Appendix C: Quantitative surveys

C.1 This appendix provides detail on the quantitative surveys that have been submitted to us by parties and our assessment of this survey evidence.

C.2 Chapter 3 sets out our position on the quantitative survey evidence, including the concerns we have with it. These are principally guided by: our published good practice,[1] which sets out the principles of survey methodology that guide our assessment of survey evidence in casework and our own thinking about the strengths and limitations of different types of research among customers of cloud services when deciding on what research to commission ourselves.

C.3 Some general points of particular relevance to the survey evidence that we have reviewed are as follows:

(a) the main purpose of statistical sample surveys is to use the questionnaire responses of a sample of the population of interest (customers of cloud services, in this case) to make estimates that are generalisable across that whole population.[2] For this estimation to be valid, the sample must be representative of the target population. The CMA's good practice on customer surveys[3] states that sound statistical survey research requires the survey design to be based on a population of interest that is clearly defined, that the sample source provides a representative coverage of that population and that the approach to sample selection uses random methods. None of the surveys submitted to us satisfy all these criteria. In particular:

(i) some of the surveys are not specific to UK and European customers and are reported at a global level. This makes the geographical coverage of the survey unclear, rendering the scope of business activity reported also therefore unclear and varying significantly between respondents. Consideration of this factor is not shown in any of the survey material submitted to us by parties. This makes interpretation with respect to UK and European customers difficult.

(ii) the sample source for almost all the surveys submitted to us is a commercial online panel which does not use randomised methods to recruit respondents. The CMA tends to place less evidential weight on

[1] 'Good practice in the design and presentation of survey evidence in merger cases', CMA 78 May 2018 While the title of this document refers explicitly to merger cases, paragraph 1.4 states that many of the principles in the document are applicable to other types of case, including market investigations.
[2] This is different to the questionnaires used in the CMA's direct engagement work with cloud customers, where the data is used qualitatively as evidence of customer behaviour.
[3] CMA 78, May 2018, page 10.

surveys involving customer recruitment from panels[4] as sample bias is a concern. The characteristics of people who join a panel may be very different from consumers or business customers in general. Furthermore, the recruitment methods for these panels are not set out in any of the survey material submitted by parties[5] so we do not have information about the provenance of the samples to be able to assess their fitness for our purposes.

(b) the choice of respondent within a sampled customer organisation is important. Decision-making on public cloud infrastructure services can involve multiple staff within a business in different roles (eg commercial, strategic and tactical day-to-day decision making) especially for the larger cloud customers. A response to a survey questionnaire can therefore be highly dependent upon the particular individual responding to it within the customer organisation. The survey evidence submitted to us uses a range of different sample definitions including IT professionals, IT directors, executive leaders, business enterprise respondents, cloud architects/cloud engineers, network and security decision-makers and influencers and data centre/colocation respondents. Within the context of online surveys, it is relatively difficult to assess the suitability of the responding individual. This highlights the challenges of clearing defining a population of interest for survey purposes in this market and accurately recruiting a sample that matches that definition.

(c) the final important issue is the need, within a quantitative survey, to be able to capture questions of interest in a standardised way that can be fully understood by respondents, such that their answers are reliable and unambiguous. We judge the public cloud infrastructure markets to be technical and complex, where industry terms are not standard or universally understood by cloud customers and in which different customers use different terms to describe the same or similar concepts. The Jigsaw research and our own engagement work with customers has shown this to be the case and reflects the heterogenous nature of cloud customers and the evolving nature of the market.[6] Furthermore, the concepts relevant to the theories of harm under investigation in this case are not ones that can be easily accessed and distilled into simple questions that work effectively in a quantitative survey questionnaire where there is no scope for clarifying or

[4] CMA 78, May 2018, page 16.
[5] We have also observed that the full technical research details of the surveys submitted by parties are not published and have not been made available to us. Such technical details include the sample frames used, their sampling approach and how respondents are recruited, if any cognitive testing of questions was undertaken and the results of this testing, the full questionnaire, responses rates achieved and the underlying data sets.
[6] Cloud Services Market Investigation Qualitative Customer Research conducted by Jigsaw (2024), section 3.5. The language used by customers to describe the different types of public cloud operating models they use is an example of this referring to different types of multi-cloud set up covering siloed, mirrored, integrated and commodity based multi-cloud models.

expanding on customer responses.[7] Concepts which require explanation such as the different models, degrees and proportions of multi-cloud and switching, covering differences between private and public cloud, IaaS, PaaS and SaaS levels across the mix of possible cloud providers and ISV's operating in the market do not lend themselves to simple survey questions. This presents a significant risk that respondents can mis-interpret survey questions, producing misleading results. It also increases the risk that survey questions can only provide a very superficial or imprecise response to questions, which, to be valid for our purposes, require a much more detailed and accurate answer.

C.4 Given these risks and limitations with conducting robust quantitative survey research for our purposes in this market, we commissioned Jigsaw to conduct qualitative research with cloud customers.

C.5 The focus of this qualitative research was not to quantify and make generalisable estimates but to explore underlying views, experiences and motivations across a good range of different customer groups relevant to the investigation.

C.6 Jigsaw's research involved sixty hours of interviews with sixty customers randomly sampled across fifty different businesses using customer lists from cloud providers.[8]

C.7 The recruitment of respondents within sampled organisations was conducted with great care to ensure that they were sufficiently knowledgeable to engage appropriately with the research. In many cases, this resulted in the research participant being a very senior member of their organisations, such as a CTO or CIO. Jigsaw also interviewed a second person within some of the sampled organisations.

C.8 The in-depth video interviews, conducted by a very experienced and intensively briefed team of five research directors, allowed for detailed discussions with customers during which their cloud set up could be discussed at length, technical terms clarified and where the precise nature and scale of their cloud use across different providers and models could be accurately captured.

C.9 For the reasons set out above, and for the research-specific reasons set out in the sections below, we place far more reliance on the insights reported from the in-

[7] In the our own customer engagement questionnaires, we carefully designed questions that were most relevant to our theories of harm and could be interpreted qualitatively considering the full responses across all questions from individual customers. This is different to statistical survey questionnaires where the objective is to generate quantitative data that is generalised to the wider population of interest.
[8] For full details of the sampling methodology used see Cloud Services Market Investigation Qualitative Customer Research conducted by Jigsaw (2024), page 15.

depth qualitative research we commissioned ourselves than the quantitative survey evidence submitted to us by parties.

C.10 Informed by our good practice we have assessed, based on the available information, the merits of specific surveys submitted to us. The following sections of this appendix report some of this survey data and draw on the general points above to comment on specific examples from these individual surveys.

Ofcom's survey for its Market Study

C.11 Ofcom commissioned a quantitative survey during its market study on the public cloud market which included questions on both switching and multi-cloud. Context Consulting conducted a 20-minute online self-completion survey with 1,004 respondents that were existing users of IaaS and/or PaaS, or that were considering adoption within 12 months. The sample source for this survey was a commercial online panel.

C.12 AWS and Microsoft have referred to this survey in their submissions on customer switching, multi-cloud and egress fees.[9] The Context Consulting quantitative research reported that among all cloud users 18% said they had switched IaaS/PaaS providers, 35% said they took on an additional IaaS/PaaS provider, 35% considered switching but did not switch and 23% never considered switching. However, Ofcom also conducted 64 in-depth qualitative interviews with customers which reported different findings on switching. During these more in-depth interviews they encountered no examples of organisations switching away from either Microsoft, AWS or Google and concluded that the switching reported in the survey was capturing migration from on-premise into the cloud, not switching between cloud providers.[10]

C.13 We also note that respondents may have included switching within the same public cloud (ie switching between first and third-party services within a public cloud) within their answers. Further, a very broad *'ever'* time frame is used in the question wording making it difficult to know when such a switch took place. The points raised above are examples of our concern about the validity of the survey evidence in the market, showing clearly how a simple survey question on switching can easily be misunderstood by respondents and can contain other ambiguities in terminology, making the data invalid.

C.14 The Context Consulting survey also reported that 61% of respondents use more than one IaaS/PaaS provider, when respondents that only use private cloud are excluded.[11] The survey also asked whether respondents would potentially use

[9] AWS' submission to the CMA [✂]; and Microsoft's submission to the CMA [✂].
[10] Cloud Services Market Research Summary of Findings, Section 6.
[11] Cloud services market study - Final report, Annex 3, page 48.

multi-cloud architecture in the future: the majority of respondents said that they would definitely (23%) or possibly (63%) multi-cloud in the future.

C.15 We also believe that these results are not robust as they may be based on a sample that includes respondents that are not solely using multi-vendor architectures or hybrid cloud. In particular, the survey asked whether respondents use more than one IaaS/PaaS provider and did not distinguish if these providers are the same public cloud or not.

Public First Survey

C.16 AWS and Microsoft cited the Public First Survey in specific submissions relating to the prevalence of switching, egress fees, multi-cloud and migration away from the cloud back to an on-premise model.[12]

C.17 It involved 1,001 interviews with UK senior business decision makers and used an online commercial panel for its sample source. Its choice of a sample source raises concern over sample bias, as outlined above.

C.18 In relation to the extent of switching and multi-cloud among the customers interviewed, the survey reports that:

(a) 26% of IaaS/PaaS users said they had never switched; 35% had considered switching but had not switched in the end; 36% of IaaS/PaaS users had not considered switching.

(a) 51% of IaaS/PaaS users reported that they were likely to switch cloud providers in the future; 20% of IaaS/PaaS users were unlikely to switch in the future. The remaining 29% said that they were neither likely nor unlikely to switch in future.

C.19 We considered that the switching question from the survey may be capturing types of switching that are not relevant to our investigation. In particular, in their answer to the question 'Have you ever switched one of your cloud infrastructure providers in the past?' respondents may have included:

(a) switching between private and on-premises solutions;

(b) switching within public clouds – ie between first and third parties hosted on the same cloud; and/or

(c) partial switching – ie only switching a few workloads away.

[12] AWS' submission to the CMA [✂]; and Microsoft's submission to the CMA [✂].

C.20 In addition, the question asked was phrased as 'Have you ever switched one of your cloud infrastructure providers in the past?'. The use of the term 'ever' creates uncertainty over the frequency and recency of any switching reported by respondents. Given these uncertainties, we are unable to use data from this survey reliably, which is another example of the imprecise responses we have seen from the surveys in this market.

C.21 AWS submitted that the results from the Public First survey show a high prevalence of multi-cloud and submitted further analysis of the results from this survey.[13] The survey asked respondents 'How many different cloud infrastructure providers does your company currently use?'. It reported that 71% of IaaS/PaaS respondents used more than one cloud infrastructure provider. Further, 56% of IaaS/PaaS respondents said that they would be likely to add an additional cloud infrastructure provider in the next few years. Microsoft also cited the Public First survey as evidence showing a high prevalence of multi-cloud in the market.[14]

C.22 We again believe there is ambiguity in this question phrasing and uncertainty in the responses from customers, as it is likely to capture multi-vendor architectures, hybrid cloud or multiple private clouds, which are not relevant for our investigation. We believe that this survey is likely to be capturing hybrid cloud or multiple private clouds because of the prevalence of private cloud users in the study: only 17% of IaaS and PaaS respondents used public cloud only; compared to 32% that used private cloud only and 48% that used both private and public cloud. This data also provides no detail about the degree of multi-cloud being reported and the split of workloads across different cloud providers. This makes these percentage figures of very limited use for the purposes of our investigation.

Flexera 2023 State of the Cloud

C.23 AWS and Microsoft submitted that the results from the Flexera 2023 State of the Cloud report indicate a high prevalence of multi-cloud.[15]

C.24 This report is based on an online survey of 750 IT professionals and executive leaders worldwide sampled from a commercial online panel. As noted above, sample sources based on commercial panels raise concerns over sample bias, compromising the relevance and representativeness of the sample. Additionally, only 13% of the sample (98 responses) is from the UK meaning that data cited by parties from this report is at the worldwide level. Given the heterogenous nature of the cloud customer base in the UK alone, this sample size also lacks robustness.

[13] AWS' submission to the CMA [✂].
[14] Microsoft's submission to the CMA [✂].
[15] AWS' submissions to the CMA [✂]; Microsoft's submission to Ofcom [✂]; Flexera 2023 State of the cloud report.

C.25 This survey reports different types of multi-cloud being used by respondents, reporting that 87% of respondent's multi-cloud in some form. However, this figure includes customers who have workloads in a public cloud platform and a private cloud and customers who multi-cloud between public clouds. Further, it is possible respondents may have recorded themselves as using multiple public clouds if they used both first and third-party PaaS, but the same underlying IaaS provider. The survey does also not provide any detail or data about the degree of multi-cloud and allocation of workloads across different public cloud providers – a key research question for our investigation. Again, within a structured quantitative survey environment and question, there is no opportunity to clarify or refine these customer responses so that we can accurately measure this customer behaviour.

Oracle's survey

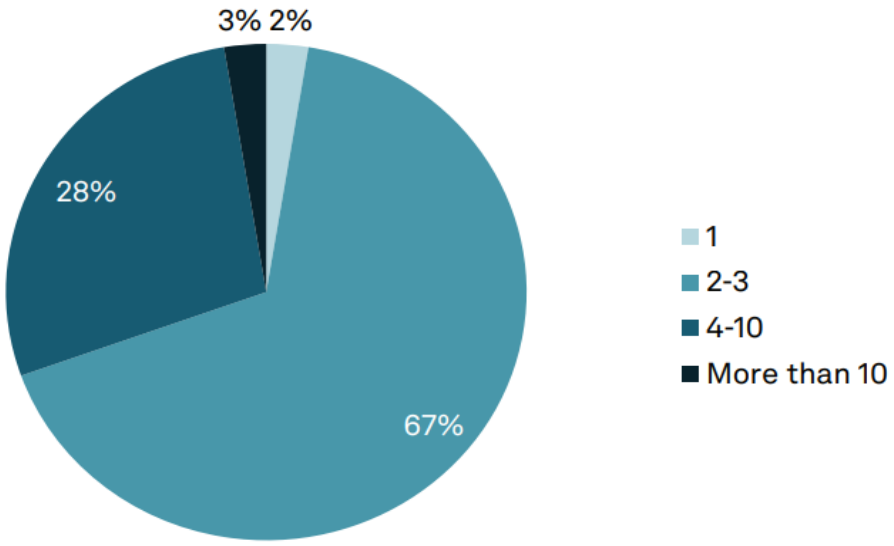
C.26 AWS and Microsoft submitted that the results from Oracle's 'Multi-cloud in the Mainstream' survey[16] show that there is a high prevalence of multi-cloud.[17]

C.27 This is an online survey of 1,500 business enterprise respondents across North America, Europe, Asia-Pacific, the Middle East and Latin America. Very limited methodological detail is provided in this survey, and the number of UK respondents is not split out. The results are reported at a global level. Given the multi-market nature of this survey, we believe it uses a commercial online panel, but the sample source is not published, nor are any other technical research details. The unreported number of UK respondents and unknown sample source cast doubt over the relevance and representativeness of the underlying sample.

C.28 We present the results on the multi-cloud question in Figure C.1 below.

[16] S&P Global Discovery Report: Multicloud in the Mainstream.
[17] AWS' submission to the CMA [✂]; Microsoft's submission to Ofcom [✂].

Figure C.1: Oracle's Multi-cloud in the Mainstream, Number of current or planned cloud infrastructure providers (IaaS/PaaS)



Q. How many IaaS/PaaS public cloud providers (such as AWS, Microsoft, Google, etc) do you use/plan to use in your IT environment?
Base: Organizations currently using or planning to use IaaS/PaaS within the next six months (n=1,500).
Source: S&P Global Discovery Report: Multicloud in the Mainstream, page 1.

C.29 This survey reports a high level of multi-cloud use but again there are significant ambiguities with this survey and uncertainty in the customer responses. For example, we note that the survey does not distinguish between use and planned use and we cannot split the two out. We also do not know whether or to what extent any planned usage will translate into actual usage, given that it is feasible that customers may encounter barriers to using multiple clouds that prevent them from enacting their plans.

C.30 Further, respondents were asked 'How many IaaS/PaaS public cloud providers (such as AWS, Microsoft, Google, etc) do you use/plan to use in your IT environment?'. We considered this wording to be ambiguous as respondents may have interpreted using multiple clouds as using one cloud provider for IaaS in addition to an ISV. We considered that this is consistent with the relatively high proportion of respondents that said that they use four or more providers. The survey also provides no information about the proportion of workloads involved in these multi-cloud infrastructures, reducing its relevance.

Cockroach Labs survey

C.31 AWS submitted survey evidence from Cockroach Labs.[18]

C.32 This was an online survey of 300 cloud architects and engineers across the US, UK and Germany in 2023. We note the sample definition used in this survey is

[18] AWS' submission to the CMA [✂].

quite different to some of the other surveys (eg IT directors or senior leaders within businesses). This illustrates the point made earlier about the difficulties in clearly defining a population of interest in this market which is a key requirement for robust quantitative survey research. The number of responses from the UK is not detailed and the sample source is not provided.

C.33 AWS submitted data from this survey stating that nearly half (47%) of UK companies employed a multi-cloud architecture in 2024, with 23% using a multi-cloud only setup.[19] No specific detail is provided about the type, degree and proportions across workloads of the multi-cloud being reported across different cloud providers/ISVs in this survey so, again, it does not provide the detail needed to reliably inform our investigation. In addition to this limitation, we have significant concerns over the representativeness of the sample for this survey.

Citrix Survey

C.34 AWS referred to an article by Citrix containing survey data,[20] as evidence of customers migrating workloads from public clouds into an on-premise environment.[21]

C.35 Citrix is a business unit of Cloud Software Group, that published results from an international survey of IT leaders about their cloud strategies and models. This was a survey of 1,200 business and IT leaders in the UK, USA, France and Germany from companies with a revenue exceeding $500 million. The data reported was based on 350 business and IT leaders in the USA only. The sample source was a commercial online panel.

C.36 This survey reported that 42% of businesses surveyed in the USA are considering or already have moved at least half of their cloud-based workloads back to on-premise infrastructures.

C.37 As with many of the surveys submitted to us, there is very limited technical research detail published about this survey and, given the sample source is only comprised of US customers, we have similar concerns over data validity and sample representativeness. For example, the data point cited above conflates customers who are considering migrating cloud-based workloads back to on premise infrastructures with those who have already executed this migration. This introduces significant ambiguity when interpreting the data from this question.

[19] AWS' submission to the CMA [✂].
[20] Citrix - Research finds IT leaders are choosing hybrid cloud strategies due to flexibility, cost-effectiveness and security.
[21] AWS' submission to the CMA [✂].

C.38 In addition, in the section on Market definition in chapter 3, we considered that the results of this survey have limited informative value in relation to the competitive constraint alternative IT models place on cloud services.

451 Survey

C.39 AWS cited a survey by 451 Research of 600 data centre/co-location respondents in 2021 to show evidence of customers moving workloads out of their public cloud environments. For example, AWS notes that 48% of respondents had transitioned a workload or application away from their public cloud providers (eg AWS, Microsoft, Google).[22]

C.40 No technical research details are provided about this survey, so we cannot assess the robustness of its methodology. However, for the data above the full question asked was 'in the past 12 months, has your organisation migrated applications/ workloads from a hyperscale public cloud provider […] to some other venue?' As we have seen with other surveys, the phrasing of the question provides information on the percentage of customers that moved any workloads to another environment but does not provide any data on the scale or proportion of workloads being moved out of these public clouds. Therefore, even taking these results at face value, they are of limited relevance to our investigation.

HCL Tech Survey

C.41 AWS submitted evidence from an HCL Tech survey that formed part of a report on trends in public cloud vs. on-prem deployment for Generative AI workloads.[23]

C.42 This is an online survey of 532 senior executives responsible for their organizations' public cloud technology investments across APAC, North America and Western Europe conducted in 2024. The number of interviews in the UK is not detailed. Again, very few technical research details are provided on this survey, but what details are provided suggest the sample is from a commercial online panel.

C.43 Given the focus of this survey was about Generative AI workloads only, it has limited relevance to wider customer behaviour on switching or moving their public cloud infrastructure services at any scale back into another environment.

[22] AWS' submission to the CMA [✂]; 451 Research - cloud repatriation: what it is, what it isn't and why it's not going away.
[23] AWS' submission to the CMA, [✂]; HCLTech - cloud evolution: mandate to modernise.

Uptime Institute Survey

C.44 AWS submitted an article including survey data from the Uptime Institute as evidence of customers switching away from public cloud back to an on-premise environment.[24]

C.45 This article provides no technical research detail about the survey. Further, the questions cited in this survey are again phrased so generally that no material information can be inferred about the scale or proportion of workloads being moved by customers out of the public cloud into an on-premise set up.[25]

OVHcloud Survey

C.46 AWS submitted another article containing survey data from OVHcloud as providing evidence of a high prevalence of multi-cloud.[26]

C.47 This article states the survey is of 504 IT decision-makers of large organisations with 201 – 700 employees in the UK and was reported in 2024. No other technical research details about this survey are provided and no detail or context is given about the nature or proportion of workloads migrated by customers, so this data is of very limited relevance.

Gartner Survey

C.48 AWS also referred to a Gartner article citing its survey as evidence of a high prevalence of multi-cloud architectures.[27]

C.49 The survey reported that 81% of respondents were working with two or more public cloud providers. No technical research details are provided on this survey so we cannot assess its robustness. The survey data reported at this general level is again of little material value as it provides no information beyond the fact that many customers have two or more providers.

IDC Market Survey

C.50 Microsoft cited two surveys by IDC in relation to the level of multi-cloud behaviour by cloud customers and the deployment of Window Server workloads.[28] These surveys sit behind a paywall, so we cannot access them to assess their robustness or relevance to this investigation.

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[24] AWS' submission to the CMA [✂].
[25] The survey asked: 'In the past 12 months, has your organisation moved (ie permanently terminated) any of its production applications from a public cloud provider to a colocation facility or to your own data centre(s)?'.
[26] AWS' submission to the CMA [✂].
[27] AWS' submission to the CMA, [✂].
[28] Microsoft's submission to the CMA [✂]; Microsoft's response to the CMA's information request [✂].

Infoblox Survey

C.51 Microsoft also cited a report containing survey data and submitted that this report demonstrates a high level of multi-cloud behaviour among cloud customers.[29]

C.52 The survey was conducted in 2024 among 1,000 network and security decision-makers and influencers knowledgeable about their organisation's public cloud environment. The survey is based on a global sample and the number of interviews with UK customers is not reported. Given the details provided, it is likely that the sample source for this survey is a commercial online panel. The report does not provide information on the survey questions underpinning the data on multi-cloud use by organisations referenced by this provider, so we are unable to determine its relevance.

[✂] US Cloud Migration Multiclient survey Study

C.53 A cloud provider referenced a survey by [✂] in relation to customers migrating workloads from on-premises and/or hosted cloud to the public cloud.[30]

C.54 This was a survey in 2023 of [✂] decision-makers, decision-influencers, decision-implementers, and observers involved in business cloud migration decisions and processes. The survey appears to be based on a US sample across six different industries.[31]

C.55 There is very limited technical research detail published about this survey and, given the sample source is only comprised of US customers, we have concerns over data validity and sample representativeness. For example, in response to a question on which public cloud IaaS vendors respondents use or are evaluating using within the next 12 months, [60-70]% responded Google Cloud, [40-50]% responded IBM Cloud and only [30-40]% responded AWS.[32] This is significantly different to the distribution of public cloud vendors that would be expected of a representative sample given the market shares presented in the market structure and concentration section of this report.[33]

Digital Ocean

C.56 AWS referenced a survey by Digital Ocean in relation to customer switching behaviour and egress fees.[34]

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[29] Microsoft's submission to the CMA [✂].
[30] [✂] submission to the CMA [✂].
[31] The six industries are: Healthcare; Retail or wholesale; Finance; Professional Services; Manufacturing; and Transportation, Comms, & Utilities.
[32] [✂] response to the CMA's request for information [✂].
[33] See chapter 3.
[34] AWS' submission to the CMA, [✂]; DigitalOcean's report on how startups and small-to-medium businesses are faring today.

C.57 This was an online survey in 2022 of 554 senior business executives across 76 countries. The detail provided on the sampling of this survey raises additional concerns over its representatives. For example, the report states that a survey link was distributed to various sample sources via email and social media channels including Digital Ocean email lists, Cloudways email lists and tech founder groups. This suggests the sample is self-selecting and will therefore likely contain significant bias. Further, it suggests the target population of interest is poorly defined and only 8% of responses (44 responses out of the total 554) are from UK customers, which is not a robust sample size for quantitative survey research.

C.58 In addition, it is unclear how the data from this survey informs the question of whether egress fees are a barrier to switching, given the survey reports that 77% of organisations which have not switched are satisfied with their current cloud provider.

Conclusions

C.59 We have found ambiguities and limitations in the individual surveys submitted to us. While these surveys may have value when used for other business purposes, they do not adequately address our key research questions.[35] The chapter 3 sections on Market outcomes and Market definition, provide further detail on these limitations when assessing the evidence of customer behaviour on switching, multi-cloud and alternative IT models.

C.60 The Jigsaw report used qualitative research techniques which have more scope to clarify the ambiguities and uncertainties we have found in the individual surveys submitted to us.[36] As a result, we have placed more weight on the Jigsaw report and have assigned very limited evidential weight to the results from the quantitative surveys discussed in this appendix.

[35] Microsoft submitted it is unreasonable for the CMA to find methodological faults and to dismiss industry surveys given that cloud providers and other market participants rely on these industry reports in the ordinary course of business. Microsoft's submission to the CMA [✂].
[36] Cloud Services Market Investigation Qualitative Customer Research conducted by Jigsaw (2024), paragraph 1.2.4.