

Technical report on Apps and app stores and Internet of Things (IoT) surveys

On behalf of London Economics for DSIT



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Introduction

Overview of research objectives

London Economics commissioned YouGov to undertake two nationally representative online studies. The Apps and app stores survey looked into usage and trust of apps as these have become an area which consumers find themselves vulnerable to cyber-attacks. The second survey covered Internet of Things (IoT) devices and connected places technology. Specifically, this investigated consumer behaviour of connected devices with the intention of better understanding areas of potential risk. Both surveys were created with a view to informing future cyber security policy.

The surveys consisted of a nationally representative cross-sectional survey of adults aged 18+ in the UK. The survey data collection was completed between the 25th of August and 15th September 2023.

- Apps and app stores: 3,796 UK adults
- Internet of Things (IoT) products and connected places: 3,352 UK adults

This report provides an overview of the data collection method used, the sampling, fieldwork procedures, and weighting.

Sampling strategy

Sample design

The sample of young people was drawn from the YouGov online panel which consists of over 2.5M adults in the UK. YouGov maintain engaged communities of panellists who have specifically opted in to participate in online research activities and provide demographic details such as their parenthood status. As a result, the panel provides continuous access to a responsive audience ready-profiled on important demographic, attitudinal, and lifestyle attributes. Members of the panel consent to completing surveys for YouGov in return for a modest financial incentive.

The sample for the surveys was designed to be representative of adults aged 18+ within the UK. To obtain a representative sample, recruitment quotas were placed on age,

gender, social grade, ethnic background, Urban/town/rural status and region. A summary of those targets used in both surveys are provided in the table below.

Table 1. Survey quota targets

	Target (%)	Target N
Age		
18-29	23%	675
30-39	16%	477
40-49	17%	519
50-59	16%	474
60-69	14%	405
70-99	15%	450
Gender		
Male	49%	1461
Female	51%	1539
Social Grade		
A, B	22%	657
C1	30%	891
C2	15%	450
D, E	33%	1002
Ethnic Background		
Any white ethnic background	82%	2460
Multiple ethnic background	3%	90
Any Asian ethnic background	9%	270
Any black ethnic background	3%	90
Any other ethnic background	3%	90
Urban/ town/ rural status		
Urban	82%	2460
Town and Fringe	9%	270
Rural	9%	270
Region		
North East	4%	123
North West	11%	330

Yorkshire and the Humber	8%	249
East Midlands	7%	216
West Midlands	9%	264
East of England	9%	279
London	13%	390
South East	14%	411
South West	9%	255
Wales	5%	144
Scotland	9%	255
Northern Ireland	3%	84

Methodology

Questionnaire design

Both questionnaires were designed by London Economics. Drafts were received by YouGov which was reviewed and updated to ensure the questions would translate successfully online. The surveys were hosted in the bespoke YouGov online survey platform.

Note that for certain questions where respondents were asked whether they would pay more for a 50% or a 90% reduction in cyber security issues, the percentage reduction they were shown was randomised and half of each sample saw 50% and half saw 90% for all these type questions. Results for these questions are shown separated out in the data tables and datafile.

Piloting method

An initial technical pilot of both surveys was conducted from the 17th to the 19th July 2023. The data was used to check the integrity of the surveys ensuring that length, routing, question performance and respondent comprehension were working as intended. Based on this, a number of minor updates were made to the surveys.

A second pilot phase was then conducted on the 21st July 2023 which was again checked by YouGov.



Following this, London Economics then reviewed the 2nd pilot data for both surveys. Based on this feedback, both survey's content was updated to meet client needs.

A final pilot was then undertaken for both surveys on the 25th August to ensure that the updates to each survey was working as intended.

The interviews collected during the course of the first and second pilots were not included in the final data set.

Fieldwork method

The survey was conducted online using the YouGov bespoke online survey platform. The fieldwork was completed from the 25th of August and 15th September 2023.

Once the sample had been drawn, an invitation was sent by email with a link to the survey embedded within it. All respondents participated in the survey in exactly the same way and the YouGov panel management team ensured the invitations to the survey were consistently and professionally managed.

Only respondents who were invited to take part could do so. The surveys could not be undertaken in any other way. All questions were mandatory, which meant respondents could not skip a question without answering. The median survey length of each survey was:

- Apps and app stores: 7 minutes and 44 seconds
- IoT and connected places: 12 minutes and 3 seconds

Sample approach

YouGov employ an active sampling method, drawing a sub-sample from the YouGov research. For both surveys a quota sampling approach was adopted and the sample was drawn to ensure representativeness at the UK level by respondent across age, gender, , social grade, ethnic background, urban/town/rural status, and region. YouGov holds this form of information on all panellists and this information was used to contact respondents who met the required criteria.

Eligible panellists were contacted by email using YouGov's automated sampling software. The email invitation is a standard format used for all surveys conducted by YouGov where the sample source is the panel. It contains no information about the survey. After clicking

on a link, the respondent is first taken to any screening questions followed by a standard welcome page informing them of the average length of time it takes to complete the survey, the broad subject matter of the survey and any incentive points which their YouGov account will be accredited with following completion. The respondent is free to stop the interview at any point and return to it later if they so desire.

Sample size

The Apps and app stores survey contains a total of n=3,796 respondents as broken out as shown in the following table.

Table 2. Survey quota targets and final achieved valid interviews Apps and app stores

	Target (%)	Target N	Final achieved (%)	Final achieved (N)	Over/under target (N)
Age					
18-29	23%	675	18%	681	6
30-39	16%	477	20%	764	287
40-49	17%	519	16%	613	94
50-59	16%	474	16%	615	141
60-69	14%	405	15%	567	162
70-99	15%	450	15%	556	106
Gender					
Male	49%	1461	44%	1684	223
Female	51%	1539	56%	2112	573
Social Grade					
A, B	22%	657	27%	1027	370
C1	30%	891	30%	1122	231
C2	15%	450	14%	536	86
D, E	33%	1002	29%	1111	109
Ethnic Background					
Any white background	82%	2460	88%	3353	893
Multiple ethnic background	3%	90	2%	77	-13
Any Asian background	9%	270	6%	209	-61
Any black background	3%	90	3%	99	9
Any other background	3%	90	2%	58	-32

Urban/ town/ rural status					
Urban	82%	2460	77%	2939	479
Town and Fringe	9%	270	11%	414	114
Rural	9%	270	12%	443	173
Region					
North East	4%	123	4%	164	63
North West	11%	330	10%	393	52
Yorkshire and the Humber	8%	249	8%	301	44
East Midlands	7%	216	7%	260	48
West Midlands	9%	264	8%	312	19
East of England	9%	279	8%	298	48
London	13%	390	12%	438	108
South East	14%	411	14%	519	80
South West	9%	255	9%	335	12
Wales	5%	144	4%	156	91
Scotland	9%	255	9%	346	190
Northern Ireland	3%	84	7%	274	63

The IoT survey contains a total of n=3,796 respondents broken out as shown in the following table.

Table 3. Survey quota targets and final achieved valid interviews IoT and connected places

	Target (%)	Target N	Final achieved (%)	Final achieved (N)	Over/ under target (N)
Age					
18-29	23%	675	18%	605	-70
30-39	16%	477	18%	615	138
40-49	17%	519	17%	571	52
50-59	16%	474	17%	572	98
60-69	14%	405	14%	484	79
70-99	15%	450	15%	505	55
Gender					
Male	49%	1461	45%	1497	36
Female	51%	1539	55%	1855	316

Social Grade					
A, B	22%	657	26%	876	219
C1	30%	891	32%	1059	168
C2	15%	450	16%	525	75
D, E	33%	1002	27%	892	-110
Ethnic Background					
Any white background	82%	2460	84%	2824	364
Multiple ethnic background	3%	90	3%	98	8
Any Asian background	9%	270	8%	272	2
Any black background	3%	90	3%	93	3
Any other background	3%	90	2%	65	-25
Urban/ town/ rural status					
Urban	82%	2460	81%	2713	253
Town and Fringe	9%	270	9%	317	47
Rural	9%	270	10%	322	52
Region					
North East	4%	123	4%	136	13
North West	11%	330	11%	372	42
Yorkshire and the Humber	8%	249	9%	288	39
East Midlands	7%	216	7%	251	35
West Midlands	9%	264	9%	312	48
East of England	9%	279	9%	299	20
London	13%	390	13%	422	32
South East	14%	411	14%	474	63
South West	9%	255	9%	294	39
Wales	5%	144	5%	162	18
Scotland	9%	255	9%	291	36

Data weighting

Weighting adjusts the contribution of individual respondents to aggregated figures and is used to make surveyed populations more representative of a project-relevant, and typically larger, population by forcing it to mimic the distribution of that larger population's significant

characteristics, or its size. The weighting tasks happen at the tail end of the data processing phase on cleaned data.

For both the Apps and app stores and IoT/connected places surveys, findings were weighted to ensure the data represented the national profile of adults across the UK by age, gender, social grade, ethnic background, Urban/town/rural status and region.

Standard weighting

When we use standard weighting variables such as gender to reweight the achieved sample back to target profiles, we create a simple weighting factor for each record. This weighting factor is a decimal number, such as 1.0 or 1.2 or 0.5. It is calculated by dividing the target proportion required by the actual proportion from the achieved sample data. The weight factor is used as a multiplier for each respondent during aggregation to determine their weighted contribution.

A weight of 1 occurs when the respondent (and respondents with the same profile) exactly reflect our target (we have exactly the number of such respondents in our study that we targeted); weights of <1 occur when we have over-achieved interviews (we have more than our target), and weights of >1 occur when we have under-achieved our targets. The table below provides an example of how weighting factors are calculated.

Table 4. An example of the calculation of weighting factors (using Apps and app store results)

Gender	Target %	Achieved %	Weight factor	Weighted data
Male	49	44	$49 / 44 = 1.113$	$44 * 1.113 = 49$
Female	51	56	$51 / 56 = 0.910$	$56 * 0.910 = 51$

RIM weighting

YouGov uses RIM (Random Iterative Method) weighting as its standard approach. RIM is used when there are a number of different standard weights that all need to be applied together. This weighting method calculates weights for each individual respondent from the targets and achieved sample sizes for all of the quota variables (in this case age crossed by gender, and region).

RIM weighting is an iterative process, whereby it recalculates the weights a number of times until the required degree of accuracy is reached. All weights are capped at six, and a

weighting report is produced for each project. The advantage of using the RIM weighting approach is that the weighting can include a greater number of variables, and it is not necessary to have targets for all the interlaced cells.

The achieved sample was reviewed against the population profile for age, gender, and region. Where differences existed, RIM weighting was used to correct for these differences to ensure a representative sample was achieved.

A summary of weights applied at wave one can be seen in figure 6 – the RIM weighting efficiency in this study is 94 per cent with the largest weight factor being 2.28 and the smallest being 0.65.

This efficiency score gives us an indication of how successful the individual RIM weights are in balancing the standard weights for all of our three quota variables. The efficiency score indicates that the sampling was close to the target and that limited rebalancing of the data was needed.

The following two tables show the weighting applied to each of the quota cells for both the Apps and app stores and the IoT/connected places surveys.

Table 5. Ranges of individual RIM weights for each quota cell – Apps and app stores

	Unweighted base	Weighted base	Smallest weight factor	Largest weight factor
Age				
18-29	681	854	0.30	3.38
30-39	764	604	0.20	2.24
40-49	613	657	0.29	3.16
50-59	615	600	0.26	2.10
60-69	567	512	0.25	2.34
70-99	556	569	0.28	3.26
Gender				
Male	1684	1849	0.24	3.38
Female	2112	1947	0.20	2.65
Social Grade				
A, B	1027	831	0.20	2.34
C1	1122	1127	0.24	3.16
C2	536	569	0.27	3.38
D, E	1111	1268	0.28	3.26
Ethnic Background				
Any white background	3353	3113	0.20	1.67
Multiple ethnic background	77	114	0.58	2.68
Any Asian background	209	342	0.73	2.88
Any black background	99	114	0.57	1.76
Any other background	58	114	1.14	3.38
Urban/ town/ rural status				

Urban	2939	3113	0.23	3.38
Town and Fringe	414	342	0.21	2.29
Rural	443	342	0.20	2.03
Region				
North East	164	156	0.51	2.04
North West	393	418	0.50	2.62
Yorkshire and the Humber	301	315	0.46	2.50
East Midlands	260	273	0.58	3.16
West Midlands	312	334	0.46	3.38
East of England	298	353	0.55	2.88
London	438	493	0.52	3.16
South East	519	520	0.45	2.65
South West	335	323	0.46	2.10
Wales	156	182	0.61	2.42
Scotland	346	323	0.43	3.07
Northern Ireland	274	106	0.20	0.66

Table 6. Ranges of individual RIM weights for each quota cell – IoT and connected places

	Unweighted base	Weighted base	Smallest weight factor	Largest weight factor
Age				
18-29	605	754	0.83	2.91
30-39	615	533	0.58	2.42
40-49	571	580	0.64	2.21
50-59	572	530	0.60	2.06

60-69	484	453	0.63	2.73
70-99	505	503	0.71	2.10
Gender				
Male	1497	1632	0.70	2.80
Female	1855	1720	0.58	2.91
Social Grade				
A, B	876	734	0.58	2.27
C1	1059	996	0.68	2.59
C2	525	503	0.70	2.13
D, E	892	1120	0.89	2.91
Ethnic Background				
Any white background	2824	2749	0.58	2.91
Multiple ethnic background	98	101	0.70	1.94
Any Asian background	272	302	0.71	1.94
Any black background	93	101	0.64	2.21
Any other background	65	101	1.10	2.80
Urban/ town/ rural status				
Urban	2713	2749	0.61	2.91
Town and Fringe	317	302	0.61	2.79
Rural	322	302	0.58	2.21
Region				
North East	136	137	0.62	1.82
North West	372	369	0.61	1.90
Yorkshire and the Humber	288	278	0.62	1.91
East Midlands	251	241	0.60	2.80

West Midlands	312	295	0.58	1.82
East of England	299	312	0.61	2.38
London	422	436	0.65	2.20
South East	474	459	0.61	2.11
South West	294	285	0.63	2.19
Wales	162	161	0.64	1.74
Scotland	291	285	0.66	1.90
Northern Ireland	51	94	1.29	2.91