an overall judgment as to the
18   efficiency of the operation, aren't you?
19 A. That could be one part of it, yes.
20 Q. Wouldn't that be sufficient? Wouldn't be all you needed
21   to do?
22 A. No, because you will almost certainly be able to
23   identify a scenario where somebody or many people will
24   operate the system, the Horizon system, throughout
25   a year, or possibly even throughout the entire life

142

1   cycle of Horizon, and will never experience one problem
2   at all because they will not trigger the unusual
3   circumstances that unearths a bug. So if you went and
4   studied that one person you would ultimately conclude
5   the system is absolutely robust. I have watched this
6   person do 10,000 transactions per year for ten years and
7   it has never had a problem.
8 Q. What I'm attempting to explore with you, Mr Coyne, is
9   your attempt to explain why it is that on the one hand
10   you have reached your judgment that Horizon is
11   relatively robust, but on the other hand you can't form
12   a judgment on the level of robustness without looking at
13   all the code. You have suggested that it is to be
14   explained because one is a relative judgment whereas the
15   other one is an absolute judgment. And I'm asking you,
16   if it is necessary to look at the code in order to make
17   a decision about robustness, why isn't it equally
18   necessary to look at the code when making a judgment
19   about relative robustness? And I don't understand why
20   the distinction between relative and absolute robustness
21   should make the slightest difference.
22 A. Because we can look at the rest of the industry in
23   either banking or point of sale or stock control or all
24   the different factors that make up Horizon and look at
25   the types of defects that are seen in those industries

143

1   and that are tolerated in those industries and the
2   impact of those failures within those industries and it
3   is through that lens that I have said that Horizon is
4   robust relative to those other industries.
5 Q. Well, could I suggest to you, Mr Coyne, what you are
6   doing in your first report, in indicating that Horizon
7   is robust then suggesting that it isn't, then suggesting
8   it is impossible to tell that it is robust, what you are
9   trying to do is to devalue the judgment that you have
10   very fairly and very honestly made that Horizon is
11   robust. What you are trying to do in your report is to
12   give a negative impression, which is not balanced but is
13   designed to achieve a conclusion?
14 A. That's certainly what I was not trying to do, no.
15 MR DE GARR ROBINSON: Very well.
16   My Lord, is this a convenient moment?
17 MR JUSTICE FRASER: If it is convenient to you. Is it?
18 MR DE GARR ROBINSON: Yes.
19 MR JUSTICE FRASER: You are moving on to a new subject,
20   right.
21   We are going to have a short 10-minute break. The
22   usual rules apply. 3.20 pm.
23 (3.12 pm)
24   (A short break)
25 (3.24 pm)

144

1   MR DE GARR ROBINSON: Mr Coyne, before the break I was
2   suggesting to you that in your first report you were
3   seeking to give a negative impression about Horizon that
4   was not consistent with your genuine view that Horizon
5   was relatively robust and you have answered those
6   questions.
7   But I'm now going to explore another aspect of that
8   which is that in your report you display more interest
9   in pointing out the problems you found with Horizon than
10   with actually giving a fair assessment of the overall
11   position of Horizon and my questions for the rest of
12   this afternoon will be looking at that question.
13   I don't have time to take you to more than a few
14   examples which is unfortunate because there are so many
15   of them in your report. And that is a problem that
16   arises in cases of this sort. The documents you refer
17   to in your report, in fact both your reports, are often
18   long and involved with substantial complexities.
19   Do you accept that where an expert is referring to
20   a great number of documents of this sort which are all
21   being presented as supporting a view, giving
22   an impression of a certain state of affairs, it is
23   incumbent on the expert to ensure that he or she deals
24   with the document scrupulously fairly so as to avoid
25   giving any risk of a false impression?

                                145

1   A. Yes.
2   Q. Counsel won't have time to cross-examine the expert on
3   all of them, and the judge certainly won't have time to
4   go through all of them with a fine-tooth comb in his or
5   her own chambers afterwards, will they? So a judge is
6   relying on the expert to discharge their duty to ensure
7   that a fair view is being given of any document being
8   referred to.
9   A. Yes.
10 Q. Now, do you think you have done that in your reports?
11 A. Yes.
12 Q. The documents you've referred to in your reports, and
13   there are a great number of them, have you considered
14   them all carefully yourself before explaining the
15   inferences you draw from them or the constructions you
16   put upon them?
17 A. That was certainly my aim in including the documents in
18   the report, yes.
19 Q. Well, let's deal with a few examples. As I say, I can
20   only deal with a few. First of all, cost benefit
21   analysis. This is a theme of both your reports, that
22   bugs in Horizon are diagnosed and fixed on a cost
23   benefit basis. Is that right?
24 A. There is certainly reference within the documents about
25   looking at bugs and fixing them on a cost benefit basis.

                                146

1   Q. There is a claim made in both your reports that where
2   bugs that are known to cause shortfalls, those bugs will
3   not be diagnosed and fixed on a cost benefit basis by
4   Fujitsu, essentially?
5   A. Yes, and I think that that was one of the agreements
6   that Dr Worden and I arrived at in one of our joint
7   statements.
8   Q. We will talk about the joint statements in a moment.
9   I am sure you will agree that it is inevitable that
10   every business will take some decisions on a cost
11   benefit basis?
12 A. Yes, that is true. It must be considered here that
13   there is a different dynamic here between the user of
14   the system and the people who fix the defects. In
15   an organisation they may have their own internal
16   programmers and therefore they may not fix things on
17   a cost benefit analysis basis. If you have
18   a development team that's not your own resources but you
19   are paying for those resources then there could be
20   a different dynamic at play there.
21 Q. The point you are making you are applying to the fixing
22   of bugs in Horizon. You are saying, correct me if I'm
23   wrong, that the support process provided by the SSC
24   allowed relevant bugs to remain in the system in order
25   to save money?

                                147

1   A. Yes, and there is certainly a reference within
2   a document to that view being taken.
3   Q. Let's see how you develop the point. If we could go to
4   your first report {D2/1/27}, please. This is
5   paragraph 3.15:
6   "There are a range of measures and controls existing
7   in Horizon each designed to prevent, detect, identify,
8   report and reduce the risk of several multifaceted
9   errors. It is likely that during the life of Horizon
10   system that these measures and controls improved. It is
11   also reasonably likely that in the majority of cases the
12   measures and controls were successful."
13   Stopping there, Mr Coyne, I need to correct
14   something I put to you before the break.
15   I put to you that there wasn't a hint of anything
16   positive said about countermeasures in your report.
17   That's not fair. There are in the report a number of
18   occasions -- a number of sentences of this sort which
19   could be said to be positive statements. What I would
20   suggest to you, however, is that that sentence is
21   a dramatic understatement of the positive view that you
22   have of the Horizon countermeasures?
23 A. I don't believe that's the case. It is correct there is
24   a range of measures and I explain what they are designed
25   for.

                                148

1 Q. In the majority of cases. Your view is that it is only
2   in a fraction of a percentage of cases that these things
3   don't work, isn't that right? Isn't that what you said
4   to me this morning?
5 A. I said it would be a fraction, yes.
6 Q. A fraction of a percentage.
7 A. Yes, it is likely a fraction of a percentage.
8 Q. Very good.
9 A. But I do actually say there it is likely that during the
10   life of Horizon the measures and controls improved and
11   that in the majority of the cases the controls were
12   successful.
13 Q. Let's move on to the next sentence, Mr Coyne, because
14   having said that positive thing, which as I have
15   suggested to you is a dramatic understatement of your
16   actual view, you then immediately try to undermine even
17   that view because you then say:
18   "However, there is also evidence to indicate that a
19   cost/benefit analysis was applied to the fixing of
20   bugs/errors/defects and that the possibility of error
21   was not reduced as far as possible."
22   So you're saying, well, countermeasures are applied
23   in -- are likely to apply most of the time, but there is
24   this problem. And you are suggesting there is a problem
25   in the support process because the support process --

                          149

1   that's Fujitsu, the SSC -- appears only to have fixed
2   bugs on the basis of a cost benefit analysis.
3   You do see that that's what you are trying to do.
4   You are trying to weaken your positive statement in the
5   previous statement even further by relying on this cost
6   benefit and basis claim, is that right?
7 A. No, I'm trying to provide the full picture and context.
8 Q. By your use of the word "However", you are setting this
9   up as undermining even the limited positive statement
10   that you make in the previous sentence, aren't you?
11 A. No, I'm setting out that after making that statement you
12   have to consider what follows.
13 Q. You repeat this point in the third joint statement and
14   you refer to it half a dozen times in your second
15   report, don't you?
16 A. I do, but it is important because the question that was
17   asked was: was it reduced as far as possible?
18 Q. I'm sorry, where is that asked?
19 A. It is one of the Horizon Issues.
20 Q. I see.
21 A. So when you consider "as far as possible", cost benefit
22   shouldn't really be involved in that consideration. It
23   should be whatever is possible.
24 Q. Let me carry on with this line. What I understand you
25   to be saying here is that there is evidence that bugs

                          150

1   which had or may have had a non-transient effect on
2   branch accounts were sometimes not resolved on the
3   grounds that the costs to Fujitsu or the Post Office
4   outweighed the benefit to the subpostmasters. Is that
5   the claim you are making?
6 A. Yes, that's certainly what I have got from one of the --
7   there's certainly a document, I am sure I make
8   a reference to it, where there is a number of bugs or at
9   least one bug that's considered. The impact of that is
10   that it very rarely occurs and therefore it is not worth
11   investing the money in fixing it.
12 Q. Let's see how you do support it in your first report,
13   shall we? If we go to page {D2/1/97} at paragraph
14   5.161, you say:
15   "Whilst both Horizon and Horizon Online contain
16   a number of measures and controls designed to check
17   system integrity, these mechanisms have been shown to
18   have failed. This is a point agreed upon in the joint
19   statement. It has been identified that known
20   issues/bugs were often deferred and dealt with on a
21   cost/benefit basis."
22   Here you have actually increased the scope and, if
23   I may say so, ambition of the claim. You are now saying
24   it happened "often". Is that your considered view of
25   the documents you have seen?

                          151

1 A. Could I just turn back, please, to the paragraph before?
2 Q. Of course. {D2/1/97}
3   (Pause)
4 A. It might be unfair for me to say "often".
5 Q. I'm going to come to whether it is unfair, Mr Coyne, but
6   first of all I'm going to ask you to analyse the
7   evidence that you rely on in support of the claim.
8   Because it is fair to say you are not saying it happened
9   once or twice over 20 years, you are saying it said it
10   happened "often", and over a 20-year period "often"
11   would usually mean dozens if not, in the context of
12   Horizon, hundreds of times. Would you agree with that?
13 A. No, I would take "often" to be ten or 15 times.
14 Q. So ten or 15 times over 20 years, you think it is fair
15   to describe that as "often", without bearing in mind the
16   context of a system which has undertaken something like
17   49 billion transactions during that period. 10 or 15
18   times as opposed to 49 billion transactions?
19 A. But this doesn't relate to the number of transactions,
20   does it? It relates to changes to the system. I do not
21   think the two correlate.
22 Q. Is it your claim then that your understanding of the
23   documents you have read is that there have been 10 or 15
24   occasions when a decision has been made not to fix a bug
25   on a cost benefit basis. Is that your understanding of

                          152

1   the evidence you have seen?

2 A. There are certainly a number of them. It might be

3   incorrect of me to say "often". There are certainly

4   a number of them.

5 Q. Well, I'm going to suggest to you, just so you

6   understand where I'm coming from, Mr Coyne, that the

7   evidence gets nowhere near anything like that and that

8   if you didn't know it, you certainly ought to have done.

9   So you can expect some questions from me about that.

10   You repeat the claim in paragraph 5.199 at page

11   {D2/1/108} where you say:

12   "Whilst both Horizon and Horizon Online contain many

13   measures and controls for ensuring system integrity,

14   these mechanisms do/have failed. It has been identified

15   that known issues/bugs were often deferred and dealt

16   with on a cost/benefit basis."

17   So you repeat the word "often". This is a theme of

18   both your reports, isn't it, that this is something that

19   happened on a regular basis?

20 A. It is certainly something that has happened and I have

21   noted on a number of occasions.

22 Q. If we go to page {D2/1/98}, in support of the claim

23   that's made in 5.161 you give one piece of evidence and

24   that's a risk and compliance meeting minute of

25   18th September 2013.

153

1 A. Mm.

2 Q. Let's look at the minutes. The bundle reference is

3   {F/11/40}.

4   (Pause)

5 MR JUSTICE FRASER: Sorry, it is {F/1140/1}.

6   While the operator is doing that, I think this is

7   one of them that was subject to the review. But it

8   doesn't matter, this isn't a specific point on that.

9   But insofar as you review documents and produce versions

10   less redacted, can someone just make sure that the more

11   up to date version goes on the database rather than the

12   original one?

13 MR DE GARR ROBINSON: My Lord, yes. All the lesser redacted

14   versions I think are certainly in the trial bundles.

15   I stand to be corrected if that's not right. I don't

16   believe this is one of them --

17 MR JUSTICE FRASER: This might not be one of them.

18 MR DE GARR ROBINSON: -- in any event.

19   You will see, Mr Coyne, this is dated

20   18th September 2013, it is the Post Office Risk &

21   Compliance Committee.

22 A. Mm.

23 Q. And what you rely on is at page {F/1140/3}. So this is

24   what you are relying on in support of your contention

25   that bugs were fixed -- often fixed on a cost benefit

154

1   basis:

2   "Discussion:

3   "It was reported that following the recent

4   Ernst & Young external audit four risks been identified.

5   Three of the risks raised had been addressed however the

6   final risk, relating to the communication by Fujitsu of

7   changes made to the Horizon system, was still

8   outstanding.

9   "It was identified that it would cost over

10   £1 million to implement the mitigation being suggested

11   by the audit and that this was not proportionate to the

12   risk being managed."

13   So certainly an example of a cost benefit analysis

14   being applied.

15   "Decisions.

16   "The Committee agreed that the risk be accepted with

17   Dave Hulbert as the owner and Lesley Sewell being

18   ultimately responsible."

19   So that's the evidence you rely on for your

20   proposition.

21 A. That --

22 Q. And as you say in paragraph 5.161, Ernst & Young had

23   identified four risks. Three have been addressed but

24   the final would cost over £1 million to mitigate.

25   If we look at the risk itself, that is in

155

1   {F/1127/1}. This is a paper for the Risk & Compliance

2   Committee, and if we look at the background,

3   paragraph 2:

4   "2.1 The 2012/13 Ernst & Young IT audit found no

5   significant exceptions but did identify a small number

6   of improvement opportunities. Four high level

7   improvement opportunities were recorded. Three have

8   progressed and are either complete or in the process of

9   completing. For one, IT&C believe we have sufficient

10   process and mitigation in place to accept this risk.

11   This paper is to highlight this decision to the Risk &

12   Compliance Committee."

13   The next paragraph reads:

14   "2.2. The specific observation was with regard to

15   Change Management Monitoring control. The actual

16   observation read 'Management should make use of a system

17   generated list of changes in performing the monitoring

18   control to further enhance its effectiveness'.

19   "2.3 The risk being that changes may be made to the

20   system that are not approved and not found through

21   monitoring."

22 A. Yes.

23 Q. So what's being said here is there needs to be

24   a change -- or what's being suggested is that it would

25   be an improvement to the system if the change controls

156

1   applied within Post Office were made automatic so that
2   every time a change was being made to the system, this
3   would be automatically notified, electronically notified
4   to Post Office that it was happening. Do you see?
5 A. This is a very important aspect. So what this is saying
6   here is the current situation is that Fujitsu will make
7   a change to the Horizon system and it is not clear
8   whether Post Office will have either approved that
9   change or will be aware that that change has been made.
10   There is a weakness in the process that needs to be
11   addressed.
12   Now, on the basis --
13 Q. Wait, can I stop you there for a moment. Are you
14   suggesting Ernst & Young were saying there was
15   a weakness in the system that had to be addressed?
16 A. They are saying there needs to be a change to the -- a
17   change to the management monitoring control.
18 Q. Look back at paragraph 2.1, Mr Coyne:
19   "The 2012/13 Ernst & Young audit found no
20   significant exceptions but did identify a small number
21   of improvement opportunities."
22   Even looking at this document you can see that the
23   characterisation you have just adopted is simply not
24   right. These are improvement opportunities. These are
25   not problems that need to be addressed, are they?

157

1 A. From the text that's being said there about the changes
2   that need to be made then they are important.
3 Q. That's your judgment, is it?
4 A. Yes.
5 Q. It is not said anywhere that I have seen. Have you seen
6   it said somewhere in one of the documents?
7 A. I believe that there is more of an Excel spreadsheet
8   type layout to this document because this is the minutes
9   of the meeting that reviews the observations from
10   Ernst & Young. There is another Excel spreadsheet where
11   I think Ernst & Young provide their output.
12 Q. I see. So you are suggesting there is an Ernst & Young
13   document which doesn't suggest that this is
14   an improvement opportunity, it actually suggests it is
15   a real problem that needs to be addressed, is that your
16   contention?
17 A. Yes, I believe it sets out --
18 Q. Very good.
19 A. Sorry, I believe it sets out more context than what is
20   included here.
21 Q. When you wrote paragraph 5.161 you had read this
22   document, had you?
23 A. Yes.
24 Q. If we look at paragraph 3, I think you suggested before
25   that Post Office didn't know what changes were being

158

1   made and that's why it is so important. Is that your
2   logic?
3 A. Yes. What this is saying here is that there is a risk
4   that changes are made without being adequately informed
5   to the Post Office.
6 Q. We see the existing system described in paragraph 3:
7   "The Post Office Service Management team currently
8   monitor IT system changes on a monthly basis by cross
9   referencing known and approved changes against a list
10   produced by Fujitsu. E&Y observed that this could be
11   enhanced ..."
12   "Enhanced", not this is a serious problem that needs
13   to be remedied, they use the word "enhanced".
14   "... if the list was generated by the IT system
15   rather than by change records."
16   It is a relatively modest enhancement, isn't it,
17   wouldn't you agree?
18 A. I believe this is pointed out because there is the
19   possibility that the change records, which are a human
20   created document, may not have been completed adequately
21   and it would be better to have it flagged up that if the
22   system changes, an automated message goes to the
23   Post Office that the system has changed rather than rely
24   upon a paper system.
25 Q. We can all agree it would be better Mr Coyne.

159

1 A. Yes.
2 Q. The question is how serious the problem is that the
3   existing monitoring system is being applied.
4   If you look at the next paragraph:
5   "IT service management engaged with Fujitsu to
6   understand how this could be achieved and it was
7   concluded a very difficult and potentially expensive
8   approach to adopt this as all changes are recorded as
9   'events' within the IT system of which there are
10   multiple thousands per day with changes only being a
11   small percentage. The cost and difficulty in extracting
12   these specific change events on a regular basis would
13   outweigh the value in monitoring the change."
14   Do you see that?
15 A. Yes.
16 Q. One can see why someone might form that judgment, yes?
17 A. Yes, but if you break that down so that there are
18   multiple thousand a day, but the changes are only
19   a small percentage, so a small percentage of multiple
20   thousands is still quite a big number and that's changes
21   made to Horizon every day.
22 Q. Mr Coyne, you do seem to be deviating from the path that
23   I'm asking you questions about. We are not talking
24   about how many changes there were. We are simply
25   talking about how they are monitored and the existing

160

1   system is a human system for monitoring those changes

2   and what's being suggested is that it should become

3   an automatic system?

4 A. Yes.

5 Q. Then if we go over the page to {F/1127/2} the proposal

6   in paragraph 5 is:

7   "To continue with the existing process of monitoring

8   but to additionally raise this as a risk within IT&C and

9   to monitor any exceptions found through the existing

10   process. If exceptions are found then re-consider the

11   proposal from E&Y and assess the impact of the change

12   versus the benefit."

13   So a weighing up exercise is taking place and the

14   conclusion for the time being is: keep things as they

15   are but be aware of this potential improvement and

16   monitor in the meantime to see whether in fact it would

17   be a good idea to make it.

18 A. Yes.

19 Q. That's an entirely reasonable approach wouldn't you

20   agree?

21 A. Well, the approach is broadly saying let's carry on

22   doing what we do now and just look at it again in the

23   future.

24 Q. No. They are suggesting, first of all, carry on as we

25   are doing now which is a monitoring system. We have

161

1   a monitoring system; a suggestion is being made as to

2   how to improve it, but as well as carrying on with the

3   system, monitor the monitoring system to see if any

4   problems arise, if there are any exceptions and if there

5   are, then go back to the proposal of automatic

6   monitoring.

7 A. That is what it says.

8 Q. It is not possible for you sitting in your chair over

9   there to say that that was necessarily the wrong

10   decision, is it?

11 A. No, that's true.

12 Q. It is the kind of thing that a business would quite

13   sensibly want to do. They would like to assess whether

14   there is a problem or not before they spend such a vast

15   amount of money. You can't say that's intrinsically

16   unreasonable, can you?

17 A. No, it is not intrinsically unreasonable but it leaves

18   exposed a risk that could be dealt with but hasn't been

19   dealt with because of a cost benefit basis and that was

20   the observation that I made.

21 Q. But there is a much more important point, Mr Coyne,

22   which is that this has nothing to do with fixing bugs in

23   Horizon, does it?

24 A. Yes, it goes directly to fixing bugs in Horizon because

25   the changes that they are talking about making are

162

1   changes to Horizon.

2 Q. Mr Coyne, let me remind you of the sentence that you say

3   this document supports that's contained in

4   paragraph 5.161 of your expert report:

5   "It has been identified that known issues/bugs were

6   often deferred and dealt with on a cost benefit basis."

7   This proposal here and the decision that was made

8   from this proposal is not evidence of any known issue or

9   bug being deferred and dealt with in a cost benefit

10   basis, is it?

11 A. No. This isn't to do with the deferment of a bug, no.

12 MR JUSTICE FRASER: Mr De Garr Robinson, there is another

13   document that goes with this one and I'm slightly

14   concerned you might be putting some of your questions on

15   an incorrect basis. So just pause there one second.

16   If you could look at please -- and I don't want this

17   to go on the common screen -- {F/869/30}.

18   I don't want to set a hare running but I just feel

19   that if you look at {F/869/30} and then it is the third

20   column from the left and {F/869/31}, I think those are

21   the more detailed points that these conclusions you have

22   been taking the witness to go with. Now I might be

23   wrong.

24 MR DE GARR ROBINSON: I'm sorry, what am I supposed to be

25   looking at my Lord?

163

1 MR JUSTICE FRASER: The testing sample of 15 back end

2   changes, ten of which were in the counter and five of

3   which were manual. If you scroll down that column. Do

4   you have {F/869/30}?

5 MR DE GARR ROBINSON: Yes.

6 MR JUSTICE FRASER: If you start at that bullet point and

7   just read that column down to the bottom of that page

8   and then onto the next page leading to the conclusion

9   that begins "There is an increased risk …".

10 MR DE GARR ROBINSON: Based on a testing sample of 15 back

11   end changes?

12 MR JUSTICE FRASER: Yes, ten at the counter and 5 manual

13   changes. If you just read that column down to yourself

14   to the conclusion, "There is an increased risk …".

15   (Pause).

16 MR DE GARR ROBINSON: My Lord, yes. Is this the 2012/13

17   audit?

18 MR JUSTICE FRASER: No. I'll tell you what I'm going to do.

19   Mr Coyne could you go out for a minute please?

20 MR DE GARR ROBINSON: Is this the Ernst & Young management

21   letter of 2011?

22 MR JUSTICE FRASER: It is. Are you about to come onto it?

23 MR DE GARR ROBINSON: No, I'm not. This proposal~-- no I'm

24   not going into it.

25   (The witness withdraws)

164

1 MR JUSTICE FRASER: Hold on one second, Mr De Garr Robinson,
2 　　I am waiting for the witness to go out.
3 　　　　Now what would you like to say?
4 MR DE GARR ROBINSON: My Lord, this document relates to
5 　　a proposal for improvement that was made in the 2012/13
6 　　audit.
7 MR JUSTICE FRASER: I know.
8 MR DE GARR ROBINSON: My Lord I believe you are taking me to
9 　　the 2011 management letter.
10 MR JUSTICE FRASER: I know, but when the witness in part of
11 　　his answers to you says, "I think there is a document",
12 　　and he goes on to deal with it directly in his report
13 　　immediately after the passage you are asking him to, it
14 　　would help me hugely if you would make it clear with him
15 　　what the document is he says supports what he is saying
16 　　justifies his conclusion on the other document you are
17 　　putting to him.
18 MR DE GARR ROBINSON: I see.
19 MR JUSTICE FRASER: Do you see what I mean?
20 MR DE GARR ROBINSON: Yes. I must confess my focus was on
21 　　fixing bugs rather than his other answers.
22 MR JUSTICE FRASER: I entirely understand that. I'm just
23 　　faced with a witness who from time to time says: well,
24 　　there is a document, and it would be enormously helpful
25 　　to me if you could either, how shall I put it neutrally,

165

1 　　either get a tick in the box that that's a document or
2 　　a cross that there isn't such a document when you are
3 　　putting those questions to him.
4 MR DE GARR ROBINSON: I will try my Lord.
5 MR JUSTICE FRASER: I'm not saying --
6 MR DE GARR ROBINSON: Given the vast size of the bundles --
7 MR JUSTICE FRASER: I'm not saying you have to do it on
8 　　every single occasion, but on this particular occasion,
9 　　because the paragraph comes immediately afterwards, it
10 　　is much better to deal with it now than, for example,
11 　　store them all up until Friday evening at 4.30 when Mr
12 　　Green tries to re-examine him in ten minutes.
13 　　　　I'm attempting to explain to you why it is going to
14 　　be helpful to me.
15 MR DE GARR ROBINSON: Yes.
16 MR JUSTICE FRASER: Can we have the witness back in please.
17 　　　　　　(In the presence of the witness)
18 MR JUSTICE FRASER: Mr Coyne, don't read anything into that
19 　　at all. I just had to have an exchange about a
20 　　particular reference, that is all.
21 MR DE GARR ROBINSON: Mr Coyne, I have suggested to you that
22 　　this particular document has nothing to do with
23 　　deferring or not dealing with issues or bugs on a cost
24 　　benefit basis and I believe you have accepted that,
25 　　I hope you have. (Pause)

166

1 　　You have accepted that?
2 A. Yes, this particular document isn't about fixing bugs on
3 　　a cost benefit basis.
4 Q. You will have seen from the documents, these documents
5 　　that what was being considered by the Risk & Compliance
6 　　Committee was a proposal that was made in the Ernst &
7 　　Young audit of 2012/13 and we branched into that
8 　　question, although I must admit it wasn't a question
9 　　I was particularly interested in at that stage. But you
10 　　did say you thought you had seen a document. Is the
11 　　document you thought you had seen the one that's
12 　　referred to in 5.162 of your first report? That is at
13 　　{D2/1/98}. Might it be the Ernst & Young letter of
14 　　2011? Is that what you were thinking of?
15 A. Do you have that document?
16 Q. Yes. It is {F/869/1} that is the management letter. Is
17 　　that the document you were thinking of?
18 A. No, I think the way the document works is there is
19 　　a management letter and there is like a spreadsheet
20 　　version of the observations I believe.
21 Q. My learned friend is very kindly suggesting that it
22 　　might be at {F/1075.1/1}. Perhaps we can go to that.
23 MR JUSTICE FRASER: I think it is just a draft of the one
24 　　that I showed you.
25 MR DE GARR ROBINSON: This one is:

167

1 　　"IT component of management letter for the year
2 　　ended 31 March 2013".
3 　　　　Is that the document you had in mind?
4 A. Quite possibly. Can I just have a look at the --
5 Q. Perhaps we could scroll forward one page, first of all.
6 　　{F/1075.1/2}. There is an overview. Then there is
7 　　a series of detailed observations. Is that page 2?
8 　　　　There is a proposal about SAP payroll in paragraph 1
9 　　{F/1075.1/3}. In paragraph 2 a proposal about POLSAP
10 　　security parameters. If we go forward a page
11 　　{F/1075.1/4}. Paragraph 3, a proposal about POLSAP
12 　　again. Paragraph 4, "Change management monitoring
13 　　control".
14 A. Yes so that relates back --
15 Q. Is that what you were thinking of?
16 A. Yes. Sorry, can I just have a moment to read that to
17 　　remind myself. (Pause).
18 MR JUSTICE FRASER: If it doesn't jump out at you as the
19 　　document to which you were referring, please just say so
20 　　and Mr De Garr Robinson can move on.
21 A. This is certainly the document that the text in the
22 　　report refers to but there are documents that relate to
23 　　cost benefit analysis within I believe it is PEAKs.
24 MR DE GARR ROBINSON: That is entirely separate and I'm
25 　　going there, please don't think I'm going to leave you

168

1   out Mr Coyne. But when you said there was
2   a spreadsheet, is this the --
3 A. Yes, I think it is.
4 Q. I'm grateful. My Lord, I don't know if that assists
5   you?
6 MR JUSTICE FRASER: That's very helpful and I don't want to
7   knock you off your course or anything like that.
8 MR DE GARR ROBINSON: No, that's quite understandable.
9   So you have accepted that the evidence you cite for
10   the proposition "known issues" were often deferred and
11   dealt with on a cost benefit basis is no evidence for
12   that proposition at all. You have accepted that,
13   haven't you?
14 A. I accept that the reference that I have provided doesn't
15   go to a document that shows that but I have other
16   references that I will --
17 Q. You didn't have you -- say you think there is a PEAK and
18   we will come -- but you didn't have a PEAK in mind at
19   the time that you made your first report, did you?
20 A. Or I have not referenced it correctly when putting the
21   report together.
22 Q. Why is it you were able to give this example as evidence
23   of the claim that this often happened. How did it come
24   about? Did you not read the document --
25 A. No, there is more than one.

                          169

1 Q. Mr Coyne, you make a claim?
2 A. Yes.
3 Q. Then you immediately cite evidence in support of it?
4 A. Yes.
5 Q. And I'm asking you how it is you came to cite evidence
6   in support of it which is no evidence at all. Did you
7   not read the document?
8 A. I have certainly read the document. I believe it is
9   incorrectly referenced.
10 Q. What do you mean incorrectly referenced please, would
11   you explain that?
12 A. Yes. So I have had a note of the point of cost benefit
13   analysis and I have then searched for the appropriate
14   reference in my database of references and it looks like
15   I have referenced the wrong document, but it does
16   contain the words "cost benefit" and that's how the
17   mistake --
18 Q. Mr Coyne, isn't that exactly the sort of thing that you
19   accepted a few minutes ago that an expert should not do?
20   That it is incumbent upon an expert when citing
21   a document as evidence for a proposition to read the
22   document carefully to ensure that it is evidence for
23   that proposition?
24 A. Yes.
25 Q. Why did you not when going through your report read the

                          170

1   document carefully with a view to ensuring it was
2   evidence for the proposition?
3 A. With regard to this I have made a mistake in referencing
4   this document.
5 Q. Can I suggest to you that the mistake that you made is
6   that you were anxious to assert that fixes were deferred
7   and dealt with on a cost benefit basis and so what you
8   did was you found a document that talked about cost
9   benefit basis and you put it in?
10 A. I have found other documents but I have made a mistake,
11   I do accept that.
12 Q. Let's go forward to another document you cite.
13   I believe this is the only other document you cite in
14   your first report for this proposition. If we go to
15   paragraph 6.1 which is at page {D2/1/109}.
16 A. Sorry, I don't have that yet.
17 MR JUSTICE FRASER: Do you have your hard copy report in
18   front of you?
19 A. Yes, I do. Yes, I have that.
20 MR DE GARR ROBINSON: So is this evidence you have in mind?
21   Perhaps I could ask you to read paragraph 6.1 to 6.3.
22   (Pause).
23   Now in fairness to you you don't cite this document
24   as being in support of your claim that fixes were often
25   dealt with on a cost benefit basis, but was this

                          171

1   a document that you had in mind in supporting that
2   claim?
3 A. Yes.
4 Q. Well, let's look at that, shall we? The document is at
5   {F/1697/1}. This is called "Reconciliation and Incident
6   Management Joint Working Document". It is dated, the
7   current version, 18 March 2013.
8   If we could go forward to page {F/1697/9} of this
9   document to see its purpose. Perhaps I could ask you to
10   read section 1.1:
11   "What is a reconciliation?
12   "End to end reconciliation within HNG-X..."
13   That is Horizon Online, isn't it?
14 A. Yes.
15 Q. "... is the mechanism by which Post Office Ltd (POL) and
16   Post office Account (POA) establish which transactions
17   are complete and correct, and which are not. An
18   incomplete transaction is not necessarily a
19   Reconciliation error, but it might become one if it is
20   not completed in a timely manner. An incorrect
21   transaction is a Reconciliation error."
22 A. Yes.
23 Q. Over the page {F/1697/10}:
24   "Each and every reconciliation error is the result
25   of some system fault. That fault might, for example, be

                          172

1   a software bug fault (introduced through either design
2   or coding), a system crash, or a telephone line being
3   dug up. Such faults may affect transactions, thus it is
4   the job of Reconciliation Service to detect when and how
5   any transaction is affected by any system fault."
6 A. Yes.
7 Q. "A reported reconciliation error provides:
8   "A business impact in terms of an error report on
9   a transaction and;
10   "Evidence of a system fault that may need some
11   corrective action.
12   "It is acknowledged that not all system faults will
13   lead to corrective action as this is generally done on a
14   contractual and/or cost benefit basis."
15 A. Yes.
16 Q. So do you say that that is evidence for the proposition
17   that bug fixes in Horizon are dealt with or deferred on
18   a cost benefit basis?
19 A. Yes.
20 Q. What this document makes clear is that a system fault
21   has a very wide range of meanings, doesn't it?
22 A. Yes.
23 Q. On a fair reading it is a fault causing an error in the
24   systems by which transaction data are compared against
25   and reconciled with client transaction data?

173

1 A. Yes.
2 Q. It is a fault which it is the job of the reconciliation
3   service to investigate, to detect when and how the fault
4   was operated?
5 A. Yes.
6 Q. It is not a fault causing Horizon to have a false
7   transaction in the first place. That is the job of the
8   SSC to investigate, isn't it?
9 A. Yes.
10 Q. It is hardly surprising that the question whether
11   a system fault causing a reconciliation error is
12   corrected might involve a cost benefit analysis or
13   an analysis of who is responsible for what between the
14   client and the Post Office, is it?
15 A. I do not think the two go hand in hand. If you are
16   deciding whether to correct bugs on a cost -- sorry,
17   correct system faults, a subset of which is software
18   bugs or faults, depending on which is in the latest
19   version of the document, then you are deciding not to
20   fix those faults because it is either too expensive or
21   doesn't provide sufficient benefit.
22 Q. Mr Coyne, I'm suggesting to you that this document says
23   nothing about the approach adopted by the SSC to bugs in
24   Horizon causing discrepancies in branch accounts. Do
25   you not accept that?

174

1 A. Well, bugs in Horizon are fixed by Fujitsu.
2 Q. They are fixed by the SSC. They are not fixed by the
3   reconciliation service, would you accept that?
4 A. I don't believe that they are necessarily fixed by SSC.
5   I think they are identified by SSC.
6 Q. You are quite right, they are fixed by development when
7   the SSC passes it onto development.
8 A. Yes.
9 Q. But they are not fixed by the reconciliation service,
10   are they?
11 A. No they are not fixed by the reconciliation service but
12   the reconciliation service will report that there is
13   a problem; that will then be investigated and it will be
14   decided whether it is a software, bug or fault either
15   introduced through design or coding, whether it is
16   a system crash, whether it is a telephone line being dug
17   up. Somebody then will decide whether that system fault
18   should be fixed. But if it is a system fault that is
19   a software bug, it will be Fujitsu that fixes that even
20   though the fault might be found initially by the
21   reconciliation service.
22 Q. What I'm suggesting to you Mr Coyne is that you can't
23   reasonably infer that this passage of this working
24   document is talking about the SSC's and the fourth
25   tier's and the third tier's approach to the fixing of

175

1   bugs in Horizon?
2 A. I believe firmly it is. That's what it is saying.
3 Q. Very well. I suggest to you, Mr Coyne, that you
4   certainly can't infer that it was often decided by the
5   SSC or development not to fix bugs because the cost was
6   too great?
7 A. Well, what it actually says, this is generally done on
8   a contractual or cost benefit basis.
9 Q. If this were generally done there would be a significant
10   number of PEAKs recording that it had been done. It is
11   the kind of thing that would be recorded in a PEAK,
12   isn't it?
13 A. If the process is working properly, then it is likely
14   that there will be a PEAK identified for these, yes.
15 Q. If there were a significant number of PEAKs -- if this
16   were often done, there would be a significant number of
17   PEAKs evidencing the fact that it is done, correct?
18 A. There might only be one PEAK.
19 Q. Why might there only be one if it is often done
20   Mr Coyne?
21 A. Because if it becomes a problem that occurs repeated
22   times and there is a consideration of what the fix is,
23   Fujitsu won't raise tens or hundreds of PEAKs per day
24   all relating to the same fault. They will refer back to
25   the one single KEL that identifies the problem. That's

176

1   the purpose of PEAKs and KELs.
2 Q. If known issues are often deferred or dealt with on
3   a cost benefit basis, then there must be a significant
4   number of separate issues that are deferred or dealt
5   with on that basis; correct?
6 A. Yes.
7 Q. For each of those issues there will be at least one
8   PEAK, sometimes there will be more, considering that
9   aspect, yes?
10 A. There should be at least one PEAK or one KEL or probably
11   both.
12 Q. So if this is often done, there will often be known
13   issues in relation to which this is done so there will
14   often be PEAKs recording that this has been done;
15   correct?
16 A. No. If the fault is found again next week, Fujitsu go
17   back, they search for the reason for the fault, they
18   find that there is a KEL -- that is the purpose of the
19   KEL it is the knowledge base. So they will not then
20   raise another PEAK, they will see that it is going to be
21   fixed at some time in the future by that KEL.
22 Q. It may be you are not quite grasping the suggestion I'm
23   making to you. Are you suggesting that actually there's
24   only ever been one issue in relation to which this has
25   happened and that there's one KEL covering it happening

1   and therefore there will only be one PEAK covering it
2   happening, is that the logic of your position?
3 A. There is likely one KEL for every different
4   manifestation of the defect.
5 Q. Yes, so if it is being done often -- your claim is that
6   it is being done often -- then there will often be PEAKs
7   recording this decision being made. In fact there will
8   probably often be KELs as well, wouldn't there?
9 A. Yes but they don't duplicate a KEL every time a defect
10   happens.
11 Q. Mr Coyne, I'm struggling and it may be my fault. If
12   known issues are often dealt with on a cost benefit
13   basis, there must often be issues which are dealt with
14   on a cost benefit basis, correct?
15 A. Yes.
16 Q. And each of those issues will have their own KELs and
17   their own PEAKs, yes?
18 A. Yes.
19 Q. Perhaps I can put my point again. In circumstances
20   where we have a system in which Fujitsu often make
21   decisions to defer or not deal with known issues on
22   a cost benefit basis, there are going to be
23   a significant number of PEAKs and KELs recording that
24   being done, do you accept that?
25 A. I do but I do not think it is Fujitsu that is taking the

1   decision to do it on a cost benefit basis. If that is
2   the Post Office taking the decision then, yes, I agree
3   with that.
4 Q. Am I right in thinking that at the time you produced
5   this report you had not found any such PEAK because if
6   you had it would be in this report, wouldn't it?
7 A. I don't know whether I was aware of it at the time but
8   there are certainly PEAKs that talk about things being
9   deferred on a cost benefit basis, whether I had found it
10   at the time of this report or found it later I'm not
11   sure.
12 Q. I suggest to you, Mr Coyne, that you obviously hadn't
13   because if you had they would have been referred to in
14   this report, would they not?
15 A. Likely, yes.
16 Q. Right. So at the time you made this report is it likely
17   that you didn't know of any PEAKs in which this was
18   recorded, that your only evidence is the two documents
19   I have just taken you to?
20 A. This document is quite strong because it talks about the
21   corrective action generally being done on a cost
22   basis --
23 Q. Is it likely that when you made this statement the only
24   evidence you had to support it was the Risk and
25   Compliance committee meeting minutes and the document we

1   have just come to? I have had your commentary on
2   whether you think either of those documents is good
3   evidence. I'm simply asking you whether it is likely
4   that those were the only two pieces of evidence you had
5   at the time you made this report?
6 A. It is certainly possible that is the case, but I would
7   have to look at when the PEAKs arrived.
8 Q. You have just said there are PEAKs, plural, where this
9   has happened?
10 A. Yes.
11 Q. Now Mr Coyne I'm aware of one PEAK which might be said
12   to support a suggestion that there was one occasion on
13   which a cost benefit analysis was adopted and I'm going
14   to take you to it. It is referred to in your second
15   report. Are you aware of others that are not referred
16   to in your second report?
17 A. I believe there is more than one, yes.
18 Q. You clearly looked very hard for them. Would I be right
19   in inferring that that is the case? You looked very
20   hard for PEAKs to support this proposition, did you?
21 A. I don't believe there were any specific searches that
22   I conducted for that, no.
23 Q. So you didn't make any specific searches but you
24   stumbled over how many PEAKs to support the proposition?
25 A. A handful perhaps.

1 Q. I'm only aware of one, Mr Coyne. Might it be possible
2   for you to come to court tomorrow and tell me what the
3   others are?
4 A. Certainly, yes.
5 Q. Let's go to the one I'm aware of. Let's go to
6   {F/271/1}. This is a PEAK PCO120937. It is dated
7   20th May 2005. It is a customer call, at the top box of
8   the PEAK, details entered are:
9   "Summary: PM is stating that the system remmed out
10   some coin."
11   If we go down to the second line in the top box:
12   "PM is stating that the system remmed out some coin
13   its own and it produced no paper work, and they would.
14   Like to know if we can find out the Pouch number so they
15   can reverse it out."
16   Do you see that?
17 A. Yes.
18 Q. If we go over the page to {F/271/2} at 16th May, 12.01.
19   I won't read it out but you will see that Sarah English
20   is unable to recreate the problem. Do you see that?
21 A. At 12.01? Yes.
22 Q. Then if we go over the page to page {F/271/3} and this
23   time at the top of the page, 17th May, 13.55. This is
24   Gary Maxwell?
25 A. Yes.

181

1 Q. The last paragraph you will see he says:
2   "I have attempted to replicate this on our test
3   counter but could not abandon the session any other way
4   than by following the available menu options. In all
5   cases the session finished as expected without writing
6   any messages."
7   They can't recreate the problem, yes?
8 A. Yes.
9 Q. Often that's a reason for thinking that there may not be
10   a problem there. But often it may be that they are just
11   perplexed and one just doesn't know.
12   If one goes to {F/271/4} (Pause). 7.32 about three
13   boxes down, 13th June 2005. This is from Lionel Higman?
14 A. Higman I believe.
15 Q. Thank you.
16   "Is the frequency of occurrence for this problem
17   known? How severe are the problems caused? Is recovery
18   possible? Would it be sufficient to raise a KEL to
19   manage future occurrences more effectively?"
20   You see the question being raised there?
21 A. Yes.
22 Q. Then if you go down to 10.13. My note is terrible ...
23 A. 10.33 might be relevant:
24   "Gary advises development have found a potential
25   bug. They want to know the scale of the problem as there

182

1   is potential risk in changing the code."
2 Q. Right. Thank you. For some reason I keep typing a 1
3   instead of a 3 in my notes. The concern being expressed
4   by development here is risk from making a change. Do
5   you see that?
6 A. Well, found a bug and then there is associated risk with
7   making the change. There are two elements.
8 Q. If we go back. I'm sorry I went too fast. If we go
9   back to page 3.
10 A. There was 10.13 on there that might be helpful as well.
11 Q. I'm sorry Mr Coyne, what were you saying?
12 A. If we go back to the page that we were just on at 10.13,
13   at the bottom.
14 MR JUSTICE FRASER: On 15th June?
15 A. 15th June, yes.
16   "First instance, check the PEAKs. The impact on the
17   office is that they will have an amount posted to the
18   suspense account ... equivalent to the remittance
19   amount. This will be evident until remedial action is
20   taken."
21 MR DE GARR ROBINSON: Stopping there. What does that mean?
22 A. So the suspense account is going to be likely in
23   balance. It is going to have an impact anyway.
24 MR DE GARR ROBINSON: It means that the postmaster is going
25   to know very well what happened, isn't it?

183

1 A. Well, the postmaster will have a suspense account that
2   doesn't balance. I do not think they will know what's
3   happened but they might know what the impact is.
4 Q. At any rate they will know there is a problem that needs
5   to be addressed, yes?
6 A. Did the postmaster raise the call on this one? Did they
7   ring up in the first instance reporting the fault?
8 Q. I believe the passage I read you -- yes, postmaster is
9   stating the system remmed out some coins, do you
10   remember?
11 A. Yes.
12 Q. The postmaster knew exactly what had happened. And he
13   says {F/271/5}:
14   "There is nothing the PM can do to correct this. The
15   sensible recovery option is for the NBSC to issue an
16   error notice for the remittance amount as in this case."
17   So that had happened in this case it would seem?
18 A. Yes, so that is a correction on the accounts.
19 Q. What we now call transaction corrections.
20   "The alternative would be for SSC to create the
21   necessary Riposte messages to cancel out the error
22   (currently being tested).
23   "A KEL has been created on the back of this call and
24   will be updated shortly.
25   "Given the frequency of the problem & the apparent

184

1   risk involved in introducing a code fix the KEL should
2   be adequate."
3   Do you see that? What's being presented there by
4   Gary Maxwell is that it is a very low frequency problem
5   and there's risk involved in introducing the code fix.
6   Do you know why there is a risk involved in
7   introducing a code fix?
8   A. There's inherent risk in any change to a system. So
9   introducing any fixes to code brings a risk with it.
10   Q. So up until now the debate is about risk of doing
11   a change compared with the benefit of doing the change,
12   bearing in mind it is such a rare problem. Do you see
13   that?
14   A. Yes.
15   Q. Then if we go down to 11.28 we see Mark Scardifield.
16   This is where the word "cost" gets mentioned:
17   "Weighing up the cost and risk of an attempted fix
18   against the fact that this has only been reported once,
19   I do not believe that we should make a code fix. If
20   further incidents of this problem are reported we can
21   review this decision. Gary has raised a KEL, so
22   returning for closure as "Published Known Error".
23   Do you see that?
24   A. Yes.
25   Q. So what we have is a debate which largely revolves

185

1   around the risk involved in making a fix in this part of
2   the system?
3   A. Yes.
4   Q. And what Mark Scardifield does is he brings in the word
5   "cost"?
6   A. Yes.
7   Q. Do you say that this PEAK is evidence for the
8   proposition that decisions about fixing problems were
9   often made on a cost benefit basis?
10   A. It certainly does indicate that.
11   Q. It indicates that what's happened is that the parties
12   are concerned primarily with risk and on that basis they
13   decide that they will leave the problem as it is. It
14   doesn't support the notion that decisions are often made
15   on a cost benefit basis, does it?
16   A. It is another reference to decisions being taken on
17   a cost benefit basis.
18   Q. It is one instance. It is a PEAK where the word "cost"
19   is referred to?
20   A. Yes and the other document that we talked about, things
21   are generally done on a cost benefit basis.
22   Q. Let's look at the KEL that was created for this?
23   A. Before we move on, just for context, can we just read
24   the top column there because it talks about what the
25   possible remedial actions are.

186

1   MR JUSTICE FRASER: Which page?
2   A. F/271 and it is the one above 10.14.
3   MR JUSTICE FRASER: If you look to the right, is it page 5?
4   A. Page 5 because it talks there that the alternative would
5   be for SSC to create the necessary Riposte message to
6   cancel out the error.
7   MR JUSTICE FRASER: You are going to have to give us both,
8   Mr De Garr Robinson and me, the date and the time please
9   of where you are reading.
10   A. Certainly, it is the very top box. It is above
11   15th June 2005.
12   MR JUSTICE FRASER: The one in the pale green at the very
13   top?
14   A. Yes. It starts with "... remittance amount as in this
15   case."
16   But of interest is the alternative remedial action
17   to fix the accounts is:
18   "... would be for SSC to create the necessary
19   Riposte messages to cancel out the error".
20   That is the insertion of messages in Riposte which
21   is relevant to other aspects that we are talking about.
22   MR DE GARR ROBINSON: Thank you. Can we now look at the KEL
23   that was created for this fix because what I want to
24   suggest to you, Mr Coyne, is that the focus of this
25   decision or the main reason for this decision was risk.

187

1   If we could look to {F/276/1} please. This is the
2   KEL that was created?
3   A. Yes.
4   Q. It says:
5   "The PM was attempting to do a remittance out ADC
6   for a bag of coins. After entering an invalid bar code
7   for the particular type of transaction the session was
8   aborted by pressing the 'home' key."
9   Then:
10   "Firstly, during the remittance out process pressing
11   'home' should not be an available option. The only way
12   of completing the session is to navigate the screen
13   prompts & cancel the session or return to Desktop and
14   bin the item on the sales stack.
15   "By aborting the session in this way the EPOSS
16   remittance items on the sales stack were incorrectly
17   committed. Normally these messages are only committed
18   once a successful barcode has been scanned/entered & at
19   the same time as the LFS remittance out message."
20   Then there is some computing gobbledygook:
21   "The PM will not be able to reverse the transaction
22   using existing reversal (because of the tran type) or
23   will they be able to use the pouch reversal function (as
24   no pouch id exists).
25   "The suspense account will be debited/credited by

188

1   the amount of the remittance. The office snapshot/cash
2   account report will continue to show the remittance
3   amount under unclaimed payments."
4   Their solution. It refers to Atos, but Atos wasn't
5   on the scene in 2005. So I apprehend that one big
6   word-processing change was made when Atos was involved
7   many years later but it says:
8   "Solution:
9   "Development have identified a possible bug in the
10   counter code. However, due to the frequency of the
11   problem & the risks involved in making the necessary
12   changes it has been decided that a code change will not
13   be made. Raise a call on EDSC. In the one case to date,
14   an error notice was issued to the office for the amount
15   of the remittance."
16   What we have here is a debate in a PEAK about risk
17   where there is a reference to cost and then we have
18   a KEL that has been produced as a result of that debate.
19   That KEL does not refer to cost, it just refers to risk.
20   Do you suggest, Mr Coyne, that this document, this
21   KEL and this PEAK together, constitute evidence that
22   deferring and dealing with known issues were often dealt
23   with on a cost benefit basis?
24 A. It is certainly another document that indicates that
25   cost was a consideration in whether to fix.

                                189

1 Q. Well this is the only document of which I'm aware, PEAK
2   or KEL, in which this point has been made. You say that
3   you are aware of others?
4 MR GREEN: My Lord, I have tried to let it run but I mean in
5   that actual section of his report at 5.166 on page 99 he
6   actually specifies the other PEAK.
7 MR JUSTICE FRASER: Give me the reference.
8 MR GREEN: It is 5.166.
9 MR JUSTICE FRASER: No, the bundle reference.
10 MR GREEN: Sorry, {D2/1/99} which is the next page of his
11   report in the same section.
12 MR DE GARR ROBINSON: This is his second report?
13 MR GREEN: No, in the first report where we were dealing
14   with the Ernst & Young stuff and you put to him only
15   documents and so forth, and in 5.166 he specifically
16   mentions a PEAK. It was put to him he hadn't looked at
17   any.
18 MR JUSTICE FRASER: Is this the one at {F/275.1/1}?
19 MR GREEN: It is my Lord, yes.
20 MR JUSTICE FRASER: Yes. Mr De Garr Robinson, I'm very
21   happy for you to look at that and resume with it in the
22   morning or do it now?
23 MR DE GARR ROBINSON: No, my Lord, I'm content to break
24   today.
25 MR JUSTICE FRASER: Okay. So Mr Green what was your point

                                190

1   on the way the question was put that it is the only
2   document?
3 MR GREEN: When you look back across the transcript --
4 MR JUSTICE FRASER: The transcript says --
5 MR GREEN: It is the only document I'm aware of.
6 MR JUSTICE FRASER:
7   "Question: This is the only document of which I am
8   aware, PEAK or KEL, in which this point has been made."
9 MR GREEN: And it has been going on for about 20 minutes.
10   And it is not really fair to Mr Coyne when one ought
11   to be aware of what he says in that very section of his
12   report on this point.
13 MR JUSTICE FRASER: Right, well --
14 MR DE GARR ROBINSON: My learned friend seems to be
15   suggesting that the document {F/275.1/1} is further
16   evidence of a decision to defer a fix on the basis of
17   a cost benefit analysis. Let's look at that, shall we,
18   can we look at {F/275.1/1} please. So this is dated
19   18th June 2005. The call logger is:
20   "Deleted user. ITU, SV&I."
21   I'm not sure what that means. POL have raised the
22   following incident:
23   "'A cash declaration was made in "Stock Balancing"
24   for the amount displayed on the Snapshot. When the Cash
25   Variance was checked afterwards a Gain of £45.05 was

                                191

1   displayed.
2   "The discrepancy was the cash value of the
3   transactions performed on the stock unit after rolling
4   into branch trading."
5   Then there is further information about it.
6   Could we perhaps go over the page {F/275.1/2}.
7   16th June at 15.59:
8   "I've attempted to recreate the situation which
9   occurred over a CA Rollover in this instance and the
10   injecting a transaction like the mails txns ...
11   Difference being that up here the trace has turned up
12   a transaction received ... and in the supplied audit log
13   nothing at all appears ..."
14   Then the next box says:
15   "After several days of attempting to recreate this
16   problem ... I have only seen one instance of this
17   problem."
18   Excuse me. (Pause)
19   Could we go back to the first page of this PEAK,
20   please {F/275.1/1}. You see the call type on the
21   left-hand side, Mr Coyne?
22 A. Yes.
23 Q. "Business Integration Testing Incidents/Defects."
24   This is the testing PEAK, isn't it?
25 A. Yes, I think that is right.

                                192

1 Q. Could you explain what a testing PEAK is?

2 A. It is a defect that has arisen on the system during

3   testing, so not in live operation.

4 Q. Does a testing PEAK like this, is it capable of

5   constituting evidence that known issues in the system

6   are dealt with on a cost benefit basis?

7 A. Certainly, if they are dealing with defects that are

8   found in testing on a cost benefit basis and therefore

9   don't fix the defect it will go out to live.

10 Q. Now, is it -- and it may be unfair to ask you this

11   question because you didn't raise it but now you have

12   seen this PEAK do you remember it?

13 A. I'm not sure I do. Can I look, please, at the end of

14   the …

15 Q. I don't know how long it is.

16 MR JUSTICE FRASER: It is five pages.

17 MR DE GARR ROBINSON: Could we look at page 4, please.

18   I must confess I hadn't read 5.166 as being even

19   relevant to this point. {F/275.1/4}

20 A. It looks like it needs to go out to Escher to be fixed

21   rather than Fujitsu. It says at the bottom:

22   "This amounts to a declaration by POA that we are no

23   longer interested in obtaining a fix."

24   But it doesn't make a reference to a cost benefit.

25 Q. Thank you.

193

1 MR JUSTICE FRASER: Right. Is that a good --

2 MR DE GARR ROBINSON: I think we are at 4.30 pm.

3 MR JUSTICE FRASER: I think it probably is. Right.

4   A couple of things. Mr Coyne, you have some

5 homework, but generally when you are giving your

6 evidence tomorrow you have got in front of you, and

7 that's why I checked this afternoon, a hard copy of your

8 report?

9 A. Yes, I have.

10 MR JUSTICE FRASER: It is very tempting when

11   Mr de Garr Robinson is asking questions just to look at

12   the screen. It's probably a good idea also to flick to

13   your report but it is completely up to you whether you

14   do that or not.

15   And Mr Green, you might want to store points such as

16   that one up for re-examination, if you have any, because

17   you might find that upon mature reflection they are not

18   the points you thought they were when you jumped to your

19   feet, although I appreciate you have been restrained, or

20   you think you have been restrained today.

21   And Mr de Garr Robinson, 10.30 am tomorrow.

22   I assume you don't have any objection to the witness

23   looking on his knowledge database to do the homework

24   that you set him?

25 MR DE GARR ROBINSON: My Lord, of course not. Obviously he

194

1   won't be talking to anyone.

2 MR JUSTICE FRASER: No, I'm just about to remind him.

3   Mr Coyne, normally you won't have homework but it is

4   particularly important that you, not your assistant,

5   does that.

6 A. Absolutely, my Lord.

7 MR JUSTICE FRASER: If he finds anything what do you want

8   him to do in terms of bringing it with him or notifying

9   references? Are you happy to get that tomorrow morning

10   at 10.15?

11 MR DE GARR ROBINSON: My Lord, yes. I don't think I will be

12   going back to it immediately. It will be something to

13   be dealt with on another day.

14 MR JUSTICE FRASER: All right. In that case, Mr Coyne, if

15   you can just find them and bring -- I don't know whether

16   it is easy to print them off. If you do find anything

17   bring it with you and we will deal with that first thing

18   but you won't necessarily be asked questions about it

19   because Mr de Garr Robinson will want to have a look at

20   it. Is that clear?

21 A. It is indeed.

22 MR JUSTICE FRASER: Anything else? 10.30 am tomorrow.

23   Thank you very much.

24 (4.36 pm)

25   (The court adjourned until 10.30 am on

195

1   Wednesday, 5th June 2019)

196

197

198

179:1,9,22
186:9,12,15,17,21
189:23 191:16 193:6,8
basket (1) 72:20
bearing (3) 131:12
152:15 185:12
become (7) 26:19 29:7
76:25 91:8 111:14
161:2 172:19
becomes (2) 123:10
176:21
before (26) 7:12 12:9
14:20 27:6 30:24
35:25 48:6 56:4 80:22
81:13 82:13 83:18
84:11 91:18 92:2
99:15 100:23 124:23
135:3 145:1 146:14
148:14 152:1 158:24
162:14 186:23
beginning (2) 108:6
115:7
begins (1) 164:9
behind (1) 11:20
being (81) 1:14,18
11:5,11 12:23 13:20
14:5 16:6 17:1,16
19:12 20:2,23 24:5
30:15 32:10 36:17
37:4 39:10 44:23
45:5,10 46:16 54:7
59:16 64:13 68:12
74:1,8,12 76:1
82:18,22 85:23 98:12
104:14 110:8 116:5
119:20 121:7 123:1,3
142:5 145:21 146:7,7
148:2 155:10,12,14,17
156:19,23,24 157:2
158:1,25 159:4
160:3,10 161:2,14
162:1 163:9 167:5
171:24 173:2 175:16
178:5,6,7,24 179:8,21
182:20 183:3 184:22
185:3 186:16 192:11
193:18
believe (58) 1:17 6:6,21
17:10,18,19 18:18
19:18,20 31:15 43:4
47:3 59:19 60:1
66:19,25 67:10
68:3,24 70:7,9 71:11
78:11 79:8 81:14
91:21 94:21 96:21
98:19 120:20 125:7
129:24 131:2,19
137:2,12,21 138:17
148:23 154:16 156:9
158:7,17,19 159:18
165:8 166:24 167:20
168:23 170:8 171:13
175:4 176:2 180:17,21
182:14 184:8 185:19
believed (2) 91:9 96:23
below (5) 12:2 29:16,18
83:5 85:4
benchmark (2) 40:13
140:18
benchmarked (2) 41:5
44:18
benchmarking (5) 41:10
44:9 122:8,11,14

beneficiaries (2) 70:12
73:5
benefit (48)
146:20,23,25
147:3,11,17
150:2,6,21 151:4
152:25 154:25 155:13
161:12 162:19 163:6,9
166:24 167:3 168:23
169:11 170:12,16
171:7,9,25 173:14,18
174:12,21 176:8 177:3
178:12,14,22 179:1,9
180:13 185:11
186:9,15,17,21 189:23
191:17 193:6,8,24
beset (1) 59:22
best (2) 3:24 23:5
better (9) 7:16 64:23
69:12 89:13,18 111:14
159:21,25 166:10
between (23) 2:2 4:20
12:19 15:6 34:3 36:7
42:1 50:20 54:5 64:21
76:13 83:16,25 88:20
89:3,8 93:23 94:2
101:6 124:16 143:20
147:13 174:13
big (3) 141:12 160:20
189:5
bill (1) 74:1
billion (3) 97:21
152:17,18
bims (4) 93:21,22
104:21 124:13
bin (1) 188:14
binary (2) 121:22
123:10
bit (2) 12:5 93:18
blindingly (1) 50:7
body (3) 40:7,10 65:18
bogged (2) 31:1 76:6
books (2) 75:24,25
bore (1) 56:7
both (22) 4:3 5:9 14:6
21:23 35:21 48:15
56:22 58:19 59:20
70:24 102:10 123:1
127:14 139:9 145:17
146:21 147:1 151:15
153:12,18 177:11
187:7
bottom (8) 9:6 28:13
29:12 39:1 91:23
164:7 183:13 193:21
box (7) 28:22 56:9
166:1 181:7,11 187:10
192:14
boxes (2) 83:2 182:13
branch (96) 8:17 11:3,5
12:22 14:3 15:1 20:6
21:4 28:24 49:8,10,17
50:10,12,14,25 52:22
64:9,11,16,18 65:9
66:5,11,14,18 67:11
68:21,22
69:2,4,8,11,21,22,24
70:4,18,22 71:16
72:4,21,22 77:20
78:18,23 79:20 80:6
83:10 85:7,15 86:2,24
87:2,3,7,8,10,16 91:25
93:2,9 94:15,18 97:5,8

98:21
99:11,13,18,22,25
100:17,19,25 101:9
113:15,22 114:2,21
117:18 118:23
119:1,1,4 129:3,17
130:2,17,18,21 131:6
138:2 151:2 174:24
192:4
branched (1) 167:7
branches (12) 9:5
71:12,13 81:1 83:7
93:3,6,13 94:7,11
121:4,7
branchs (2) 50:17,21
brdb (1) 73:8
breach (1) 19:4
break (9) 55:25 56:13
100:23 144:21,24
145:1 148:14 160:17
190:23
briefly (2) 10:7 36:15
bring (4) 111:4 117:14
195:15,17
bringing (2) 38:11 195:8
brings (2) 185:9 186:4
british (1) 44:12
broadly (4) 17:11
105:21 131:20 161:21
broking (1) 77:22
brought (6) 31:4 36:16
62:17 97:9 100:19
103:15
buckets (1) 73:17
budgets (1) 29:23
bug (53) 22:13,15
23:2,4
24:11,14,16,18,25
25:3,24
49:15,15,16,17 51:7
52:21 54:1,12,18
60:14 67:6,9,23 68:18
70:8 71:10,16
86:1,15,23,24 87:7,9
93:1,4 94:8 100:4,5
131:5 138:24 143:3
151:9 152:24 163:9,11
173:1,17 175:14,19
182:25 183:6 189:9
bugs (118) 8:4,6,10
10:16,25 12:1 13:9
14:12,25 15:4 16:8
19:23
20:9,10,15,21,24
21:3,3,25 22:1,10
23:16 24:3,6
25:3,10,13,15 27:24
32:7 37:6,8 52:11
60:17,22,23 63:24
64:6,9,15,18
65:15,21,25
66:10,10,11
67:10,14,15,23,25
68:3,7,16,22 69:1 71:5
72:1,3 77:19 78:17,23
79:20 81:1 83:9,14
85:7,14 88:9 93:14
95:23 97:4,7,12,13
98:1,3,11,16
99:8,21,24
100:6,24,25 101:9
106:20 110:15 112:19
128:18 129:14

136:11,17 138:22
141:9 146:22,25
147:2,2,22,24
150:2,25 151:8 154:25
162:22,24 165:21
166:23 167:2
174:16,18,23 175:1
176:1,5
bugserror (1) 28:24
bugserrorsdefects (1)
149:20
build (7) 32:16,20
33:5,8,13 47:8,18
building (1) 106:8
built (1) 33:3
bullet (1) 164:6
bundle (5) 8:1 10:9,9
11:20 27:4 38:24
41:13 46:6 60:3
124:4,10 125:24,25
154:2 190:9
bundles (3) 108:13
154:14 166:6
business (12) 30:5
39:15,16 52:10,17
69:23 102:20 124:15
147:10 162:12 173:8
192:23
businesses (10) 45:13
52:4 56:22 57:5,12
58:2,8,9,14 120:8

<hr>

C

c (2) 9:15 106:6
c111 (2) 8:1 19:22
c112 (1) 9:17
c311 (1) 10:10
c318 (1) 10:12
c319 (1) 11:13
c331 (1) 11:20
c3321 (1) 11:21
c3322 (1) 13:7
c3323 (1) 13:22
c3324 (1) 14:9
ca (1) 192:9
calculate (2) 18:19
36:18
calculated (1) 67:20
calculation (4) 36:20
48:7 67:22 100:14
calculations (6) 35:7
36:2,3,4,13 67:13
call (15) 5:14 8:5 21:6
23:1 79:19 92:5,6
126:1 181:7
184:6,19,23 189:13
191:19 192:20
called (2) 25:23 172:5
calls (2) 18:13 48:25
came (3) 62:4 105:14
170:5
cancel (4) 184:21
187:6,19 188:13
cannot (1) 59:23
cant (18) 34:19 36:5
51:15 53:19,23 57:20
86:3,20 98:11
133:1,9,16 135:5
143:11 162:15 175:22
176:4 182:7
capability (1) 108:11
capable (2) 134:19
193:4

care (5) 44:8,15 120:25
121:1 129:6
careful (2) 94:24 119:4
carefully (5) 121:10,12
146:14 170:22 171:1
carry (7) 61:13,16 69:15
137:5 150:24
161:21,24
carrying (1) 162:2
cases (9) 50:7 51:12
58:19 145:16 148:11
149:1,2,11 182:5
cash (3) 191:23,24
192:2
cast (1) 11:10
catastrophic (1) 142:1
catch (4) 21:8 22:9,14
133:13
categories (1) 103:23
categorisation (1) 23:22
category (1) 3:15
caught (1) 17:5
cause (13) 8:15 9:4
10:17 15:1,4 17:8
19:24 20:25 49:7
71:11 83:7 137:25
147:2
caused (9) 16:8 18:2
25:18 32:6 80:15 89:5
90:17 96:18 182:17
causes (1) 79:10
causing (7) 25:13 78:17
128:18 173:23
174:6,11,24
caveats (1) 135:2
central (2) 10:5 14:2
centre (3) 12:24 14:2
91:10
certain (12) 8:12,13,20
37:25 38:1 48:10
73:16 86:20 103:6
109:22 133:13 145:22
chair (1) 162:8
challenge (1) 118:14
challenges (1) 52:16
chambers (1) 146:5
change (34) 4:19 7:18
83:16,25 84:5,7
89:3,5,11 90:18
96:18,25 156:15,24,25
157:2,7,9,9,16,17
159:15,19 160:12,13
161:11 168:12 183:4,7
185:8,11,11 189:6,12
changed (7) 38:4 89:21
96:16,21 133:2,9
159:23
changes (24) 91:5 94:4
152:20 155:7
156:17,19 158:1,25
159:4,8,9,22
160:8,10,18,20,24
161:1 162:25 163:1
164:2,11,13 189:12
changing (1) 183:1
chaps (1) 104:16
characterisation (1)
157:23
characterise (1) 81:17
characterised (1) 98:2
characteristics (1)
32:18
check (4) 1:12 22:22

151:16 183:16
checked (2) 191:25
194:7
checks (2) 24:23 50:16
cheques (1) 26:9
chesterfield (2)
50:10,11
chesterfields (2)
50:16,21
choose (1) 121:11
chosen (1) 121:10
chris (1) 102:19
chronological (1)
110:23
circumstances (9) 1:6
3:2 46:17,20 53:19
74:24 106:23 143:3
178:19
cite (6) 169:9 170:3,5
171:12,13,23
citing (1) 170:20
claimant (1) 18:8
claimants (9) 1:14
10:15,24 11:16 17:25
18:22 19:5 20:6
107:11
claims (2) 17:25 19:5
clarify (2) 9:10 63:10
clarity (1) 129:6
clear (15) 14:24 33:21
46:21 54:17 64:13,14
106:6 113:21 127:23
134:6 135:13 157:7
165:14 173:20 195:20
clearer (1) 132:9
clearly (4) 89:3 111:17
128:6 180:18
clever (1) 109:11
client (2) 173:25 174:14
clients (1) 54:10
close (1) 52:24
closed (1) 52:23
closely (1) 29:21
closings (1) 1:21
closure (1) 185:22
code (31) 118:17,24
119:1 139:20 140:5,6,8
141:1,8,12,14,20,20,22
142:2,2,4,8,15
143:13,16,18 183:1
185:1,5,7,9,19 188:6
189:10,12
codes (1) 118:20
coding (4) 10:25 11:25
173:2 175:15
coin (2) 181:10,12
coins (2) 184:9 188:6
collaboration (1) 36:19
column (5) 163:20
164:3,7,13 186:24
comb (1) 146:4
come (17) 48:6 56:2,11
68:5 82:10 101:16
114:1 119:9 136:3,15
139:24 152:5 164:22
169:18,23 180:1 181:2
comes (4) 17:25 52:19
91:19 166:9
coming (3) 48:20
135:23 153:6
comment (1) 135:5
commentary (1) 180:1
comments (2) 29:13

92:19
commissioned (1)
120:10
commit (1) 44:5
committed (4) 72:20
73:7 188:17,17
committee (6) 154:21
155:16 156:2,12 167:6
179:25
common (4) 60:7 67:4
126:1 163:17
commonly (2) 45:24
46:2
communication (4)
51:8 93:23 94:2 155:6
communications (1)
30:9
company (1) 102:12
comparable (8) 40:14
42:15 44:3 45:5,9,11
56:17 81:15
comparators (1) 82:19
compare (1) 44:16
compared (9) 42:20,21
43:1 54:8 56:18 58:14
82:18 173:24 185:11
compares (1) 43:12
comparing (1) 76:1
comparison (1) 76:13
compatible (1) 38:12
competitive (1) 58:9
complaining (1) 18:2
complete (3) 96:25
156:8 172:17
completed (3) 3:5
159:20 172:20
completely (7) 25:16
34:23 37:23 53:21
63:21 122:21 142:6
194:13
completing (2) 156:9
188:12
completion (1) 72:17
complex (2) 36:12 57:5
complexities (1) 145:18
complexity (2) 44:23
45:14
compliance (6) 153:24
154:21 156:1,12 167:5
179:25
complication (1) 63:15
component (1) 168:1
components (1) 106:15
computer (5) 22:18
41:15 52:3 102:25
120:8
computing (1) 188:20
conceivably (1) 116:20
concept (5) 26:13,24
31:20 32:10 82:6
concern (2) 62:4 183:3
concerned (2) 163:14
186:12
conclude (1) 143:4
concluded (1) 160:7
conclusion (8) 41:10
82:2 128:14 144:13
161:14 164:8,14
165:16
conclusions (1) 163:21
conditions (5) 26:16,18
27:23 32:8 58:19
conduct (1) 104:12

conducted (6) 13:25
32:15 122:9,11,13
180:22
conducting (1) 47:20
confess (2) 165:20
193:18
configuration (1)
133:21
confirm (9) 60:21 64:5
65:14 66:17 69:8
71:25 78:22 79:22
99:16
confirmed (5) 53:13
62:17 66:10,11 69:10
confirming (2) 65:20
79:19
confirms (2) 77:18
79:23
confused (2) 62:21
83:11
connect (1) 108:15
conscious (1) 136:7
consequence (1) 71:7
consequences (7) 14:15
22:1,15 27:13 28:2
92:15,17
consequential (2) 26:1
49:25
consider (18) 22:19
43:15 48:4,6,9,16,16
50:3,3 90:19 95:2
130:3,19 131:4,5,6
150:12,21
considerable (2) 100:8
113:19
consideration (7) 31:7
83:6 84:8 107:8
150:22 176:22 189:25
considered (19) 41:20
42:3,15 43:20 51:19
52:2 53:15 55:20
84:3,18 87:9 88:11
95:2 120:7 146:13
147:12 151:9,24 167:5
considering (7) 5:2 34:9
49:4,7,9 140:19 177:8
consisted (1) 61:6
consistent (3) 82:17
99:13 145:4
constitute (1) 189:21
constituting (1) 193:5
constructed (3) 82:4
83:18 133:15
constructions (1)
146:15
construe (1) 20:8
contain (5) 112:20
115:3 151:15 153:12
170:16
contained (8) 47:9
60:10 68:25 83:9 97:4
105:6 114:10 163:3
containing (2) 18:9
19:16
content (3) 5:22 89:17
190:23
contention (2) 154:24
158:16
contentious (1) 102:10
contents (2) 6:6,21
context (29) 9:11 10:7
11:14 15:25 16:20
18:23,24 37:18,20

43:11,13 44:18 49:5,6
59:12 80:22 81:8 82:4
85:20 87:22 89:6
100:15 106:21 128:17
150:7 152:11,16
158:19 186:23
contexts (1) 44:10
continue (3) 28:17
161:7 189:2
continued (1) 134:17
contractual (2) 173:14
176:8
contribute (1) 65:3
contributing (1) 64:25
control (12) 13:13
32:18 33:6 45:12
49:24 57:19 141:25
143:23 156:15,18
157:17 168:13
controls (25) 9:18 12:21
13:23 17:13 21:23,24
22:19,20,21,25 23:12
35:11 45:1,16 47:9
48:9 138:23
148:6,10,12 149:10,11
151:16 153:13 156:25
controversial (1) 21:7
convenient (3) 101:15
144:16,17
copies (3) 5:19 72:24
126:10
copy (3) 66:22 171:17
194:7
corner (1) 124:7
corpus (1) 107:20
correct (40) 5:25 7:7
14:14 21:8 22:9 24:24
26:3 42:25 55:1 58:25
63:24 67:13 68:11,19
75:16 80:2,5,12,16
84:14 100:6,14 107:22
108:10 127:18
134:5,21 135:1,4
147:22 148:13,23
172:17 174:16,17
176:17 177:5,15
178:14 184:14
corrected (7) 25:21
59:4 80:6 83:22
130:20 154:15 174:12
correction (7) 12:4
17:15 50:24
80:8,10,12 184:18
corrections (5) 6:17,20
80:15 92:20 184:19
corrective (3) 173:11,13
179:21
correctly (5) 27:21 44:2
130:12 131:21 169:20
correlate (1) 152:21
correlation (1) 123:19
corrupted (2) 12:23
13:5
cosmetic (2) 23:25 24:1
cost (57) 146:20,22,25
147:3,10,17
150:2,5,21 152:25
154:25 155:9,13,24
160:11 162:19 163:6,9
166:23 167:3 168:23
169:11 170:12,16
171:7,8,25 173:14,18
174:12,16 176:5,8

177:3 178:12,14,22
179:1,9,21 180:13
185:16,17
186:5,9,15,17,18,21
189:17,19,23,25
191:17 193:6,8,24
costbenefit (3) 149:19
151:21 153:16
costs (2) 58:7 151:3
couldnt (6) 36:9 69:23
75:12 79:14 107:15
109:11
counsel (2) 22:3 146:2
count (1) 47:2
counter (5) 45:8
164:2,12 182:3 189:10
countermeasure (7)
21:11 47:1,2 49:24
131:20 134:25 142:16
countermeasures (64)
17:6,10,12 21:7,16
22:4,9,12,14,17 23:1
25:14 26:3 28:23,25
29:4 31:4,13 32:13
35:11 45:17 46:23
47:23 48:17,25
49:1,1,20 51:4 53:17
130:3,9,12,19
131:10,12,16
132:1,4,13,14,17,22,24
133:11,12
135:11,20,24
136:1,5,13,16,21,23
137:7 138:4,6,16,23
140:7 148:16,22
149:22
couple (4) 2:6 103:1
123:9 194:4
course (11) 4:13 26:2
43:19 44:10 68:6
114:1 123:9 133:10
152:2 169:7 194:25
courses (1) 32:2
courts (1) 17:24
covered (2) 18:9 70:4
covering (2) 2:13,15
177:25 178:1
coyne (108)
5:14,16,18,24 7:25
15:18 18:20 29:18
31:18 32:25 33:15
34:8,13 40:21 43:24
46:20 47:10 48:8 50:8
53:11 54:4 56:3,15
59:16,20 61:3,21
62:21 63:17 64:12
66:15 67:6 68:6,15,20
69:9 75:23 77:17
78:15 79:5,21
80:18,24 81:7,24 82:5
83:11 84:9 85:2 86:5
87:5 88:7 89:10 90:10
95:5,15 96:11 98:14
100:4 101:17,21 117:5
119:22 121:9 126:22
129:8 130:14 131:23
133:8,17 135:23
136:18 143:8 144:5
145:1 148:13 149:13
152:5 153:6 154:19
157:18 159:25 160:22
162:21 163:2 164:19
166:18,21 169:1

170:1,18 174:22
175:22 176:3,20
178:11 179:12 180:11
181:1 183:11 187:24
189:20 191:10 192:21
194:4 195:3,14 197:3
coynes (1) 5:19
crash (2) 173:2 175:16
crazy (1) 116:10
create (7) 13:11 62:4
69:24 80:13 184:20
187:5,18
created (20) 11:16
26:20 70:4 80:9 83:10
85:7,14,23 87:13
88:10 97:5,7
99:18,21,24 159:20
184:23 186:22 187:23
188:2
creates (1) 86:1
creating (2) 12:19 18:11
credence (1) 73:11
criteria (2) 63:16
115:12
critical (11) 14:24 15:3
16:1,4,16,18,20
31:2,6,11 44:15
cross (4) 65:11 71:22
159:8 166:2
crossexamination (2)
7:24 197:5
crossexamine (1) 146:2
crossexamined (2)
1:14,19
curious (1) 70:7
current (5) 13:16 20:19
133:21 157:6 172:7
currently (2) 159:7
184:22
curve (2) 123:8 124:22
custom (1) 67:4
customer (3) 58:4
69:23 181:7
cuts (1) 30:9
cycle (2) 20:17 143:1

D

d111 (1) 6:25
d1110 (1) 30:8
d112 (1) 105:9
d113 (1) 105:19
d118 (2) 27:5 82:14
d119 (5) 27:16 29:11
83:2 89:16 97:1
d121 (1) 7:2
d1226 (1) 88:1
d141 (1) 7:4
d142 (4) 28:6,9,12
41:14
d144 (1) 28:21
d151 (1) 7:6
d1510 (2) 4:22 7:8
d211 (2) 6:1 101:25
d21108 (1) 153:11
d21109 (1) 171:15
d21167 (1) 6:3
d2120 (1) 113:8
d21206 (1) 124:11
d21213 (1) 67:1
d21214 (1) 69:19
d2125 (3) 60:3,8 70:18
d2126 (3) 51:25 120:3
127:25

d2127 (1) 148:4
d2177 (2) 128:3 139:5
d2178 (1) 41:1
d2183 (2) 112:11,15
d2197 (2) 151:13 152:2
d2198 (2) 153:22
167:13
d2199 (1) 190:10
d2411 (1) 6:12
d241141 (1) 46:7
d241142 (1) 46:24
d241154 (1) 40:18
d24116 (1) 115:9
d241266 (1) 6:14
d3111 (1) 38:24
d31129 (2) 125:21,23
d31130 (2) 126:13,15
d31187 (1) 125:14
d3196 (1) 39:22
daily (1) 109:19
dalmellington (1) 93:7
danger (3) 46:15 128:5
131:18
data (36) 9:14,14,15
11:2,2,4
12:15,16,16,19,20,22,24
13:4,4,10,10,11,15
14:1,2 24:20
25:7,13,21 37:13
38:13,15,20 57:7
76:13 106:17,21
108:17 173:24,25
database (4) 72:22
154:11 170:14 194:23
databases (2) 102:16
118:12
date (6) 20:19 61:14
116:23 154:11 187:8
189:13
dated (4) 154:19 172:6
181:6 191:18
dates (4) 1:21 83:23
121:18,20
dave (1) 155:17
day (10) 32:9 111:21
140:7,9,9
160:10,18,21 176:23
195:13
day147717 (1) 78:2
days (7) 1:13,15 61:8
63:3 120:16,17 192:15
de (102)
1:3,8,17,20,23,25
2:5,9,17,21,24
3:4,6,12,17,20,23
4:2,18,19 7:23,24,25
12:7,11,14 18:7
21:15,17,22 22:6
28:12 55:24 56:1,15
60:8 67:6 68:15 78:15
81:23 88:5,7
101:14,21 108:23
109:1 112:14 124:5,10
125:13,16,22,24
126:2,8,14 133:18,20
134:2,18 144:15,18
145:1 154:13,18
163:12,24
164:5,10,16,20,23
165:1,4,8,18,20
166:4,6,15,21 167:25
168:20,24 169:8
171:20 183:21,24

187:8,22 190:12,20,23
191:14 193:17
194:2,11,21,25
195:11,19 197:5
deadline (1) 3:8
deal (10) 71:4 92:22
117:8 137:12
146:19,20 165:12
166:10 178:21 195:17
dealing (11) 23:5
35:22,23 44:10 58:6
92:23 104:8 166:23
189:22 190:13 193:7
deals (2) 71:3 145:23
dealt (26) 23:24 31:8
37:9 54:15,21 71:8
86:15 89:7 107:4
151:20 153:15
162:18,19 163:6,9
169:11 171:7,25
173:17 177:2,4
178:12,13 189:22
193:6 195:13
debate (4) 185:10,25
189:16,18
debitedcredited (1)
188:25
decide (8) 16:23 18:21
32:22 33:2 48:5
103:11 175:17 186:13
decided (4) 14:20
175:14 176:4 189:12
decides (1) 73:4
deciding (6) 14:17
18:16 116:18 130:1
174:16,19
decision (15) 33:10
48:20 136:7 143:17
152:24 156:11 162:10
163:7 178:7 179:1,2
185:21 187:25,25
191:16
decisions (7) 19:4
147:10 155:15 178:21
186:8,14,16
declaration (2) 191:23
193:22
deep (1) 106:19
defect (21) 21:12 23:13
51:8 52:21 54:1,12
62:9 64:25
70:11,13,21 85:23
86:15,17 105:4 138:24
140:6 178:4,9 193:2,9
defects (39) 8:5
10:16,25 15:15,17
20:16 23:5,11,24 24:1
27:9 28:24 37:2,7
43:14,15 62:6,9 63:25
95:23
98:6,11,20,22,23
110:15 122:15
128:18,24 129:15
133:13 134:17 135:4
136:12 138:22 141:10
143:25 147:14 193:7
defendant (2) 10:18,21
defendants (1) 11:23
defensive (4)
24:13,16,19 25:2
defer (2) 178:21 191:16
deferment (1) 163:11
deferred (10) 151:20

153:15 163:6,9 169:10
171:6 173:17 177:2,4
179:9
deferring (2) 166:23
189:22
define (2) 32:25 45:4
defined (2) 30:23 45:20
definitely (2) 121:14
127:19
definition (4) 27:18
29:15,17 83:3
degree (1) 102:18
delay (3) 35:17 75:10
77:5
deleted (1) 191:20
deliberate (1) 121:15
delivers (1) 129:25
demonstrate (3) 64:15
75:19 78:22
demonstrates (1) 60:23
depart (1) 7:18
department (1) 64:23
depending (3) 4:9
141:11 174:18
depends (2) 27:11
39:16
deployed (3) 29:7 31:22
40:14
describe (9) 37:12
38:18 52:14 74:20
90:18 106:12 108:6
124:23 152:15
described (5) 34:15
56:17 95:20 107:6
159:6
describing (1) 118:22
description (1) 108:19
design (19) 21:11
22:17,18 26:6 29:8
32:15,17 33:6
35:12,13,13,16 36:16
47:6,19 106:7 116:3
173:1 175:15
designed (20) 21:24
22:7 25:9,12,17,19
38:12 48:17 49:2 51:3
59:5 75:15 77:21 79:6
80:19 95:16 144:13
148:7,24 151:16
designing (4) 33:2 34:9
35:3 47:7
desktop (1) 188:13
detail (2) 70:2 90:21
detailed (4) 4:8 10:15
163:21 168:7
details (3) 75:6 87:8
181:8
detect (4) 9:19 148:7
173:4 174:3
detected (2) 12:25 37:8
detection (1) 12:4
determination (2) 90:22
96:20
determine (3) 32:5
91:20 112:19
determined (2) 83:8
97:2
determining (6) 31:10
33:22 52:8,11 91:11
141:19
devalue (1) 144:9
develop (1) 148:3
developed (3) 11:1 12:1

110:3

development (7) 147:18
175:6,7 176:5 182:24
183:4 189:9
deviating (1) 160:22
devices (1) 142:1
devise (1) 24:5
devoted (3) 29:23 129:8
130:16
diagnosed (2) 146:22
147:3
dialogue (1) 119:17
diametrically (2)
96:16,22
didnt (25) 13:2,17
14:24 45:18 48:8
69:24 77:8 81:11
84:20 87:24 95:5
107:17 109:25 128:13
130:16,18,24 137:23
153:8 158:25
169:17,18 179:17
180:23 193:11
difference (4) 12:19
15:6 143:21 192:11
different (37) 27:8
30:25 32:21 34:3,23
37:22,22,24 44:13
45:10 51:8 59:21 62:4
63:14,21 65:3,11
77:10 86:19 88:3
97:25 102:25 125:19
126:6 133:12,12,14
137:9 140:8,21
141:7,25 142:1 143:24
147:13,20 178:3
differently (2)
133:15,16
differs (1) 75:1
difficult (7) 52:25 80:24
90:10 91:5 110:5
122:6 160:7
difficulties (1) 1:9
difficulty (2) 109:9
160:11
digital (1) 108:14
dimension (1) 30:18
dimensions (8) 27:8
30:11,14,17,22,22,24
31:1
direct (1) 74:5
direction (1) 96:25
directly (2) 162:24
165:12
director (2) 108:9 109:5
disagree (5) 46:25 47:1
58:13 109:2 136:20
disagreement (2) 83:2
106:13
disasters (1) 30:10
discharge (1) 146:6
disclosed (17) 3:15 42:1
53:9 61:8 67:16 69:14
85:10 88:14,15,16,20
102:3 105:24 108:3
113:12 117:25 118:15
disclosure (8) 10:14,19
93:21 103:8,20 108:11
113:17 118:3
disclosures (1) 88:24
discovered (4) 24:8
60:14 62:9,10
discovery (1) 62:5

discrepancies (20) 8:16
10:17 19:25 54:19,20
66:14 83:10 85:7,14
88:10 97:5,8
99:19,21,25 110:14
113:25 128:19,24
174:24
discrepancy (8) 50:20
54:13 71:11 87:12,16
91:22 104:14 192:2
discussed (4) 76:20,23
104:15 116:25
discussing (5) 22:7
26:12,25 39:3 81:12
discussion (1) 155:2
displace (1) 58:10
display (1) 145:8
displayed (2) 191:24
192:1
disputed (1) 18:10
disregard (2) 133:1,9
distance (1) 109:23
distilled (1) 3:25
distinction (1) 143:20
divider (1) 11:20
doctrine (1) 32:5
document (81) 10:12
39:23 61:6 64:11,22
84:10,15 86:3,6
104:17 108:3
110:19,20 111:8,15
112:11 115:9 116:18
119:3,7 126:15 128:3
145:24 146:7 148:2
151:7 157:22
158:8,13,22 159:20
163:3,13
165:4,11,15,16,24
166:1,2,22
167:2,10,11,15,17,18
168:3,19,21 169:15,24
170:7,8,15,21,22
171:1,4,8,12,13,23
172:1,4,6,9 173:20
174:19,22 175:24
179:20,25 186:20
189:20,24 190:1
191:2,5,7,15
documentation (3)
53:7,24,24
documented (1) 50:6
documents (85)
3:6,11,14 5:3 33:19,21
54:25 55:6,19
87:13,21 88:2,20
93:22,22,25 98:19
100:20
103:5,7,10,19,20,24
104:15,19,21 105:6,24
107:8,20,21,23,25
108:1 109:7,16
110:9,13,16,21,22
111:1,3,9,11,13,16,19,23,24
112:2,3,6,8 115:22,25
116:3,4,6,21
117:13,17,22,24
118:18 119:6,24
130:23 145:16,20
146:12,17,24 151:25
152:23 154:9 158:6
167:4,4 168:22 171:10
179:18 180:2 190:15
does (34) 6:17 23:13

24:11 27:12 28:16
30:14 31:7 34:14
36:11 49:7 55:1 58:25
59:2 73:3 78:21,22,23
86:10 91:13 92:22
108:12 126:20 134:7
139:1 152:20 162:23
170:15 183:21
186:4,10,15 189:19
193:4 195:5
doesnt (39) 3:22 24:25
25:3 32:8 34:12
36:2,10 44:16 45:23
47:25 51:7 58:23
62:18 69:4 73:6 74:21
78:5 79:22 81:4 88:24
96:3 108:11 115:3
119:1 126:19 134:9
138:3,25 152:19 154:8
158:13 168:18 169:14
173:21 174:21 182:11
184:2 186:14 193:24
dohave (1) 153:14
doing (15) 3:3 16:12
22:22 36:9 96:12
102:17 117:11 119:12
125:21 144:6 154:6
161:22,25 185:10,11
done (34) 2:13 3:20 4:2
20:11 24:23 41:10
62:8 67:22 72:19
74:9,12 90:22,23
100:13 125:5 129:4
141:11 146:10 153:8
173:13
176:7,9,10,16,17,19
177:12,13,14
178:5,6,24 179:21
186:21
dont (107) 2:15 5:11
12:13 15:6 17:10
18:18 19:18,20
20:2,20 23:6 30:21
31:15 33:24 35:3
39:10 43:6 44:5 46:13
47:3,13 50:3 52:18,23
53:23 54:15,23,24,25
55:4 56:8,9 57:2,6,14
58:13 59:9 60:1 61:12
66:3 67:19,19 68:11
70:7 71:20 72:6 75:25
77:17 78:5 79:7 81:14
91:18 92:1,1,18
93:18,18
94:10,10,13,15 95:5
96:10,21 100:13
107:25 116:10,11
118:10 127:25
128:7,21 129:24 130:7
131:2,19 132:6 135:3
136:7 137:6,9 138:17
140:2 142:11 143:19
145:13 148:23 149:3
150:15 154:15
163:16,18 166:18
168:25 169:4,6
171:16,23 175:4 178:9
179:7 180:21 193:9,15
194:22 195:11,15
dot (3) 69:15,15,15
double (1) 26:9
doubtful (1) 61:22
down (19) 11:11 22:18

28:22,22 31:1 52:6
76:6 101:10,11 104:16
106:12 160:17
164:3,7,13 181:11
182:13,22 185:15
downgraded (1) 63:13
dozen (1) 150:14
dozens (4) 136:2,2,2
152:11
dr (31) 1:18 2:1,13 7:11
27:6 29:9,13 38:25
39:1 45:17 46:8,20
47:23 48:25 68:1,3,6
81:4 100:9 106:11
117:19 123:18
125:7,10 131:10
132:1,4 136:20 137:8
138:7 147:6
draft (1) 167:23
drafted (2) 18:25 19:1
dramatic (2) 148:21
149:15
draw (2) 33:25 146:15
drawn (1) 43:6
drill (1) 95:24
drops (1) 123:9
drum (1) 47:12
dual (1) 26:4
due (3) 4:13 68:5
189:10
dug (2) 173:3 175:16
duplicate (1) 178:9
during (22) 12:17
20:11,21 116:25
117:9,16 121:3,6
122:1,24 124:25
127:20 134:18
135:10,17 136:5,24
148:9 149:9 152:17
188:10 193:2
duty (1) 146:6
dynamic (2) 147:13,20

E
---

earlier (4) 121:15,18,20
122:14
early (7) 84:15 89:19
120:16,17 122:1
124:25 127:12
ease (1) 108:18
easy (2) 109:9 195:16
edisclosure (1) 108:14
ediscovery (1) 109:3
edsc (1) 189:13
effect (5) 21:25 23:2,3
26:5 151:1
effective (2) 27:22 29:6
effectively (3) 110:23
130:4 182:19
effectiveness (1) 156:18
effects (3) 28:25 52:11
93:17
efficiency (1) 142:18
eight (2) 71:12,13
either (20) 19:18 21:10
29:20 67:25 70:23
92:5 96:1 100:9
121:23 130:24 133:6
143:23 156:8 157:8
165:25 166:1 173:1
174:20 175:14 180:2
elaborate (3) 36:2,6,13

electronic (4) 76:9,15
108:17 134:24
electronically (1) 157:3
element (4) 36:16
49:4,8 76:25
elements (9) 16:4 29:7
35:22 37:11 45:9
52:19 62:18 117:19
183:7
eliminate (1) 28:25
else (7) 2:22 31:18
56:10 107:7,7 140:5
195:22
eludes (1) 140:7
email (4) 1:16 2:13,16
4:1
employ (1) 109:25
employed (1) 106:16
employing (1) 22:23
enable (4) 19:11 22:7
64:23 86:11
enabled (3) 49:21
115:12,13
enabling (1) 108:16
encompasses (2)
39:5,11
encountered (1) 51:9
end (17) 4:9,10 24:15
25:13,18 40:1 44:4,6,7
83:18 103:16,17
164:1,11 172:12,12
193:13
endeavour (1) 137:18
ended (2) 101:4 168:2
engage (1) 141:2
engaged (4) 103:18
107:5 137:19 160:5
engagement (1) 2:2
engaging (2) 33:21
129:5
engineering (1) 29:22
english (1) 181:19
enhance (1) 156:18
enhanced (3)
159:11,12,13
enhancement (1)
159:16
enormity (1) 139:19
enormously (1) 165:24
enough (1) 64:13
enquiry (1) 140:10
ensure (9) 23:5,12
24:23,25 25:3 73:12
145:23 146:6 170:22
ensuring (2) 153:13
171:1
entered (2) 14:3 181:8
entering (1) 188:6
entire (5) 20:7,17 112:8
138:18 142:25
entirely (3) 161:19
165:22 168:24
entirety (1) 142:6
entity (1) 63:15
entry (2) 9:15 57:7
environment (1) 121:8
eposs (1) 188:15
equal (1) 16:22
equally (1) 143:17
equivalent (1) 183:18
equivocal (1) 84:24
ernst (12) 155:4,22
156:4 157:14,19

158:10,11,12 164:20
167:6,13 190:14
error (35) 11:5,7 13:14
25:6 27:10,22 32:7
41:7 51:7 52:21
54:1,12 60:20 61:7
64:4 69:24 71:23 77:2
80:12 86:15 138:24
149:20 172:19,21,24
173:7,8,23 174:11
184:16,21 185:22
187:6,19 189:14
errors (41) 8:4 9:13,21
10:16,25 11:2,25
12:16,18 13:9,10,11
14:12 18:11 20:15
26:4,7,8,20 30:10
57:7,17,20,23 58:1
63:24 69:18,21,22
70:3 95:23 98:11
110:15 112:17 128:18
129:15 136:11 138:22
141:10 148:9
escaped (1) 37:6
escher (1) 193:20
essential (3) 17:16 32:4
137:18
essentially (2) 111:8
147:4
establish (6) 49:11
61:14 62:8 141:9
142:4 172:16
established (3) 48:13,14
93:10
estimate (5) 116:8,8
118:8 139:14,20
estimated (1) 41:4
etc (2) 1:21,21
evade (1) 24:4
even (14) 38:11 46:17
59:3 75:10 87:20
122:1,5 142:25 149:16
150:5,9 157:22 175:19
193:18
evening (1) 166:11
event (1) 154:18
events (5) 28:19 29:1
36:24 160:9,12
ever (12) 24:16 29:4
49:12 94:19
98:15,16,16,17,22,24
129:9 177:24
every (12) 24:22 50:19
56:8 108:2 141:17
147:10 157:2 160:21
166:8 172:24 178:3,9
everybody (2) 33:12
134:9
everyone (2) 57:4 89:23
everything (5) 76:10
111:12 134:25 140:5
141:2
evidence (58) 5:4 10:14
39:7 41:6,23,25
50:5,23,24 51:16
53:20 54:14
55:2,10,15,18 56:4
60:22 67:11 72:3
81:20 82:15
84:10,16,21 86:1
104:25 106:3 124:19
149:18 150:25 152:7
153:1,7,23 155:19

158:10,11,12 164:20

163:8 169:9,11,22
170:3,5,6,21,22
171:2,20 173:10,16
179:18,24 180:3,4
186:7 189:21 191:16
193:5 194:6
evidencing (1) 176:17
evident (1) 183:19
exacting (1) 57:1
exactly (5) 41:13 61:12
72:6 170:18 184:12
examination (1) 37:13
examinationinchief (2)
5:17 197:4
examined (3) 65:6,8
102:1
example (16) 37:3
38:11 50:8,9 69:17
71:10 73:25 84:20
86:18 107:11 109:10
142:8 155:13 166:10
169:22 172:25
examples (4) 59:8,10
145:14 146:19
excel (3) 118:15
158:7,10
exception (4) 47:24
75:18 79:18,24
exceptions (12) 74:23
75:20 76:19 77:3
78:16,21 79:11 156:5
157:20 161:9,10 162:4
exchange (1) 166:19
exclusive (1) 81:6
excuse (1) 192:18
exercise (2) 41:10
161:13
exist (2) 53:25 64:10
existed (3) 9:19 62:6
86:9
existence (4) 21:23
66:18 77:18 122:16
existing (8) 36:17 148:6
159:6 160:3,25
161:7,9 188:22
exists (2) 53:16 188:24
expect (2) 4:12 153:9
expectation (2) 98:5
99:1
expected (7) 3:18 51:7
72:17 76:3 78:1 79:9
182:5
expecting (1) 3:19
expediency (1) 113:13
expensive (2) 160:7
174:20
experience (13) 11:25
12:16 28:7 36:6 41:15
42:13,16 79:7 110:2
126:23,23 127:3 143:1
expert (13) 1:14 10:14
18:6 84:14 139:14,16
145:19,23 146:2,6
163:4 170:19,20
experts (9) 2:2 4:20
5:3,7 19:19 22:7 67:7
82:25 105:20
explain (21) 31:18
63:22 71:6 73:1 77:9
81:3 85:3 95:9
96:19,23 102:8 124:14
129:6,7 140:16 141:6
143:9 148:24 166:13

170:11 193:1
explained (7) 2:14
41:25 70:15 89:21
99:15 135:3 143:14
explaining (4)
138:8,9,10 146:14
explains (3) 55:12,13
77:2
explanations (1) 78:16
explore (5) 42:8 55:13
89:10 143:8 145:7
exploring (1) 88:5
exposed (1) 162:18
express (4) 84:17,22,24
89:16
expressed (3) 89:17,19
183:3
expressing (1) 89:15
expression (1) 97:13
extended (1) 37:4
extends (1) 123:8
extent (32) 8:10
9:3,13,18 15:3,8
16:2,7,11 17:2,4,7
19:23 20:3,9,24 30:16
49:5,10,19 60:21 64:5
65:15,20,24 71:25
77:19 80:25 112:17
115:14 131:6 137:24
external (1) 155:4
extra (1) 120:1
extracting (1) 160:11
extremely (8) 9:4,20
12:21 13:4,13,18 17:8
48:10
ey (2) 159:10 161:11
eye (1) 11:10
eyes (1) 94:24

F
---

f (1) 85:5
f107511 (1) 167:22
f107512 (1) 168:6
f107513 (1) 168:9
f107514 (1) 168:11
f11271 (1) 156:1
f11272 (1) 161:5
f1140 (1) 154:3
f11401 (1) 154:5
f11403 (1) 154:23
f16971 (1) 172:5
f169710 (1) 172:23
f16979 (1) 172:8
f271 (1) 187:2
f2711 (1) 181:6
f2712 (1) 181:18
f2713 (1) 181:22
f2714 (1) 182:12
f2715 (1) 184:13
f27511 (4) 190:18
191:15,18 192:20
f27512 (1) 192:6
f27514 (1) 193:19
f2761 (1) 188:1
f8691 (1) 167:16
f86930 (3) 163:17,19
164:4
f86931 (1) 163:20
f99ed (1) 72:11
face (2) 18:10 37:16
faced (4) 16:12 30:25
32:11 165:23
facility (1) 109:21

factor (1) 37:24
factors (6) 48:6 62:16
84:2 140:20,21 143:24
fad (8) 118:20,21,23,25
119:1,3,5,7
fail (2) 22:21 26:21
failed (4) 137:14,18
151:18 153:14
fails (2) 26:23 142:6
failure (5) 27:9 35:17
79:1 137:15 142:2
failures (6) 26:22
30:7,9,24 128:23
144:2
fair (27) 46:12,25 59:25
60:1 71:2 90:15 92:24
93:16 104:6,24 108:19
109:6 111:22 121:13
124:18 128:10 129:11
132:3,20 135:15
145:10 146:7 148:17
152:8,14 173:23
191:10
fairly (3) 136:22 144:10
145:24
fairness (1) 171:23
fallen (1) 105:24
false (10) 11:16 15:1,4
18:13 19:16 24:15
46:2 63:1 145:25
174:6
familiar (1) 42:18
family (2) 104:19 116:2
far (10) 16:25 34:6
35:25 62:6 100:11
109:21 128:21 149:21
150:17,21
fast (2) 43:9 183:8
faster (1) 43:10
fault (25) 51:8 90:21
91:11,13 130:10
172:25,25
173:1,5,10,20,23
174:2,3,6,11
175:14,17,18,20
176:24 177:16,17
178:11 184:7
faults (8) 28:18,18
123:11 173:3,12
174:17,18,20
features (2) 47:6,8
february (2) 115:7
117:23
fed (1) 116:5
feedback (1) 116:5
feel (4) 46:19 55:13
134:19 163:18
feet (1) 194:19
felt (5) 63:20,22 81:3
84:20 85:13
few (12) 10:11 61:8
63:2 66:17 68:16,17
104:21 136:15 145:13
146:19,20 170:19
figure (1) 124:3
figures (6) 22:23 24:23
50:16,17,21,21
filter (1) 108:16
filtering (1) 115:12
final (2) 155:6,24
finally (1) 4:9
financial (9) 54:9 73:13
74:3,7 75:2,11

79:12,13 80:2
find (24) 19:21 21:13
64:24 95:25 104:25,25
107:3 109:16,17
110:4,5,6,9,19 111:15
114:25 119:6 123:21
138:21 177:18 181:14
194:17 195:15,16
finding (5) 21:12 52:25
76:6 80:24 84:16
findings (1) 19:11
finds (1) 195:7
fine (4) 51:6 67:4 76:10
134:11
finetooth (1) 146:4
finish (1) 23:8
finished (4) 4:6 12:9
124:17 182:5
firmly (1) 176:2
first (81) 4:11 6:1 7:25
8:4 10:11 20:18 23:4,6
25:10 29:10,10 34:24
38:25 39:25 40:17
41:2,3,24 45:18
49:14,16 51:24 60:2,3
61:22 62:7 64:3,8
65:12 68:8 70:17
83:17,19 90:11,19
91:14 95:16 98:15
100:11
101:1,6,7,22,24
103:14 104:12 108:1
112:12 117:5 119:23
120:1,10,22 123:24,25
124:2 127:24 128:5,25
130:11,15,15 139:6
141:16 144:6 145:2
146:20 148:4 151:12
152:6 161:24 167:12
168:5 169:19 171:14
174:7 183:16 184:7
190:13 192:19 195:17
firstly (2) 96:21 188:10
five (4) 87:19 116:21
164:2 193:16
fix (19) 14:14 147:14,16
152:24 174:20
176:5,22
185:1,5,7,17,19 186:1
187:17,23 189:25
191:16 193:9,23
fixed (21) 22:2 23:14
49:21 51:14 92:13
140:8 146:22 147:3
150:1 154:25,25
175:1,2,4,6,9,11,18
177:21 193:20
fixes (7) 11:1 12:1
171:6,24 173:17
175:19 185:9
fixing (10) 146:25
147:21 149:19 151:11
162:22,24 165:21
167:2 175:25 186:8
flag (1) 44:11
flagged (1) 159:21
flick (2) 116:21 194:12
flow (1) 58:21
flush (1) 23:11
focus (15) 15:19 20:5
21:2,3 105:23
106:1,19,24 113:21
117:16 120:19 122:7

129:19 165:20 187:24
focused (3) 20:7 106:25
138:20
focusing (1) 120:16
follow (2) 32:9 133:7
followed (1) 107:3
following (6) 1:9 10:19
27:18 155:3 182:4
191:22
follows (4) 32:9
131:24,25 150:12
forensics (2) 102:17,18
forgive (1) 109:2
forgiving (2) 108:22,24
form (8) 48:2,24 49:19
89:25 124:24 135:8
143:11 160:16
forma (1) 119:7
formally (1) 108:3
formed (1) 62:2
forming (8) 38:7 48:23
49:14 52:6 123:14
128:5 142:10,17
forster (3) 102:16 104:4
117:7
forth (1) 190:15
forward (8) 12:5 107:7
110:22 115:6 168:5,10
171:12 172:8
forwarded (1) 2:16
found (31) 68:8 92:4
94:20 99:24 103:24
105:23 111:2,2 112:20
114:5,10,17,21
136:11,21 145:9
156:4,20 157:19
161:9,10 171:8,10
175:20 177:16
179:5,9,10 182:24
183:6 193:8
foundation (2) 106:6,8
four (15) 1:13 6:23 8:8
16:1 17:16 67:14
97:11 102:6,8 105:10
116:24 117:3 155:4,23
156:6
fourth (3) 4:24 62:9
175:24
fraction (7) 59:1
81:18,21 149:2,5,6,7
fractions (1) 57:24
frank (1) 132:20
frankly (1) 57:19
fraser (106)
1:7,12,18,21,24
2:4,8,11,19,22,25
3:5,9,13,18,22,24
4:3,17,21,23
5:1,9,15,18 6:24 7:23
12:5,8,13 18:5
21:15,18 22:3 28:10
55:24 56:2 60:6 67:1
68:12 78:2,9,12,14
87:25 88:4 101:16
108:22,24 112:12
124:6
125:9,12,15,21,25
126:3,5 133:5,17
134:1,15 144:17,19
154:5,17 163:12
164:1,6,12,18,22
165:1,7,10,19,22
166:5,7,16,18 167:23

168:18 169:6 171:17
183:14 187:1,3,7,12
190:7,9,18,20,25
191:4,6,13 193:16
194:1,3,10
195:2,7,14,22
fraud (1) 30:10
free (1) 43:14
freeths (1) 3:7
frequency (4) 182:16
184:25 185:4 189:10
frequent (1) 11:3
frequently (1) 31:22
friday (2) 3:21 166:11
front (3) 101:25 171:18
194:6
fujitsu (39) 5:5 11:3
38:1 52:10 54:23,24
55:18 90:23
91:2,4,19,19 92:2,8
93:3,7,12,16,23
94:2,6,11 106:16
124:16 135:4 147:4
150:1 151:3 155:6
157:6 159:10 160:5
175:1,19 176:23
177:16 178:20,25
193:21
fujitsus (1) 64:23
fulfilled (1) 91:8
full (5) 61:18 76:20
116:2 130:19 150:7
fulltime (2) 103:13
104:2
fully (2) 65:6 129:1
function (3) 38:3,3
188:23
functional (2) 35:11,13
fundamental (1) 52:8
further (14) 5:2 7:21
10:19 11:4 15:24
96:24 99:10 117:22
121:25 150:5 156:18
185:20 191:15 192:5
future (4) 37:17 161:23
177:21 182:19

G
---

g (3) 66:23 67:1 68:13
gain (1) 191:25
gained (1) 52:14
gaining (1) 52:9
garner (1) 139:19
garr (102)
1:7,12,18,21,24
2:4,8,11,19,22,25
3:5,9,13,18,22,24
4:3,17,21,23
5:1,9,15,18 6:24 7:23
12:5,8,13 18:5
21:15,18 22:3 28:10
55:24 56:2 60:6 67:1
68:12 78:2,9,12,14
87:25 88:4 101:16
108:22,24 112:12
124:6
125:9,12,15,21,25
126:3,5 133:5,17
134:1,15 144:17,19
154:5,17 163:12
164:1,6,12,18,22
165:1,7,10,19,22
166:4,6,15,21 167:25

168:20,24 169:8
171:20 183:21,24
187:8,22 190:12,20,23
191:14 193:17
194:2,11,21,25
195:11,19 197:5
gary (4) 181:24 182:24
185:4,21
gathered (1) 103:24
general (3) 19:12,15
26:13
generally (14)
71:3,6,15,16,18,20
74:3 104:24 173:13
176:7,9 179:21 186:21
194:5
generated (4) 75:19
76:17 156:17 159:14
generates (1) 74:21
generic (10)
8:13,14,20,21 9:7
10:10 11:19 21:20
39:20 58:12
generically (1) 96:1
genuine (1) 145:4
get (16) 25:15 31:1,9
43:23 51:11 55:23
76:11 86:16 91:13
93:7,9 95:15 107:12
114:13 166:1 195:9
gets (3) 91:18 153:7
185:16
getting (4) 56:15 76:6
77:5 140:22
give (30) 3:10,13
16:7,25 20:2 40:23
50:8 59:21 67:2 80:19
81:25 82:6 87:14
95:16 104:10 110:10
112:5,7 115:24 118:8
126:9 137:1 140:3
142:5 144:12 145:3
153:23 169:22 187:7
190:7
given (37) 3:2 13:18
15:5,10,20 16:12
17:4,9 18:24,25
20:4,25 29:18 31:8
32:4,4 33:23 37:7 39:8
57:10 58:8 61:1 62:23
72:9 78:10 82:16
84:10 95:20 107:16,16
119:18 136:25 137:2
139:15 146:7 166:6
184:25
gives (3) 34:5 46:10
63:21
giving (10) 11:4 37:3
46:2 56:3 128:10
138:14 145:10,21,25
194:5
gobbledygook (1)
188:20
goes (13) 46:24 66:16
72:21,22 73:17 125:7
136:1 154:11 159:22
162:24 163:13 165:12
182:12
going (58) 1:13 2:10
10:11 20:24
21:6,11,13 22:3 24:3,6
37:21 43:24 47:21
48:6 49:13 55:24 56:6

67:3 70:15 71:11
77:24 79:15 82:14
87:25 88:6 94:4 97:6
107:1,14 122:23
126:24 128:20 129:1
133:18,22 134:15
139:5 141:17 144:21
145:7 152:5,6 153:5
164:18,24 166:13
168:25,25 170:25
177:20 178:22 180:13
183:22,23,24 187:7
191:9 195:12
gone (11) 40:23 70:12
75:3,14 76:4 96:24
101:9,9,11 105:1
107:2
good (52) 17:21 18:7
37:5 42:25 55:25 72:3
84:21 85:25 86:1
87:6,8 89:8,10,24
90:8,13,17 91:2,12
92:3,8,12,15 93:3,5,12
95:3,9,25 96:9 111:5
121:13 128:7,13,19,21
129:6,10 130:8
131:4,17,20 132:2,15
136:6,13 149:8 158:18
161:17 180:2 194:1,12
graduated (1) 102:17
grammatical (1) 18:4
grant (2) 102:23,24
granular (1) 36:8
graph (11)
123:13,15,22,25
124:12,12,13 125:5,7
126:2 127:4
graphs (3) 33:24,25
125:2
grapple (2) 22:8 31:18
grasping (1) 177:22
grateful (11) 1:11
3:16,23 7:17,21 9:12
12:11 38:23 55:12
132:20 169:4
great (7) 44:23 117:8
136:19 137:11 145:20
146:13 176:6
green (32) 1:19
4:15,16,22,24
5:2,10,17,19 6:25 7:21
81:20 87:24 88:1
124:4,9 126:4,6,13
166:12 187:12
190:4,8,10,13,19,25
191:3,5,9 194:15
197:4
grounds (1) 151:3
group (6) 102:12,15
108:5,10,20 109:4
groups (1) 108:14
guard (2) 32:6 35:5
guarded (1) 32:11
guarding (1) 35:6
guess (1) 116:10

H
---

hadnt (11) 62:15 65:6
69:11 84:21 85:12,18
86:6,8 179:12 190:16
193:18
half (8) 26:25 29:12
43:5 61:3 115:6 117:1
136:23 150:14

hand (7) 63:18 83:12
  91:23 143:9,11
  174:15,15
handed (1) 91:25
handful (1) 180:25
handled (1) 57:13
handling (3) 27:22
  52:11 57:11
happen (8) 13:2,17 17:4
  36:10 49:13 80:8 96:1
  129:24
happened (24)
  15:11,13,21,22 17:3
  50:23 80:12 116:17
  129:20,21 141:24
  151:24 152:8,10
  153:19,20 169:23
  177:25 180:9 183:25
  184:3,12,17 186:11
happening (6) 13:3 20:3
  82:17 157:4 177:25
  178:2
happens (15) 24:17
  49:15 51:10 73:20
  74:3,7 75:17 76:17
  79:25 80:6 91:18
  92:1,2 135:3 178:10
happy (6) 5:7 55:20
  58:9 136:19 190:21
  195:9
hard (6) 5:19 66:21
  171:17 180:18,20
  194:7
hardly (1) 174:10
hardware (4) 27:9
  30:6,24 35:18
hare (1) 163:18
harvesting (2) 73:15,19
hasnt (4) 24:12 75:14
  134:7 162:18
hasty (1) 89:15
havent (15) 9:8
  16:21,23 53:20 59:16
  67:20,22 84:11 86:11
  94:24 100:13 118:13
  122:9,13 169:13
having (15) 24:19 32:21
  41:10 49:24 58:6
  77:20 78:25 94:11
  99:11 105:8 113:9
  114:5,14 130:22
  149:14
headache (1) 108:16
headed (1) 8:4
health (1) 44:15
hear (2) 88:3 133:5
heard (2) 7:10 56:4
hearing (1) 1:5
held (1) 13:11
help (11) 37:18 78:5
  89:6,7 96:19 107:7
  116:25 117:3 125:22
  126:5 165:14
helped (1) 102:9
helpful (13) 15:23 37:20
  82:1 87:17,21
  89:20,23 90:20 95:9
  165:24 166:14 169:6
  183:10
helping (1) 117:8
here (32) 5:21 11:16
  13:1 19:9,10 33:12
  34:7 42:24 43:14

54:11,13 72:2 83:14
  85:2 89:16 96:25
  99:20 103:21 121:14
  139:22 147:12,13
  150:25 151:22 156:23
  157:6 158:20 159:3
  163:7 183:4 189:16
  192:11
high (16) 26:9,10 79:8
  83:9 85:6,14 88:9
  96:14 97:4,11,12,13
  98:3 99:21 129:24
  156:6
higher (1) 112:6
highlight (1) 156:11
higman (2) 182:13,14
hint (2) 136:4 148:15
historic (2) 37:2 93:10
historical (2) 38:20,20
history (1) 120:9
hit (1) 91:9
hngx (1) 172:12
hold (3) 99:12 133:5
  165:1
home (3) 47:12
  188:8,11
homework (3) 194:5,23
  195:3
honestly (2) 116:10
  144:10
hope (2) 21:7 166:25
hoping (1) 4:8
horizon (215) 8:2,5,18
  9:3,14,16,19 12:3,21
  13:12 14:11
  15:2,12,13 16:22 17:7
  18:2,10,13,15
  19:17,21
  20:7,12,16,21 21:3,25
  22:1 28:17,24 30:17
  34:22 41:5,11,18,20
  42:2,7,14,22 43:12,21
  44:4,16,17 45:15
  47:22 48:8,10
  49:6,7,9,20 50:13
  51:20 52:1,9,18
  53:2,15 54:6 55:14,21
  56:16,18 58:15,17,22
  60:15,24 61:20
  62:19,24
  63:4,7,9,12,19 64:1,16
  72:3,20 77:19 78:17
  79:20 80:20 81:2
  82:18 83:6,7,13 84:3
  89:25 90:5,6,8,9,12,17
  92:9 95:17,21
  96:6,13,24 97:2,25
  98:17 100:25 105:1,24
  106:1,7,9,14,22
  112:18,18 115:15
  120:6,11,17,17,22,23,24
  121:1,5,14
  122:2,3,17,20,21
  123:6 125:5,8
  126:18,19
  127:7,9,13,13,14,14
  128:6,10,14,19,24
  129:23 130:2,4
  131:13,24
  132:6,7,12,15,25
  133:12,21 134:5,20
  135:1,14,18
  137:13,17,19,21,25

138:9
  139:9,9,10,15,16,23
  142:24 143:1,10,24
  144:3,6,10
  145:3,4,9,11 146:22
  147:22 148:7,9,22
  149:10 150:19
  151:15,15 152:12
  153:12,12 155:7 157:7
  160:21 162:23,24
  163:1 172:13 173:17
  174:6,24 175:1 176:1
horizons (4) 42:20 64:2
  137:7 138:18
hour (3) 26:25 48:13
  136:23
housekeeping (1) 4:14
however (10) 10:24
  13:12 14:12 136:13
  139:16 148:20 149:18
  150:8 155:5 189:10
huge (2) 64:8 69:10
hugely (1) 165:14
hulbert (1) 155:17
human (11) 14:7 21:24
  22:22 24:5 32:7 52:2
  76:1 77:23 120:6
  159:19 161:1
hundred (1) 116:21
hundreds (4) 72:9 119:5
  152:12 176:23

I

id (3) 71:20 104:12
  188:24
idea (4) 110:10 112:7
  161:17 194:12
identification (2) 25:20
  54:13
identified (35) 1:15
  45:17 49:21 51:14
  54:18,23 67:10,14,25
  68:3,4,8 93:1 94:11
  97:7 98:4,13 100:6,9
  105:2 130:20 131:5,7
  132:2 136:17 138:19
  151:19 153:14
  155:4,9,23 163:5
  175:5 176:14 189:9
identifies (2) 76:18
  176:25
identify (18) 9:19 14:14
  16:19 35:4 94:8 95:23
  98:11 103:6,9
  104:13,21 116:20
  129:14 130:10 142:23
  148:7 156:5 157:20
identifying (6) 21:25,25
  92:15 93:3,6,13
ill (1) 164:18
illdefined (1) 29:20
illustrate (1) 142:8
illustrates (3) 125:2
  126:17,17
illustration (1) 136:12
im (167) 1:11 3:23
  4:4,8 7:17,21 9:12
  10:3,11 12:11,11
  18:5,20,20,22
  20:20,22 21:6,22 24:2
  26:2 31:6 32:3,24
  33:5,15 34:8,13 35:25
  36:5 38:23

40:21,21,22 42:25
  43:8,10,24 44:17
  46:22 47:11,15,17,20
  48:4,4 52:25 53:4,7
  54:11,22,22
  55:2,3,9,10,12 61:13
  63:17 64:13
  68:15,19,20 69:6,9
  75:21 76:5,6 77:14
  79:16 80:22,24 81:14
  82:14 83:11 85:9
  87:4,5,20,21
  88:4,6,19,23 89:1,9,17
  91:17 94:16 95:15
  98:14,14 101:5 105:18
  108:10,23 109:9,23
  110:7 112:10,14,24
  114:8 117:24 121:21
  123:22,22 124:5,12
  125:21,22 126:22
  127:19 129:3
  132:10,20 133:20
  136:9,9 137:4,4
  139:6,24 143:8,15
  145:7 147:22
  150:7,11,18 152:5,6
  153:5,6 160:23
  163:13,24
  164:18,23,23 165:22
  166:5,7,13 168:24,25
  169:4 170:5 174:22
  175:22 177:22 178:11
  179:10 180:3,11,13
  181:1,5 183:8,11
  190:1,20,23 191:5,21
  193:13 195:2
images (1) 123:17
imagine (1) 109:21
imbalances (1) 110:15
immediately (5) 149:16
  165:13 166:9 170:3
  195:12
impact (72) 21:8 22:10
  24:25 25:23,24 26:1
  28:18,23 34:2 43:14
  49:5,10,11,13,17,21,25
  52:21 54:3 59:10
  60:22 64:6
  65:8,15,20,24 66:11
  68:21,25 69:2,9,11,22
  70:18,23
  71:6,13,16,25
  77:19,20 78:23 79:20
  81:1,5 86:2,24
  87:2,7,8,10,20
  93:2,10,24 99:11
  100:19 124:15
  129:3,16,16,22 130:2
  131:6,7 144:2 151:9
  161:11 173:8
  183:16,23 184:3
impacted (1) 98:20
impacting (2) 34:4 93:9
impacts (15)
  64:9,11,16,18
  66:5,6,18 67:11 68:22
  70:5 72:4 99:13
  130:17,18,21
imperfect (1) 30:16
imperfection (1) 27:13
implement (1) 155:10
implementation (1)
  35:16

implemented (2) 11:1
  12:2
implementer (1) 102:24
implied (1) 29:19
implying (1) 106:3
importance (4) 10:5
  17:22 57:10 100:20
important (23) 9:23
  10:1,3 18:7 31:20 38:4
  39:4,8,10 43:15 51:10
  59:11 64:19,20
  84:10,13 132:10
  150:16 157:5 158:2
  159:1 162:21 195:4
impossible (10)
  23:18,20 82:7,9,10
  116:8 139:21 141:2,11
  144:8
imprecise (1) 30:21
impression (23) 46:2,10
  59:22,22 62:2,23,23
  63:3,22 80:19 81:25
  82:6 90:10
  95:15,17,21 114:13
  128:5,10 144:12
  145:3,22,25
improve (2) 53:9 162:2
improved (3) 111:18
  148:10 149:10
improvement (9) 62:12
  156:6,7,25 157:21,24
  158:14 161:15 165:5
improvements (2) 62:15
  96:3
improving (2) 90:24
  140:22
incapable (1) 119:12
incident (2) 172:5
  191:22
incidentally (1) 29:9
incidents (1) 185:20
incidentsdefects (1)
  192:23
include (3) 27:24 28:1
  63:20
included (7) 6:20 13:12
  95:19 103:11 107:8
  135:20 158:20
includes (2) 134:23,24
including (8) 27:21 41:7
  55:18,19 71:4 98:24
  134:25 146:17
incomplete (1) 172:18
inconsistent (2) 82:22
  87:14
incontrovertible (1)
  120:20
incorrect (3) 153:3
  163:15 172:20
incorrectly (3) 170:9,10
  188:16
increase (2) 14:1 122:23
increased (3) 151:22
  164:9,14
incumbent (2) 145:23
  170:20
indepth (1) 115:14
index (1) 197:1
indicate (9) 29:15 70:21
  85:22 118:22 119:17
  126:19 137:16 149:18
  186:10
indicated (5) 14:12 41:2

65:5 100:18 128:25
indicates (4) 5:4 123:15
  186:11 189:24
indicating (4) 65:24
  74:24 117:18 144:6
indication (5) 86:16,19
  87:1 112:5 115:24
indicative (1) 99:11
indicator (2) 86:3 119:3
individual (3) 11:22
  107:11 132:22
industries (4) 143:25
  144:1,2,4
industry (14) 26:14
  31:23 39:20 40:15
  41:6 45:24 46:3,5,9,16
  96:2 140:18 141:24
  143:22
inevitable (1) 147:9
infallible (1) 28:16
infer (6) 92:24 93:16
  94:10,12 175:23 176:4
inferences (1) 146:15
inferred (1) 92:25
inferring (1) 180:19
infinitive (2) 108:22,24
infinitum (1) 22:24
information (17) 10:20
  53:4 73:6,22 74:25
  75:1,12 78:8 87:15,18
  94:12,13 104:22
  107:12 119:19 135:8
  192:5
informed (2) 92:18
  159:4
informing (1) 92:16
inherent (1) 185:8
initial (4) 84:4
  127:15,18 133:23
initially (6) 42:2 98:9
  100:17 111:15 113:14
  175:20
injecting (1) 192:10
input (2) 12:22 13:4
inputs (1) 27:22
insertion (1) 187:20
insofar (1) 154:9
instance (5) 183:16
  184:7 186:18 192:9,16
instances (1) 132:23
instead (3) 70:13 128:2
  183:3
institution (4) 74:7
  75:2,11 80:2
institutions (5) 54:9
  73:13 74:4 79:13,13
instruction (1) 129:13
instructions (2) 104:10
  129:25
integration (1) 192:23
integrity (2) 151:17
  153:13
intella (1) 108:15
intelligence (1) 109:25
intelligent (7) 107:17
  109:7,15 110:10
  113:13 117:11 119:9
intelligently (2)
  108:16,25
intended (1) 106:2
intensive (1) 121:1
interactive (1) 106:15
interest (11) 111:15

112:21 113:13 114:11
  115:2,5 116:18,23
  134:16 145:8 187:16
interested (4) 33:15
  90:12 167:9 193:23
interesting (1) 114:17
interfering (1) 125:23
internal (2) 124:4
  147:15
internet (1) 12:16
interpret (1) 14:17
interpretation (1) 27:17
interpreted (1) 30:17
interpreting (1) 10:8
interrupt (1) 87:24
interrupted (2)
  61:13,16
interrupting (1) 136:9
intervening (2) 96:17
  115:25
intervention (3) 72:8
  75:15 77:24
into (23) 3:14,25 11:5
  26:10 31:4 32:13
  47:25 48:17 54:6
  72:21,22 73:20,21
  79:25 91:19 96:7,8
  108:2 141:15 164:24
  166:18 167:7 192:4
intrinsically (2)
  162:15,17
introduced (4) 11:5
  27:22 173:1 175:15
introducing (4)
  185:1,5,7,9
invalid (2) 17:21 188:6
invariably (1) 38:8
investigate (2) 174:3,8
investigated (1) 175:13
investigating (1) 98:6
investigation (3) 98:8
  99:10 108:15
investing (1) 151:11
involve (6) 34:12,14
  36:1,2 79:11 174:12
involved (17) 37:23,25
  38:1 76:11,25 93:7,9
  98:7,12 145:18 150:22
  185:1,5,6 186:1
  189:6,11
involves (1) 140:24
involving (3) 12:15
  34:15 36:3
irelands (1) 75:24
ironed (2) 123:1,3
irrelevant (3) 111:9,17
  114:2
isnt (54) 15:14,23 16:3
  19:9 24:17,19
  26:14,16 29:9 31:25
  32:8 41:11,21 43:9
  48:3,24 59:11 63:15
  73:10,11 76:8,15,20
  80:20 87:11 92:24
  94:6,20 96:5,13 97:23
  106:25 109:6
  121:15,22 132:21
  138:5 142:14 143:17
  144:7 149:3,3 153:18
  154:8 159:16 163:11
  166:2 167:2 170:18
  172:13 174:8 176:12
  183:25 192:24

isolated (3) 34:18,20 35:22
issued (1) 189:14
issues (54) 8:2,4,8 9:10,22,23 10:2 11:14 14:17,21 15:3 16:1,6,22 17:1,17,21 18:15,16,24 19:2,19,21 20:23 22:6 26:25 34:23 39:2,9 48:8 49:6 106:14,19 115:13,15 116:5 129:15 137:13,19,21,23 150:19 166:23 169:10 177:2,4,7,13 178:12,13,16,21 189:22 193:5
issuesbugs (3) 151:20 153:15 163:5
itc (2) 156:9 161:8
item (1) 188:14
items (1) 188:16
its (27) 12:7 23:2 24:14 30:1 32:22 53:16 63:9,11 64:20 65:16,18 67:4 74:8,11 82:7,18 87:17 96:20 106:14 119:1 120:9 139:10 142:6 156:18 172:9 181:13 194:12
itself (6) 25:6 27:24 79:19 104:23 135:10 155:25
itu (1) 191:20
ive (1) 192:8

J

jamie (1) 102:22
jason (2) 5:16 197:3
jc1 (1) 112:14
job (4) 137:16 173:4 174:2,7
joint (41) 4:21,22,23,24 6:23,24,25 27:3,4 28:4 29:11 40:1 51:23 59:17 60:11 67:7,9 68:9,18 82:12 83:16,18,20 84:9,18 87:25 90:4 96:12 101:1,5,6,7 105:8,21 112:12 128:25 147:6,8 150:13 151:18 172:6
journey (1) 43:22
js2 (3) 70:8 100:6,10
judge (5) 55:14 79:4 85:13 146:3,5
judgment (67) 4:4 17:24 19:3 45:6 47:22 48:2,15,23,24 49:14,19 52:6,12 53:2,12,21 83:12 84:22 86:11 88:9 89:16 91:1 96:5,7 122:4 123:14 124:24 126:22 127:1,3 130:8 131:13,24 132:11,12,21,24 134:19,20,23,23,24 135:9,9 136:4 138:5,15 139:8 140:3,11,12,14,17,19,24 141:21,23 142:10,17

143:10,12,14,15,18 144:9 158:3 160:16
jump (1) 168:18
jumped (3) 12:5,10 194:18
june (8) 1:1 182:13 183:14,15 187:11 191:19 192:7 196:1
justifies (1) 165:16

K

keep (4) 94:11 95:13 161:14 183:2
keeping (1) 94:17
kel (49) 41:7 64:11,21,25 65:2,3 69:3,4 70:24 71:3,5,6,15 85:22,23,25 86:13,14,18,22,23 87:10,14,17,18 104:17,21 114:25 176:25 177:10,18,19,21,25 178:3,9 182:18 184:23 185:1,21 186:22 187:22 188:2 189:18,19,21 190:2 191:8
kels (63) 64:9,10,15,18,21 65:4,5,14,18,24 66:8,13,17,20 68:12,16,17,21,24 69:1,8,10,13 70:4,17,19,21 71:4 85:9,12,13,16,25 87:6,21 88:8,11,12 99:3,9,12,15,18 100:16 102:2 107:20 112:18,25 113:1,6 114:6,10,14,14,15 115:17 116:7 117:17 126:21 177:1 178:8,16,23
key (5) 49:4,8 52:19 138:25 188:8
kind (10) 35:8 56:22 57:22 93:14 94:19 109:23 118:20 140:10 162:12 176:11
kindly (2) 1:4 167:21
knew (3) 86:8 99:18 184:12
knock (1) 169:7
know (56) 1:9 2:12,15 20:13 54:23,25 55:1,4 56:7,7 61:12 66:3 67:19 68:11 71:21 72:6 78:6 79:5 86:10 87:3,5,8 91:18 92:1,2,18,21 93:18,19 100:13 109:6 116:10,11 118:10 128:21 132:6 135:3 136:7 137:10 153:8 158:25 165:7,10 169:4 179:7,17 181:14 182:11,25 183:25 184:2,3,4 185:6 193:15 195:15
knowingly (1) 128:9

knowledge (4) 64:11,22 177:19 194:23
known (21) 11:7 41:7 60:20 61:6 64:4 71:23 147:2 151:19 153:15 159:9 163:5,8 169:10 177:2,12 178:12,21 182:17 185:22 189:22 193:5

L

lack (1) 35:17
landscape (1) 138:18
large (30) 10:24 29:22 30:5,18 31:3,11,14 39:5,12,16 40:2 44:20 45:13 57:5 59:3 62:17 64:15,18 65:16,18,23 66:8 68:21 69:12 70:17 79:18 88:16 99:9 108:17 131:9
largely (3) 23:25 114:2 185:25
larger (4) 77:25 98:9 111:23 120:21
last (12) 4:6 10:22 26:25 50:19 70:10 100:22 123:5 133:2,10 136:23 142:9 182:1
lasting (1) 57:17
later (14) 17:25 19:6 21:14 28:5 43:24 63:4,6,12 70:14 96:15 105:14 135:24 179:10 189:7
latest (1) 174:18
launch (4) 37:7 120:21,24 122:20
launches (1) 127:13
lawyers (1) 78:11
lay (1) 99:19
laymen (1) 110:5
layout (1) 158:8
lead (1) 173:13
leading (2) 103:13 164:8
leads (1) 65:2
learned (3) 1:8 167:21 191:14
learning (2) 40:7,10
least (5) 16:24 46:18 151:9 177:7,10
leave (3) 136:8 168:25 186:13
leaves (1) 162:17
led (4) 85:23 100:17 128:14,24
left (2) 121:25 163:20
lefthand (1) 192:21
legacy (14) 36:19,22,23 120:17 122:2,20 123:6 125:5 126:19 127:13,14 133:12 135:14 139:10
legal (1) 98:19
length (1) 136:19
lens (1) 144:3
lesley (1) 155:17
less (14) 63:7 95:20 100:11 101:2 120:12 121:18,24 122:25 124:17,19,25 127:16,21 154:10

lesser (1) 154:13
let (13) 19:21 31:9 42:24 50:8 51:11 64:13 65:10 72:18 82:5 132:9 150:24 163:2 190:4
lets (33) 15:10 31:1 41:1,13 46:6 49:15 51:24 55:23 60:2 65:11 69:6 71:22 79:19 82:12 87:23 99:19 105:18 118:1 125:15 127:24 134:2 146:19 148:3 149:13 151:12 154:2 161:21 171:12 172:4 181:5,5 186:22 191:17
letter (7) 45:20 164:21 165:9 167:13,16,19 168:1
level (29) 9:20 13:14 32:19,22 33:1,3,8,10,12 34:7,11 41:4 42:25 48:11 58:1 78:25 79:8 85:7,14 88:9 96:14 97:11 99:21,24 120:13 139:15,24 143:12 156:6
levels (5) 83:9 97:4,12,13 98:3
lfs (1) 188:19
life (14) 15:2,12,13 20:7,11,16,17,21 44:15 122:17 139:10 142:25 148:9 149:10
light (3) 5:2 41:25 128:1
like (49) 1:8,10 2:23 3:20 8:8 10:7 14:10 23:1 36:11 42:8 44:19 45:12 63:22 66:15 67:17 68:7 73:10,11 74:5 77:8 81:3 85:3 88:18 94:23 97:20,22 99:22 101:22 110:15 120:2 121:8,11 128:2 129:7 131:23 133:5 140:16 141:5 152:16 153:7 162:13 165:3 167:19 169:7 170:14 181:14 192:10 193:4,20
likelihood (9) 16:3 19:12,15 20:3 34:4 35:20 83:6 137:24 138:6
likely (48) 8:10 14:25 15:4,8,9,12,22 16:8 17:3,5,8 18:12 19:23 20:9,10,24 21:3,8 22:9 41:4 51:9 55:6,9 80:11,14,16 86:17 87:10 93:24 114:23 116:13 120:10 131:7 133:11 137:10,23 148:9,11 149:7,9,23 176:13 178:3 179:15,16,23 180:3 183:22
limited (4) 21:14 22:12 113:16 150:9
limiting (1) 28:23

limits (3) 28:18 49:5,9
line (7) 24:10 91:10,23 150:24 173:2 175:16 181:11
linear (1) 116:15
lines (4) 24:11 79:12 118:17 142:15
lionel (1) 182:13
list (10) 8:1 13:16 14:4 35:12 107:25 108:1 138:4 156:17 159:9,14
listed (3) 39:2 66:3 68:13
lists (2) 76:7 115:1
literally (1) 118:17
little (4) 24:20 30:21 87:18 90:8
live (7) 23:22 24:1,7 37:4 141:15 193:3,9
lives (1) 127:15
log (3) 11:7 41:7 192:12
logger (1) 191:19
logic (2) 159:2 178:2
logs (4) 60:20 61:7 64:4 71:23
long (9) 4:9 43:22 93:5 98:8 115:8 123:4 136:24 145:18 193:15
longer (1) 193:23
look (85) 6:12 7:8 8:8 10:7 20:17,20 28:10 29:11 36:21,21 37:1,4,6,8 38:14,19,20 40:18 41:13 49:23 51:23 60:2,4 62:1 64:3 69:17 70:2,14,24 71:2,5 77:12 84:20 86:4 101:25 103:10 104:11 105:3,5,9,18 113:9 114:25 115:1,9 125:15,23 126:14 127:5 130:11 139:5 140:4,5 141:1,1,20,22 143:16,18,22,24 154:2 155:25 156:2 157:18 158:24 160:4 161:22 163:16,19 168:4 172:4 180:7 186:22 187:3,22 188:1 190:21 191:3,17,18 193:13,17 194:11 195:19
looked (34) 14:16 22:2 25:21 42:5 67:6 75:20 76:21 79:25 84:21 107:2 112:24 113:2,2,4,5,6 114:9,13,15 115:16,19,22 116:9,14 118:8,25 119:23,24 122:15 138:17,22 180:18,19 190:16
looking (41) 3:11 12:12 32:22 34:20 36:24 37:19 38:8,13 44:12 70:23 84:2 86:12 95:8 97:1 99:3 100:4 101:21 102:5 107:1 110:13 111:3 112:16 115:25 117:19 119:14 124:5,6,12 129:2 131:18 141:8 142:4,14,15,16 143:12 145:12 146:25 157:22

163:25 194:23
looks (3) 124:17 170:14 193:20
loop (2) 52:23,24
lordship (6) 1:3 2:6,7,10 3:20 5:6
lordships (1) 3:8
loss (1) 125:16
lost (1) 3:1
lot (6) 47:14 77:9 109:7 116:4,14,15
lots (4) 45:13,14 109:10 114:1
low (7) 9:20 13:13,18 48:10 57:23 81:16 185:4
ltd (1) 172:15
lunch (1) 100:23

M

machine (1) 142:15
machines (1) 57:19
magnitude (1) 139:17
mails (1) 192:10
main (4) 19:9 86:24 93:15 187:25
mainly (2) 105:23 106:1
maintained (3) 73:22 74:14 82:15
major (3) 52:4 120:9 122:22
majority (11) 57:12 58:18,21 59:3 71:19,21 103:15 131:21 148:11 149:1,11
makes (3) 5:8 53:11 173:20
making (21) 2:8,15,20 12:21 19:4 47:13 48:15 74:4 92:12 99:20 134:19 143:18 147:21 150:11 151:5 162:25 177:23 183:4,7 186:1 189:11
maladroit (1) 114:9
manage (2) 109:3 182:19
manageability (1) 58:5
managed (2) 27:13 155:12
management (15) 25:23 44:11 73:22 156:15,16 157:17 159:7 160:5 164:20 165:9 167:16,19 168:1,12 172:6
managing (2) 28:1 33:22
manifestation (1) 178:4
manifests (1) 25:6
manner (2) 12:24 172:20
manpower (1) 58:5
manual (10) 47:1,3 52:2,10 72:8 76:25 79:8 120:6 164:3,12
manufacturing (1) 43:12
many (40) 23:16 26:2 30:17 37:7 52:17 59:7 61:12 62:10 66:2 67:25 69:3 77:15

78:4,15,15,16 84:10,11,13 85:22 97:7 101:9 106:19 112:8 116:6,7,12 118:8 128:19 129:15 137:6 138:8 139:18 141:16 142:23 145:14 153:12 160:24 180:24 189:7
map (1) 88:23
march (5) 3:2 4:25 6:18 168:2 172:7
mark (2) 185:15 186:4
marry (1) 118:16
match (1) 77:8
material (3) 13:12 88:19 104:13
materially (1) 127:21
materials (1) 104:13
maths (1) 100:13
matter (2) 1:25 154:8
matters (1) 104:8
mature (6) 39:5,12,17 40:2 42:9 194:17
maxwell (2) 181:24 185:4
maybe (2) 3:25 43:3
mean (25) 9:10 27:12 28:16 30:14 46:19 53:21 63:10 81:5 85:4 90:3 91:4 95:22 97:12 100:4 121:3 123:8 133:24 134:7,9 138:6 152:11 165:19 170:10 183:21 190:4
meaning (5) 21:19,20 30:1 46:11 82:7
meanings (1) 173:21
means (8) 30:15 55:23 56:16 59:23 79:15 81:9 183:24 191:21
meant (1) 69:22
meantime (1) 161:16
measure (2) 36:7 82:8
measured (1) 63:16
measurement (1) 82:11
measures (27) 9:18 12:3,18 13:13,16 14:6,7 16:11 17:13 21:23,24 25:9,12,17,19 32:18 33:6 45:1,16 48:9 148:6,10,12,24 149:10 151:16 153:13
measuring (1) 34:18
mechanism (3) 24:17 37:23 172:15
mechanisms (2) 151:17 153:14
medical (1) 57:19
meet (1) 103:22
meeting (3) 153:24 158:9 179:25
meetings (1) 109:19
members (5) 102:9 111:2 117:2,3,6
memorandum (1) 105:21
mention (4) 2:1,23,25 61:15
mentioned (2) 116:24 185:16
mentioning (1) 96:16

passage (4) 42:5 165:13
175:23 184:8
passed (1) 94:13
passes (1) 175:7
past (6) 36:21 37:5,14
38:8,13,15
path (1) 160:22
patrick (2) 102:23,24
pause (13) 40:25 67:2
133:17 140:1 152:3
154:4 163:15 164:15
166:25 168:17 171:22
182:12 192:18
paying (1) 147:19
payment (2) 70:12 74:2
payments (5) 45:10
73:4,13 74:4 189:3
payroll (1) 168:8
pco120937 (1) 181:6
peak (37) 41:7 63:11
65:2 69:5 71:14 91:23
94:14,19,22 104:17
115:2 169:17,18
176:11,14,18
177:8,10,20 178:1
179:5 180:11 181:6,8
186:7,18 189:16,21
190:1,6,16 191:8
192:19,24 193:1,4,12
peaks (88) 5:4 61:7
62:1 63:2 64:10,21
65:1,3,6,7,8 69:14
70:19,22,25
85:10,17,19
86:4,7,8,8,11,19 87:19
88:13,14,15,16
89:1,5,6,12 91:1
92:4,25 94:7,25
99:15,17 100:16,18
101:12 102:2
103:16,18 104:20
107:15,20 109:10
112:19,20 113:1,6,12
114:4,5,10,15
115:1,2,19 116:12,12
117:13,17 118:2,4
122:18 127:5,6 168:23
176:10,15,17,23
177:1,14 178:6,17,23
179:8,17
180:7,8,20,24 183:16
peakspike (1) 126:17
people (13) 36:6 43:10
47:21 98:7 102:6,8
103:13,15 107:6
116:24 139:18 142:23
147:14
per (5) 72:10 77:23
143:6 160:10 176:23
percent (1) 57:24
percentage (8) 81:18
139:25 149:2,6,7
160:11,19,19
percentages (1) 138:19
perception (1) 46:15
perfect (9) 14:11 25:15
29:1,4 30:15 56:1 57:4
134:10 141:14
perfection (1) 27:12
perform (4) 27:20 35:7
141:21,22
performance (6) 26:18
37:14 38:9,14,15,20

performed (2) 44:24
192:3
performing (3) 36:20
38:18 156:17
perhaps (15) 3:21 40:17
61:14 68:5 92:6 95:8
127:25 135:16 167:22
168:5 171:21 172:9
178:19 180:25 192:6
period (23) 18:8 97:22
98:2 117:1,9,17 121:6
122:14 123:6,8
127:6,10,20 133:20
134:17,18
135:10,14,15,17
136:12 152:10,17
periods (14) 60:15
120:19 121:24
122:1,8,9,24 123:4,4
124:25 127:16,18
136:5,24
perplexed (1) 182:11
person (3) 70:10
143:4,6
personal (1) 1:6
personally (1) 112:24
peter (2) 5:16 197:3
phone (1) 79:12
phrase (2) 30:1 33:11
phrased (1) 72:7
pick (6) 25:17 26:3
38:25 51:5 73:15 91:6
picked (3) 59:4,8,9
picking (3) 11:21 13:7
116:19
picks (5) 23:16,19,20
picture (2) 61:18 150:7
piece (4) 29:20 142:2,2
153:23
pieces (1) 180:4
pilot (1) 121:3
pin (7)
69:17,18,18,21,22
70:3 74:5
place (33) 12:3,18
14:14 16:11 22:19
23:4,6 25:10 32:18,21
33:13 38:5 43:22 45:8
49:20 51:5 59:5
62:12,17 75:15 88:24
89:14 91:14 96:3
98:11 130:11
132:5,6,7,8 156:10
161:13 174:7
placed (2) 20:5 106:24
plainly (1) 89:8
platform (3) 103:8,21
108:2
play (2) 103:3 147:20
plead (1) 10:19
pleading (1) 8:22
pleadings (6) 8:25 9:7
10:9 18:25 98:18,25
please (34) 1:3 6:14 7:8
12:6 15:18 18:3 31:18
40:9 61:13,16 67:22
84:7 85:3 112:11
115:10 126:1,14 128:3
132:9 137:4 148:4
152:1 163:16 164:19
166:16 168:19,25
170:10 187:8 188:1
191:18 192:20

193:13,17
plural (1) 180:8
pm (13) 101:16,18,20
144:22,23,25 181:9,12
184:14 188:5,21 194:2
195:24
poa (2) 172:16 193:22
pointed (3) 88:12 98:19
159:18
pointing (2) 47:17
145:9
points (9) 2:11 39:24,25
105:23 136:14 138:14
163:21 194:15,18
pol (3) 113:12 172:15
191:21
polsap (5) 73:11,21
75:11 168:9,11
poor (5) 95:17,20 98:10
128:10 132:17
portion (1) 69:13
position (20) 7:16 22:20
43:23 53:1,23 67:18
80:2,5 88:8 90:25
99:16 108:8 122:8
123:22 126:25 138:7
139:14 140:9 145:11
178:2
positioned (4) 43:7
130:12 131:21 133:15
positioning (1) 51:4
positive (6)
148:16,19,21 149:14
150:4,9
possibility (3) 60:16
149:20 159:19
possible (37) 8:10 14:25
15:8,9,12,22 19:23
20:9,10 23:14,16
31:16,16 32:25 33:2
40:13 47:24 57:9 70:1
78:16 79:10 105:22
109:1 137:14 138:4
139:23 141:13 149:21
150:17,21,23 162:8
180:6 181:1 182:18
186:25 189:9
possibly (7) 77:4
95:8,12 113:5 133:13
142:25 168:4
post (52) 12:23 13:1,25
14:10 38:2 50:9 52:9
54:7,9 55:1,3,7,19
67:16 73:8,10,23
74:11,14,25 75:25
78:10 79:12 80:1
91:24 92:16,18,21
93:17,23
94:2,13,17,18 96:2
106:16 116:6 124:16
135:4 151:3 154:20
157:1,4,8 158:25
159:5,7,23 172:15,16
174:14 179:2
posted (1) 183:17
postmaster (5) 183:24
184:1,6,8,12
postmasters (1) 54:14
pot (1) 138:13
potential (13) 8:15 9:13
13:10 15:1 19:24 26:7
103:9 106:20
112:17,19 161:15

182:24 183:1
potentially (3) 26:10
119:17 160:7
pouch (3) 181:14
188:23,24
power (1) 30:9
powerful (2) 108:14
109:21
practical (5) 17:21
20:22 29:8 42:10 71:7
practice (7) 36:10
39:6,12 40:7,10 49:2
142:16
practices (1) 13:25
practitioner (1) 33:17
precise (1) 118:10
precisely (5) 26:2,13
59:6 66:4 81:12
prefer (1) 71:20
preparation (2)
103:2,14
prepared (1) 127:11
presence (1) 166:17
presentday (2) 52:1
120:5
presented (2) 145:21
185:3
pressing (2) 188:8,10
preston (1) 102:18
presumably (4) 103:19
107:19 111:1 119:9
prevent (8) 9:19 12:18
25:3,10,12 49:24
128:17 148:7
previous (2) 150:5,10
previously (1) 34:8
primarily (2) 61:6
186:12
prince2 (6) 33:17,19
34:19 36:1,5,7
principle (1) 67:18
principles (2) 24:12
42:11
print (1) 195:16
prior (1) 10:14
prioritisation (1) 16:23
priority (1) 16:22
private (2) 56:19,23
privilege (1) 3:3
pro (1) 119:7
probably (10) 3:1 10:1
81:17 89:18 101:3
124:21 177:10 178:8
194:3,12
problem (44) 25:20
51:13 70:24 71:1,7,8
72:15 77:13 80:15
91:9,20,21 92:9,12,16
130:1 140:7 141:17
143:1,7 145:15
149:24,24 158:15
159:12 160:2 162:14
175:13 176:21,25
181:20 182:7,10,16,25
184:4,25 185:4,12,20
186:13 189:11
192:16,17
problems (40) 11:15
17:3,3,5 25:13,18 32:6
48:10 58:7 59:4,23
65:5 72:8 89:7
104:25,25 113:22,24
114:3 117:18 120:21

121:2,6 122:23,25
123:3 126:25 129:2,2
130:16,18 133:23
136:20 137:24,25
145:9 157:25 162:4
182:17 186:8
procedures (1) 13:24
proceed (1) 5:22
proceeded (1) 72:16
proceedings (3) 9:24
10:2 16:20
process (62) 8:19 22:12
23:21 25:25 27:11
32:15 33:22 34:14
42:4 53:8 54:24 55:4
60:24 73:15,19,19
74:16,21
75:3,14,17,21
76:5,7,12,12,15 77:25
79:2 90:20,24
91:2,4,10,12,25
92:2,3,22 93:19 98:12
107:3,5 111:7,13,21
112:9 116:3 117:14
131:4 135:6 138:20
147:23 149:25,25
156:8,10 157:10
161:7,10 176:13
188:10
processes (17) 33:6
38:5 43:21
52:10,14,17 55:19,20
62:12,14,15 73:17
89:13 98:10 106:15
123:2 134:25
processing (3) 9:15
57:7 73:2
produce (4) 5:6,12
115:7 154:9
produced (15) 4:13 19:3
27:7 60:4 61:21,25
82:13 101:7 117:23
119:23,24 159:10
179:4 181:13 189:18
produces (1) 25:6
producing (4) 4:4 16:13
24:15 96:15
product (1) 23:22
profitability (1) 58:8
programme (3)
24:21,21,22
programmer (1) 102:25
programmers (1)
147:16
programmes (1) 24:20
programming (6)
24:13,16,19 25:2
44:13 123:2
progressed (1) 156:8
project (8) 29:23 33:23
35:16 37:19,21 39:21
47:17 121:3
projects (4) 36:12
102:10,11,23
prompts (1) 188:13
proof (1) 4:10
propagate (1) 25:4
propagated (1) 73:21
properly (8) 57:11,14
98:2 101:23 129:5
139:1,2 176:13
proportion (5) 57:16
58:24 59:3 81:10

83:13

proportionate (1)
155:11
proposal (11) 161:5,11
162:5 163:7,8 164:23
165:5 167:6
168:8,9,11
proposed (1) 29:17
proposition (11) 155:20
169:10,12 170:21,23
171:2,14 173:16
180:20,24 186:8
propositions (1) 61:2
prospective (1) 38:19
protective (1) 12:18
provide (9) 9:11 10:15
96:4 106:6,8 111:10
150:7 158:11 174:21
provided (3) 106:22
147:23 169:14
provides (2) 108:20
173:7
providing (2) 17:19
80:22
provision (2) 10:20
100:16
provisional (1) 84:24
public (1) 29:20
published (1) 185:22
purpose (6) 19:1 20:22
32:5 172:9 177:1,18
purposes (6) 9:23 10:2
45:5 59:14 105:16
141:19
putting (5) 62:7 163:14
165:17 166:3 169:20

           Q

q (635)
6:1,3,6,9,12,14,17,20,23
7:2,4,6,8,10,14,17
8:4,8,24 9:2,10,12
10:1,5,7 11:9,13,19
13:7,21 14:9,20,24
15:10,18
16:1,6,11,16,19,24
17:12,15,21,24
18:4,20
19:7,9,11,15,20
20:2,7,20 21:2,6,10
22:12,25 23:7,9,15,18
24:2,10,19
25:2,6,9,12,17
26:2,12,16,24 27:3,16
28:1,4,9,15,21
29:4,6,15 30:1,5,14,24
31:9,18,22,25
32:2,4,24 33:15,19
34:8,23 35:1,3,25
36:10,15 37:12,16
38:7,11,18,23
39:11,14,22
40:6,10,13,17,21
41:1,10,13,18,20,23
42:4,7,13,18,20,24
43:3,5,8,17,19,24
44:2,20,23
45:1,4,13,16,20,23
46:1,6,17,23
47:5,10,22
48:2,8,13,20,23
49:4,14,19 50:1,3,7,19
51:11,18,22 52:25

53:6,11,15,19 54:4,17
55:5,12,18,23 56:22
57:1,4,10,16,19,22
58:1,4,14,17,23
59:3,11,14,16,20
60:2,10,13,19
61:9,11,13,16,21,25
62:21 63:11,17
64:3,8,12 65:10,20,23
66:2,5,8,15,21,24
67:9,13,21,23,25
68:5,20 69:1,6,17,21
70:3,7,14
71:2,15,19,22
72:11,14,18,24
73:3,6,10,19
74:3,7,11,14,16,20,23
75:4,8,10,17,23
76:6,12,15,17,23,25
77:2,5,12,17 78:20
79:4,10,16,24
80:5,10,18,24
81:7,12,15,19
82:5,12,21,25
83:5,20,22,25
84:5,7,9,13,17,20
85:2,6,12,18,20,25
86:5,10,22 87:4,23
88:14,16,18
89:1,3,8,15,20
90:2,4,15,17 91:1,15
92:4,12,15,24
93:12,16
94:1,3,6,10,19,22
95:1,5,9,13,15,19
96:5,11
97:1,11,15,17,20,25
98:14,22 99:3,6,12,18
100:2,4,8,22 101:5,12
102:5,8,12,14
103:2,13,18
104:1,6,10,24
105:8,14,16,18 106:11
107:5,11,14,19,23
108:5,8,10,13
109:6,9,13,15,19,21
110:2,10,16
111:1,10,22
112:1,5,11,24
113:2,6,8,21,24
114:4,8,13,17,20,24
115:6,19,22,24
116:7,12,24
117:3,8,11,13,16,22
118:1,5,8,12,19,25
119:9,12,14,22
120:16,19
121:3,9,13,17
122:1,11,13,19
123:4,13,21,25
124:3,14,17,24 125:4
126:11,19,22
127:8,14,18,23
128:13,25 129:12,18
130:1,7,14,24
131:3,12,16,23
132:9,20 133:3
134:9,12,23
135:7,13,17,20,23
136:9,15 137:4,16,23
138:2,5 139:3,13
140:2,10,13,16,23
141:13,19 142:9,14,20

20:6,18 54:1 151:4
subset (3) 48:5 114:23
174:17
substantial (2) 65:18
145:18
substantially (1) 4:6
substantive (1) 2:2
succeeded (2) 106:4,9
successful (3) 148:12
149:12 188:18
successfully (1) 58:22
suffer (2) 28:17 57:16
suffered (1) 134:7
sufficient (5) 135:8
142:20 156:9 174:21
182:18
suggest (28) 27:16 31:2
36:11 38:7 46:1 53:11
66:15 82:5 92:24
94:15 98:23 116:13
123:22 129:8 130:14
131:23 136:9 138:12
140:23 144:5 148:20
153:5 158:13 171:5
176:3 179:12 187:24
189:20
suggested (22) 2:12
62:22 63:5 65:8 77:15
78:3,5,6 80:18 98:10
99:6 128:4,9 132:5
134:4 143:13 149:15
155:10 156:24 158:24
161:2 166:21
suggesting (46)
18:20,23 20:20,22
34:8,13 36:1,10
50:19,22,25 51:11,14
53:19 54:17 55:5
61:21 68:15,20
69:1,9,21 70:3 72:2
79:17 87:4,5 122:13
123:13 129:4 131:3
132:10 140:2 141:19
144:7,7 145:2 149:24
157:14 158:12 161:24
167:21 174:22 175:22
177:23 191:15
suggestion (7) 33:15
79:21 80:21 81:24
162:1 177:22 180:12
suggests (3) 77:24
79:23 158:14
suit (1) 1:5
suitable (1) 111:11
summary (4) 3:10,13
80:23 181:9
supplemental (3) 2:1
6:9 62:5
supplied (1) 192:12
support (31) 38:1,2
52:2,18 64:23,24
90:20 91:2,4,10,10
116:5 120:6 122:17
123:2 131:4 147:23
149:25,25 151:12
152:7 153:22 154:24
170:3,6 171:24 179:24
180:12,20,24 186:14
supported (2) 52:2
120:6
supporting (6) 37:23
38:2 106:16 135:21
145:21 172:1

supports (3) 121:21
163:3 165:15
suppose (1) 128:20
supposed (1) 163:24
sure (28) 2:17 9:22 10:3
18:5 31:6 32:24 36:14
46:22 48:4,4 56:4
68:19 75:21 85:10
88:19,23 92:12 94:16
99:13 109:11 110:7
132:23 147:9 151:7
154:10 179:11 191:21
193:13
surfaced (1) 85:24
surprising (4) 76:7 88:3
89:22 174:10
surround (1) 130:4
surrounding (4) 113:25
117:21 135:1,20
survival (1) 58:11
suspense (4) 183:18,22
184:1 188:25
svi (1) 191:20
sworn (2) 5:16 197:3
symbols (1) 109:22
symptoms (1) 22:14
system (152) 9:4
13:10,11 14:5,11
22:10,18 23:25
24:4,7,14 25:14
26:10,16,21,23
27:10,20,24 29:4,8
31:1,10,10
32:11,15,16,21 33:2,5
34:9,10
35:3,5,6,8,8,24
36:17,17,18,19,22,23
37:2,3 38:11,12,14,15
40:13 41:8,20 42:2
47:7,23 48:16,17,21
49:4,6,9,20 50:14,16
51:6,20 52:18 53:16
54:6 57:4 58:17,22
59:22 60:24 62:19
64:16,25 72:15,20,25
73:1,2,3,21 78:25 79:5
86:18 89:24 95:10
97:17 98:8 122:22,24
126:24 130:4 133:1,9
135:10 138:25
142:11,24,24 143:5
147:14,24 148:10
151:17 152:16,20
153:13 155:7
156:16,20,25
157:2,7,15
159:6,8,14,22,23,24
160:3,9 161:1,1,3,25
162:1,3,3 172:25
173:2,5,10,12,20
174:11,17
175:16,17,18 178:20
181:9,12 184:9 185:8
186:2 193:2,5
systems (60) 11:25
12:15,17 14:11,13
30:6 32:6 39:15
40:2,11,14 41:15
42:13,15,18,21,22
43:1,11,13
44:3,9,10,16,17,18,20
45:1,7 47:6 51:2 52:3
54:7 56:17,18

57:1,6,22 59:5 72:25
73:8,10,11,22
74:14,17 77:21,22
79:7,14 81:15 102:25
106:17 120:8 134:24
138:9 139:15,17
141:25 173:24

T

table (12) 46:24 66:19
67:7,9,9,13,23 68:18
70:8 100:4,5 125:16
tag (2) 111:7,20
tagged (1) 111:12
tagging (1) 111:19
taken (14) 16:21,21
32:13 48:13 62:22
79:25 80:1,5 88:24
132:16 148:2 179:19
183:20 186:16
takes (3) 4:9 26:18
47:23
taking (8) 40:21 45:8
96:7 161:13 163:22
165:8 178:25 179:2
talk (12) 31:14 32:14
36:15 54:4 56:9 69:6
82:16 120:24 130:17
137:6 147:8 179:8
talked (2) 171:8 186:20
talking (44) 20:15 34:7
35:10 43:20 44:15,17
45:4,13,16 54:5,10,11
56:19,23 57:22 66:5
76:5 81:15 95:1,25
96:9 97:17,21,25
110:14,14,24 120:1
123:5,7,16 128:20
129:9,10,23 130:21
133:20 139:25
160:23,25 162:25
175:24 187:21 195:1
talks (6) 30:24,25 86:14
179:20 186:24 187:4
task (5) 104:23 118:16
139:19 141:2,11
team (19) 102:9
107:6,14 109:3,13
110:3,16 111:2,23
112:6,8 113:2,18
116:24 117:2,3,6
147:18 159:7
technical (7) 13:13,23
14:6 19:19 21:20,23
26:17
techniques (6) 39:17
107:17,19 109:16
110:1 113:14
technology (2) 102:17
123:1
teething (2) 126:24
133:23
telephone (2) 173:2
175:16
telling (1) 87:9
tells (1) 93:17
tempting (1) 194:10
ten (10) 78:11 86:18,20
100:12 143:6
152:13,14 164:2,12
166:12
tend (1) 128:8

tens (8) 77:22 97:14,15
98:1 99:7 100:1,2
176:23
tension (1) 61:4
term (9) 21:15,21,22
22:4 26:17 29:19
47:20 81:8 90:1
termed (1) 33:11
terminals (1) 14:3
terms (6) 23:23 26:13
46:16 119:21 173:8
195:8
terrible (1) 182:22
test (4) 24:4 141:15,16
182:2
tested (3) 24:12 39:17
184:22
testing (16)
23:10,15,19,20 37:5,6
121:8 141:13 164:1,10
192:23,24 193:1,3,4,8
text (5) 96:9 115:12
137:6 158:1 168:21
thank (23) 1:8,24 4:17
21:2 22:5 37:12 48:23
51:22 53:6 55:23
93:16 101:14 108:5
114:24 119:22 123:25
126:15 127:23 182:15
183:2 187:22 193:25
195:23
thanking (1) 1:4
thats (93) 2:11 5:11
11:19 12:13
16:1,16,22 18:5,18
21:7 22:3 23:23
24:2,10 25:23 26:2,8
27:3 28:4 29:7 36:20
41:20 43:4 46:17 51:1
53:4 54:14 60:1
67:18,19 68:5,11 69:5
74:1 76:3,25 77:12
80:12 81:21 85:2 86:2
90:8 91:14 93:18
94:1,16,19 100:20
101:5 102:23 106:11
107:1 109:23 115:8
116:24 121:13,15
122:24 124:24 127:23
130:14 131:2 134:11
138:7 144:14 147:18
148:17,23 150:1,3
151:6,9 153:23,24
154:15 155:19 158:1,3
159:1 160:20 161:19
162:11,15 163:3 166:1
167:11 169:6,8 170:16
176:2,25 182:9 194:7
theme (5) 47:12
105:2,7 146:21 153:17
themes (7) 103:6
110:25 111:18
116:6,19,20 117:21
themselves (1) 94:12
therefore (8) 1:12 28:17
113:16 114:13 147:16
151:10 178:1 193:8
theres (24) 4:14 9:6
24:6 36:8 53:20 63:14
78:20 81:9 85:19
87:18 90:8 91:12
93:24 96:10,24 119:8
122:23 123:17 132:17

151:7 177:23,25
185:5,8
thereto (2) 10:19,20
thing (17) 3:24 4:3,11
20:11 46:12 89:10
95:7 104:20 109:23
118:20 126:7 130:25
130:23 132:5
133:14,21,22,22
136:24 141:9 145:13
146:2,3 149:23 157:2
161:14 165:23,23
169:19 177:21 178:9
179:4,7,10,16 180:5
181:23 187:8 188:19
thinking (14) 89:4
104:1 110:2 112:1
113:18 115:16 117:16
121:9 122:4 167:14,17
168:15 179:4 182:9
thinks (2) 74:8,12
third (8) 28:4,22,22
51:23 91:10 150:13
163:19 175:25
thirty (1) 65:3
thorough (1) 139:19
thoroughly (1) 115:13
though (5) 5:9 39:11
71:2 94:1 175:20
thought (15) 62:7
63:7,11,19 100:17,24
101:1 111:3,5,11
112:14 114:17
167:10,11 194:18
thousand (3) 78:11
88:18 160:18
thousands (7) 72:9
77:16,23 78:4 118:10
160:10,20
threat (8) 30:2
58:2,4,4,5,7,7,10
three (25) 1:15 15:17
39:2 45:20 62:9 67:15
68:3 97:9,11
98:6,9,16,20,22 99:4
105:14,22 115:6 117:1
118:12,15 155:5,23
156:7 182:12
through (28) 24:14
25:15 35:15 46:23
47:18,21 58:22 70:1
72:25 77:6,7 103:9
104:13,16 107:3
109:10 111:20 116:21
117:15 119:15 126:9
144:3 146:4 156:20
161:9 170:25 173:1
175:15
throughout (11) 20:16
23:10 46:9 56:6
121:24 122:17 133:2
134:17 136:12
142:24,25
throw (1) 47:14
thrown (2) 14:21 59:4
thus (1) 173:3
tick (1) 166:1
tiers (2) 175:25,25
time (93) 3:1 17:24
20:11 21:10,13 23:12
24:22 28:5 38:4 40:22
50:19 55:25 56:1,8
60:15 61:5 63:8,11,18
64:17 65:4 66:9 68:22
69:11 70:16 72:19
75:8 77:7 85:11 88:5
91:5,6,8 93:6 95:2
96:15,17 98:5,8
99:6,23 100:23

101:1,23 102:1
104:3,6 105:5,6,10,13
107:24 108:4 115:25
116:2,9,13,25 117:4,8
119:25 120:14 121:15
123:11,12 129:24
130:23 132:5
133:14,21,22,22
136:24 141:9 145:13
146:2,3 149:23 157:2
161:14 165:23,23
169:19 177:21 178:9
179:4,7,10,16 180:5
181:23 187:8 188:19
timeframe (1) 113:16
timeline (1) 110:20
timely (1) 172:20
times (11) 1:21 13:12
38:6 47:11 84:11
150:14
152:12,13,14,18
176:22
tiny (8) 57:16 58:24
59:3
81:10,10,11,17,20
title (1) 126:6
today (10) 4:9,10
43:21,22 44:4 52:4
120:8 133:11 190:24
194:20
todays (1) 78:3
together (8) 62:7
103:25 104:22
132:13,16,22 169:21
189:21
told (2) 98:22 128:2
tolerance (3) 57:6,23
81:16
tolerated (2) 79:9 144:1
tomorrow (7) 4:11
33:20 181:2 194:6,21
195:9,22
too (5) 34:6 137:4
174:20 176:6 183:8
took (2) 99:7 138:13
topic (2) 40:3 42:9
total (3) 57:24
111:22,24
towards (4) 44:4,6
103:16,17
tps (4) 72:25 73:1,3,20
trace (1) 192:11
track (1) 23:3
trade (2) 110:4,7
trading (1) 192:4
traffic (1) 57:19
tran (1) 188:22
tranche (1) 104:12
transaction (36) 11:3,5
12:22 13:15 16:13
18:8 19:12 45:7 50:23
57:25,25
72:16,19,21,22 73:2
75:5,16 77:5,11
80:8,10,11,15
172:18,21
173:5,9,24,25 174:7
184:19 188:7,21
192:10,12
transactional (1) 106:21
transactions (36)
8:17,19 14:3 18:12
44:23 54:6,7,8

57:10,11,13 58:21
60:25 72:24
73:7,16,20,25
74:8,11,24 75:23,25
76:2,8 77:23 83:14
97:20,21 143:6
152:17,18,19 172:16
173:3 192:3
transcript (4) 78:3
81:22 191:3,4
transfer (2) 9:15 24:22
transferred (4) 12:23
24:21 45:10 54:6
transmission (4)
12:15,17 13:14 18:11
transmit (1) 73:6
transmitted (2) 12:19
72:25
transpires (1) 62:13
treating (1) 124:19
trial (6) 17:22 19:3,6
22:6 59:14 154:14
tricks (2) 110:3,7
tried (4) 59:21 82:6
96:23 190:4
tries (1) 166:12
trigger (4) 23:13 24:17
63:25 143:2
triggered (2) 24:18
138:24
triggers (1) 31:8
trivial (1) 20:13
true (7) 6:7,21 84:19
109:13 135:14 147:12
162:11
truism (1) 13:9
try (12) 17:25 24:13
88:23 103:8 104:18
110:18,23 125:22
126:5 129:13 149:16
166:4
trying (17) 32:22
47:11,15 55:12 63:17
69:6 81:25 89:9 90:11
117:20 134:12
144:9,11,14 150:3,4,7
tuesday (1) 1:1
turn (1) 152:1
turned (3) 68:16,18
192:11
twenty (1) 65:2
twice (2) 26:11 152:9
txns (1) 192:10
type (8) 26:11 95:24
105:4 119:19 158:8
188:7,22 192:20
types (4) 35:15 50:12
104:14 143:25
typical (3) 47:5 51:2
106:23
typically (20) 21:11
22:17 24:16 25:23
32:14 34:2,4 35:12
36:6 47:18 54:23
64:10 69:5 70:22 87:2
103:4 104:12 105:3
110:13,18
typing (2) 26:9 183:2

U

ultimate (3) 19:4,4 32:9
ultimately (2) 143:4
155:18

unable (4) 10:15 52:24
139:14 181:20
unaffected (1) 1:22
unclaimed (1) 189:3
unconventional (1) 2:12
undergone (2) 52:4
120:9
underlies (1) 26:24
undermine (7) 8:18
60:23 61:19 64:1,1
82:1 149:16
undermining (1) 150:9
understand (40) 2:3
16:24 25:24 30:21
32:24 38:5 40:4 43:25
44:2 52:25 64:19,20
67:17 70:25 77:17
80:24 87:20 89:23
90:20,21,24 91:6 95:5
108:10 110:18,20
115:5 117:20 122:22
128:22 129:2,21
133:23 140:23,25
143:19 150:24 153:6
160:6 165:22
understandable (1)
169:8
understanding (16)
38:7 51:10 52:9,13,17
62:25 63:1 89:13
90:23 106:7
129:13,20,21 139:19
152:22,25
understands (1) 102:21
understatement (2)
148:21 149:15
understood (6) 2:22
12:13 21:18 40:7,10
42:10
undertaken (3)
75:18,22 152:16
undertakes (1) 97:20
unearth (1) 110:4
unearths (1) 143:3
unfair (7) 59:20 116:14
128:11,12 152:4,5
193:10
unfortunate (1) 145:14
uninteresting (1) 15:14
unit (2) 24:23 192:3
units (1) 24:20
university (1) 32:2
unknown (1) 24:6
unless (2) 4:15 84:17
unlikely (3) 9:4 12:21
13:4
unreasonable (2)
162:16,17
unreliability (1) 62:18
unresolved (1) 60:15
until (5) 133:22 166:11
183:19 185:10 195:25
unusual (1) 143:2
updated (3) 5:11 64:22
184:24
upgrade (3) 120:22
122:21,23
upgraded (1) 120:11
upon (12) 11:9 36:24
41:6 52:13 124:24
126:23 139:17 146:16
151:18 159:24 170:20
194:17

upper (1) 44:4
used (22) 20:18 23:23
34:19 44:11 45:24
46:2,4,9,9 47:10 52:4
107:16,19 109:15,24
110:1,11 113:13
119:16,21 120:8 121:7
useful (1) 19:11
user (10) 25:1,13,18
26:4,7,7 27:10 30:10
147:13 191:20
users (3) 44:21 45:14
64:24
using (11) 21:19,20,22
81:8,14,15 86:6
115:11 121:4 123:14
188:22
usual (1) 144:22
usually (5) 5:5 7:16
50:12 56:19 152:11
utilising (1) 137:6

V

value (12) 21:14
26:9,10 35:19,20 75:9
96:10,12 129:25
137:12 160:13 192:2
values (1) 33:25
variance (1) 191:25
variations (1) 119:21
varied (1) 120:14
various (16) 11:9 16:11
38:5 59:5 73:16,17
88:23 96:3,9
102:10,21 103:23
119:16 136:14 137:7
138:13
varying (1) 60:15
vast (6) 58:21 71:19,21
131:21 162:14 166:6
vendors (1) 37:22
versed (1) 111:14
version (11) 5:11,12 6:9
52:1 120:6,22 122:20
154:11 167:20 172:7
174:19
versions (3) 97:25
154:9,14
versus (1) 161:12
volteface (1) 89:22
volume (18) 59:23
60:20 64:4,8,15
65:14,16,18,23
68:13,21 69:8,10
70:17 71:24 82:17,21
103:5
volumes (1) 108:17

W

wait (1) 157:13
waiting (1) 165:2
wanting (1) 95:13
wants (2) 88:5 133:19
warranted (1) 99:10
wasnt (12) 42:2 62:24
82:3 116:15,17
121:7,19 131:1 136:7
148:15 167:8 189:4
wasting (1) 40:22
watched (1) 143:5
way (30) 20:18 22:3,23
23:5,13 24:14 25:14

26:6 31:17 34:18 36:9
37:21 65:11 76:6 82:3
84:16,25 87:9,13
96:11 114:9 117:15
130:10 133:25 142:12
167:18 182:3
188:11,15 191:1
ways (8) 20:8 84:14
106:9 109:11 137:9,11
141:7,16
weaken (1) 150:4
weakness (3) 91:17
157:10,15
weaknesses (4)
91:13,15,16 138:19
website (1) 108:13
wed (1) 95:22
wednesday (2) 1:5
196:1
week (15) 1:5,9,13,15
3:21,22 4:6 56:6,7
72:10,11 77:23 79:15
97:21 177:16
weeks (7) 2:6 3:7 24:8
61:9,11 96:15 98:13
weighing (2) 161:13
185:17
went (7) 3:14 108:2
111:13 116:16 119:14
143:3 183:8
werent (3) 20:7 104:1
127:20
weve (1) 119:25
whatever (6) 23:1 57:25
91:24 104:17 133:10
150:23
whats (11) 11:11 14:5
70:7 85:20 96:11
156:23,24 161:2 184:2
185:3 186:11
whatsoever (1) 53:12
whenever (2) 5:5 7:15
whereas (3) 80:20 84:4
143:14
wherever (1) 57:9
whilst (10) 37:19 46:8
52:1 84:2 88:12
106:18,21 120:5
151:15 153:12
whoever (1) 74:2
whole (8) 35:23 44:13
66:16 107:19 112:6
117:3 122:17 132:16
whom (1) 78:6
wide (3) 36:3 173:21
wideranging (10) 60:21
64:5 65:15,20,24
66:10,11 71:25 77:19
80:25
widespread (3) 57:6
69:8 70:17
willing (1) 34:11
wish (1) 7:18
withdraws (1) 164:25
withhold (1) 84:22
withstanding (1) 28:1
witness (11) 28:11 56:9
62:14 163:22 164:25
165:2,10,23 166:16,17
194:22
wonder (2) 3:9 59:16
wondering (3) 47:11,15
126:22

wont (15) 33:8,16 36:21
50:7 71:12 81:5 94:16
126:5 146:2,3 176:23
181:19 195:1,3,18
worden (24) 1:18 2:13
7:11 27:6 29:9 39:1
45:17 46:8,20 47:23
48:25 68:1,3,6 81:4
106:11 125:7 131:10
132:1,4 136:20 137:8
138:7 147:6
wordens (7) 2:1 29:13
38:25 100:9 117:19
123:18 125:10
wording (1) 121:10
wordprocessing (1)
189:6
work (16) 25:25 28:23
44:11 51:5 58:22,24
59:1 94:7 102:12
106:22 131:22 132:24
138:6,16 149:3 181:13
workaround (1) 47:3
workarounds (2)
47:2,25
worked (12) 43:11
44:14 77:21 102:18,24
103:1 104:4,9 130:13
136:24 138:10,23
working (10) 24:14
76:3,10 77:25 103:13
104:2 105:11 172:6
175:23 176:13
works (2) 58:20 167:18
workshop (1) 47:18
workshops (1) 47:20
world (3) 21:19 44:3
58:9
worry (1) 12:13
worse (2) 53:10 140:22
worth (1) 151:10
wouldnt (19) 22:15
27:24 38:16,21 58:2
71:2 81:17
84:17,22,25 96:18
112:1,10 142:20,20
159:17 161:19 178:8
179:6
wrestled (1) 32:10
writing (3) 3:25 105:20
182:5
written (4) 4:5 5:11,12
82:3
wrong (27) 25:22 40:23
42:25 53:22 59:7
75:3,14 76:4 77:11,25
79:1,15 83:14,23
100:5 105:1 107:1,2
108:10 124:5 125:13
127:19 132:18 147:23
162:9 163:23 170:15
wrongly (1) 19:12
wrote (3) 64:17 68:22
158:21

Y

year (7) 96:2 125:17
134:3 135:16 142:25
143:6 168:1
years (15) 24:9 50:20
93:8 94:22 97:18
102:19 103:1 123:10
127:12 133:10 134:1
143:6 152:9,14 189:7

yesterday (1) 1:16
yet (4) 61:18 65:6 99:14
171:16
young (12) 155:4,22
156:4 157:14,19
158:10,11,12 164:20
167:7,13 190:14
youre (6) 17:1 47:11,15
65:17 81:25 149:22
yourself (6) 39:24 44:5
108:6 112:3 146:14
164:13
youve (4) 33:3 95:19
118:12 146:12

Z

zenith (2) 63:9,10

0

0 (4) 34:3 36:7 44:4,7
03 (1) 88:2

1

1 (16) 8:9 11:24 23:23
60:11 83:16,18,20
90:4 101:7 102:5
117:5 137:19
155:10,24 168:8 183:2
10 (4) 44:4,6 152:17,23
1000 (1) 77:2
10000 (2) 72:11 143:6
1013 (3) 182:22
183:10,12
1014 (1) 187:2
1015 (1) 195:10
1030 (4) 1:2 194:21
195:22,25
1033 (1) 182:23
104 (1) 101:18
10minute (1) 144:21
11 (1) 172:10
111 (2) 5:3 7:8
1128 (1) 185:15
114 (1) 114:8
1151 (1) 56:12
1155 (2) 56:2,11
1200 (2) 56:14 118:3
1201 (2) 181:18,21
1262 (3) 113:16
114:4,20
128 (2) 113:8,10
129 (1) 126:1
130 (1) 126:14
1355 (1) 181:23
13th (1) 182:13
15 (6) 152:13,14,17,23
164:1,10
154 (1) 40:18
1559 (1) 192:7
15th (3) 183:14,15
187:11
16 (1) 115:10
163 (5) 112:20
114:5,10,17,20
16th (13) 83:12,22 84:1
88:20 89:4,9 90:6 95:3
101:23 107:15 113:10
181:18 192:7
17th (1) 181:23
18 (3) 45:17 46:23
172:7

187 (1) 126:2
18th (3) 153:25 154:20
191:19
193 (6) 123:24
124:3,4,6,9,10
1999 (2) 120:10 123:5
19992000 (1) 122:1
1st (1) 117:23

2

2 (6) 12:14 23:24 67:9
156:3 168:7,9
20 (8) 50:20 94:22
97:18 113:11 133:10
152:9,14 191:9
200 (3) 66:16,25 88:18
2000 (2) 77:3 123:5
200000 (3) 94:25
107:16 109:10
2001 (1) 135:15
2002 (1) 135:17
2005 (5) 181:7 182:13
187:11 189:5 191:19
2010 (4) 120:11 122:2
135:15,17
2011 (5) 124:18,20
164:21 165:9 167:14
2012 (3) 134:2,4,18
201213 (5) 156:4
157:19 164:16 165:5
167:7
2013 (5) 124:22 153:25
154:20 168:2 172:7
2019 (5) 1:1 4:25
134:4,18 196:1
205 (2) 101:16,20
206 (2) 124:4,10
20th (1) 181:7
20year (2) 97:22 152:10
21 (3) 12:9 156:4
157:18
214 (1) 69:17
218000odd (1) 113:12
22 (4) 10:12,13 12:10
156:14
23 (4) 10:23 27:5 83:1
156:19
24 (2) 10:12 11:10
25 (2) 44:6 70:15
26 (2) 88:1 120:4
28 (1) 101:4
29 (4) 67:23 100:6,8
101:4

3

3 (18) 9:2 11:20 23:24
27:5 39:5,9,11
75:23,24 120:5 124:3
127:24 137:19 158:24
159:6 168:11 183:3,9
30 (1) 3:10
31 (5) 29:14 41:14
60:5,10 168:2
310 (1) 127:25
312 (1) 144:23
313 (1) 28:22
315 (1) 148:5
32 (1) 60:13
320 (2) 115:10 144:22
324 (1) 144:25
33 (10) 60:19 62:22,24
63:21 69:7 70:15

71:22 80:18 81:24
82:16
37 (6) 51:25 52:13
55:14 81:9 82:2 120:3
374 (1) 39:23
39 (2) 52:7,15

4

4 (17) 1:1 9:12 83:20,25
88:14,20 89:3,9 96:13
97:6 99:23 101:6,22
105:10 137:19 168:12
193:17
430 (2) 166:11 194:2
436 (1) 195:24
4505 (1) 191:25
47 (1) 97:20
48 (2) 39:1,3
49 (3) 97:21 152:17,18
4th (1) 4:25

5

5 (10) 4:5 34:3 36:7
136:3 161:6 164:12
187:3,4 197:3,4
50 (3) 11:22 12:7,8
5000odd (1) 114:10
5114 (5)
112:16,18,20,24 114:6
5161 (5) 151:14 153:23
155:22 158:21 163:4
5162 (1) 167:12
5166 (4) 190:5,8,15
193:18
5199 (1) 153:10
53 (1) 12:2 13:8 14:13
54 (3) 12:2 13:21 14:13
55 (1) 14:9
567 (1) 46:7
588 (1) 139:13
591 (1) 41:2
599 (1) 40:19
5th (1) 196:1

6

6 (2) 9:17 137:20
61 (2) 171:15,21
63 (1) 171:21
67 (1) 112:21
6th (1) 6:18

7

7 (1) 197:5
732 (1) 182:12
76 (3) 112:23,24 114:18
78 (1) 41:1

8

8 (1) 82:14

9

9 (2) 29:11 89:16
90 (1) 129:24
99 (1) 190:5