



# 5G TESTBEDS AND TRIALS PROGRAMME EVALUATION

Annex 1: Methodology, KPIs and Consultation Tools

29 April 2023



# CONTENTS

1.	METHODOLOGY .....	3
2.	KEY PERFORMANCE INDICATORS .....	19
3.	CONSULTATION TOOLS .....	23

# 1. METHODOLOGY

## Introduction

RSM were commissioned by DCMS to conduct an interim evaluation of the 5G Testbeds and Trials Programme in April 2022. It is the second of three evaluations. The first took place in 2020<sup>1</sup> and the final evaluation is planned for 2025.

The DCMS 5G Testbeds and Trials Programme awarded funding to more than 30 projects to look at how deployment of 5G could be made more effective; foster a set of diverse use cases for 5G; and develop the 5G ecosystem in the UK.

There were three workstreams to the evaluation:

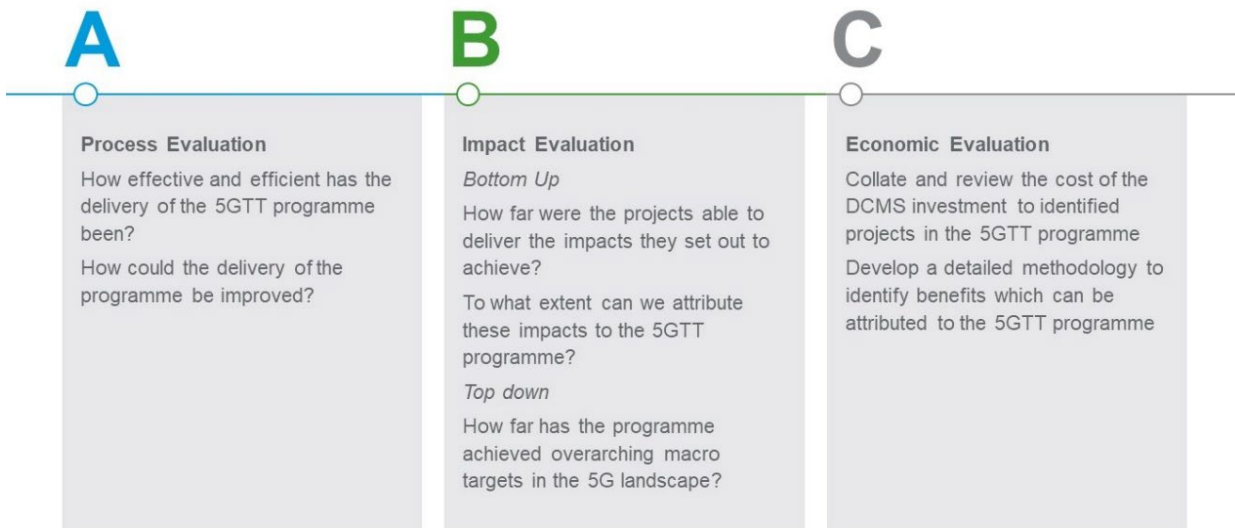
- Workstream A: A **process evaluation**, building on the initial evaluation from 2019/20.
- Workstream B: An **impact evaluation** combining two perspectives:
  - **Bottom-up**. Using detailed qualitative case studies of selected 5GTT projects to gain insights into how and why the programme has been able to generate impacts. This approach uses a **theory of change** to assess the extent to which the programme led to the observed outputs and outcomes, and the potential for eventual impacts in the wider economy.
  - **Top-down**. This approach builds an economic narrative for the wider economic impacts of 5GTT. The analysis is based on interviews with delivery partners and other stakeholders with knowledge of the UK telecoms ecosystem, surveys of businesses in the 5G ecosystem more broadly, along with analysis of programme management information, other studies of 5G, and external market data.
- Workstream C: Planning an **economic evaluation** and assessment of programme Value for Money. This included analysis of the cost of DCMS's contribution to a set of case study projects, and developing a methodology for including full economic benefits at the final evaluation stage planned for the first half of 2025.

Relevant research questions for each workstream are summarised in the diagram below:

---

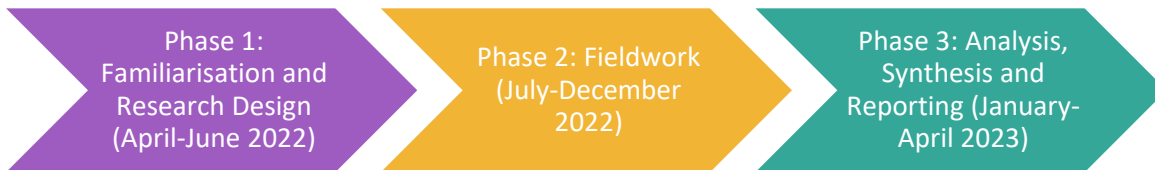
<sup>1</sup> [ICF Process and Early Impact Evaluation of 5G Testbeds and Trials Programme, September 2020](#)

**Figure 1: Overview of the evaluation workstreams**



The programme of work set out in RSM’s proposal was divided into three work phases, outlined in the diagram below:

**Figure 2: Work phases, RSM 5GTT Programme Evaluation 2022-2023**



The rest of this annex describes the research programme in more detail, including the research instruments used.

**Phase 1: Familiarisation and research design**

This involved project initiation, desk research (i.e. a review of programme management information, external data and literature), developing the theory of change, reviewing the available data relevant to provide evidence of impacts, selecting a sample of projects for case study research, identifying control groups of firms and scoping out methods for comparing these with the project beneficiaries, and designing and piloting research instruments for fieldwork.

The RSM project team met DCMS in April 2022 for a formal **project initiation meeting** to discuss the vision and scope of the project, the methodology, delivery risks and mitigation strategy. This confirmed, amongst other, the scope of the tender and identified programme

management information, key research and policy documents, and contacts for familiarisation discussions. A **project initiation document** was produced after this meeting.

Seven **familiarisation interviews** were held with key DCMS staff members familiar with the design and operation of the programme. These were mostly held in May, a follow-up consultation on the 5G ecosystem was held in July. These interviews have helped the study team understand the aims and objectives of the programme and guided our initial thinking around the Theory of Change. We also held **internal workshops** with DCMS staff to discuss the evaluation approach, theory of change and economic impact transmission channels.

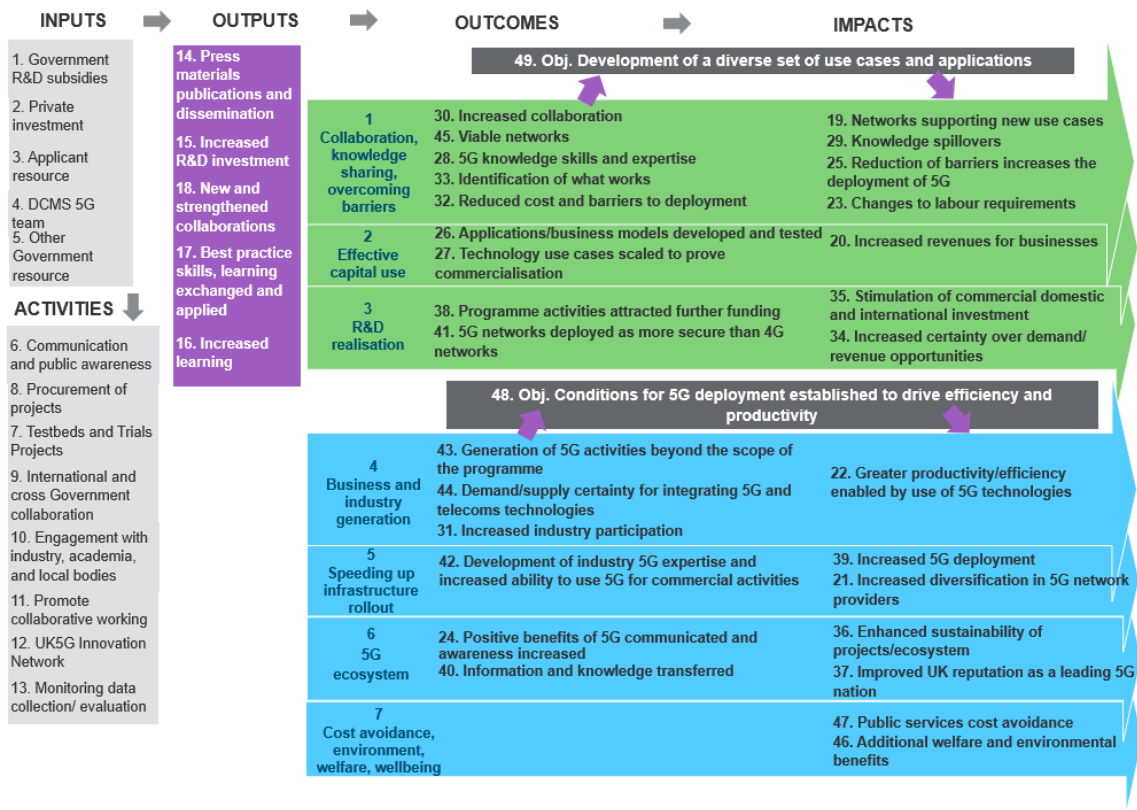
## 1. Theory of change

We reviewed the **theory of change** developed as part of the previous evaluation and interviewed a member of DCMS staff that had been overseeing this work. We also reviewed the proposed **success measures** for the programme. Based on this research, and our own experience with theory-based evaluation, we adjusted the theory of change. We incorporated new elements in consideration of mechanisms through which value is transmitted into the wider economy.

The Theory of Change shows impact pathways and set out how impact is expected to happen in consideration of how activities lead to outputs and how these outputs generate outcomes and impacts. The revised theory of change is used alongside contribution analysis.

- We have reported on the degree to which the expected outputs, outcomes and impacts have been generated and assess the degree to which results can be attributed to the programme
- We assess the degree to which market failures have been addressed and assess the contribution of the programme

Figure 3 Programme Theory of Change / logic model – revised model



Note: KPIs are itemised, and numbering is referenced in the Annex

## 2. Case Study Selection

The specification suggested that at least 15 case studies should be carried out from the funded projects. A case study sample was drawn up which provided balanced coverage of the following characteristics of funded projects:

- **Sector: Infrastructure**, Manufacturing and **Industry, Transport** and logistics, **leisure/tourism/events media and health**.
- **Urban/Rural specification**
- **5G technology deployed:** by whether a **standalone** or **non-standalone** 5G installation, and whether using **public** or **private** (with some using both). As the ratio between private and public networks is approximately 3:1 in the population count is reflected within the case study sample selected.
- **Project success:** A mix of Amber and Green RAG ratings throughout their project.
- **Region:** All regions of England were represented except Yorkshire and the Humber, as are Scotland and Wales (but not Northern Ireland).

To ensure that all these guidelines were met we initially selected 17 projects to ensure some redundancy if case studies were not feasible. The table below summarises these projects. Ultimately, 5G Ports was excluded from the case study sample, due to issues setting fieldwork (it coincided with work related to project closure). Following discussions with WM5G the Transport Road Sensors project was integrated as part of the Transport Use Cases. These projects are therefore struck out in Table 1 below, and the numbers in brackets in the summary row shows the counts when these are excluded/combined.

**Table 1: Summary of case studies selected**

Project name	Sector	Rural/ Urban	Standalone/ Non-standalone/ Mixed	Public/ Private	RAG	Region
West Mercia Rural 5G	Health	Rural	NS	Private	A	WM
Liverpool 5G Create	Health	Urban	S	Private	A	NW
5G AMC2	Industry	Unknown	S	Private	A/R	Scotland
5G CAL	Industry	Unknown	S	Private	A/G	NE
5G FoF	Industry	Urban	S	Private	A/R	NW
5G Wales Unlocked	Infrastructure	Rural	NS	Public	G	Wales
5G New Thinking	Infrastructure	Rural	S	Private	A	UK
WM5G Infrastructure Accelerator	Infrastructure	Urban	N/A	Public	A	WM
Connected Cowes	Leisure	Rural	NS	Private	A/R	SE
Connected Forest	Leisure	Rural	Mixed	Private	A/G	EM
5G Festival	Leisure	Unknown	NS	Private	A/G	SE
MK:5G	Leisure	Urban	S	Private	A/R	SE
5G Logistics	Transport	Urban	S	Private	A	SW
<del>5G Ports</del>	<del>Transport</del>	<del>Urban</del>	<del>S</del>	<del>Private</del>	<del>A/G</del>	<del>EoE</del>
5GRN	Transport	Urban	S	Private	A/R	
<del>WM5G (Transport Road Sensors)</del>	<del>Transport</del>	<del>Urban</del>	<del>Mixed</del>	<del>Public</del>	<del>A</del>	<del>WM</del>
WM5G (Transport Use Cases)	Transport	Urban	Mixed	Public	A	WM
Summary	3 Infrastructure 3 Industry 5 (3) Transport 4 Leisure 2 Health	5 Rural, 9 (7) Urban, 3 Unknown	4 NS, 9 (8) S, 3 (2) Mixed	13 (12) Private, 4 (3) Public	1 G 4 (3) A/G 7 (6) A 5 A/R	Coverage of most regions/ countries

Project name	Sector	Rural/Urban	Standalone/ Non-standalone/Mixed	Public/Private	RAG	Region
ITT	3 Infrastructure 3 Industry, 2 Transport 3 Leisure 1 Health	At least 4 rural and 4 urban projects	At least 4 of each		At least 5 of each	Good coverage of all regions

To develop case studies, we spoke to all case study project lead partners and asked their suggestions of other consortium members to interview to get other perspectives on the project.

### 3. Quantitative research design

We explored the option of using quasi-experimental modelling to measure the impact to the private sector firms, and control for attribution to the 5GTT programme. This analysis was proposed alongside other analytical efforts to assess the programme’s value-for-money. We presented to DCMS three main quantitative research strands for consideration, building on data for successful applicants, unsuccessful applicants and/or non-applicants.

- Difference in difference (DiD) analysis
- Propensity Score Matching
- Regression discontinuity design (RDD)

Reference models were identified for each of these approaches. We also appraised the Key Performance Indicators (KPIs) set out in the programme logic model that can capture the extent of 5G adoption and potential impact thereof. Because the KPIs are still relatively broad, we identified a number of more specific variables of interest for the quantitative analysis.

For the Difference in Difference analysis, we planned to control for a range of performance indicators (R&D expenditure etc.) and for the following:

- Year of establishment
- Employment
- Turnover
- Sector

We also considered the need for other controls. Programme beneficiaries have not received the same support and some consortia may have operated better than others too. Where possible we look to control for or identify differences in performance due to the following differences in support:

- Firms that belong to more than one consortium – increased exposure may mean that these (10) firms have benefitted relatively more
- Partially treated firms that received no DCMS funding despite being part of a funded consortium – this group of 33 may have benefitted relatively less from the programme



For the firms to be comparable, we mapped the characteristics of the treatment group against possible comparator firms using a number of different data sources. Once comparator firms had been identified we spent time identifying missing email contacts. RDD was ruled out as a feasible approach, due to data limitations, despite scoring having been made available. Because of low response rates to surveys were not able to apply alternative quasi-experimental approaches.

Risks and implications of the final evaluation are set out in the main report.

## Phase 2: Fieldwork

### 4. Monitoring data

We reviewed monitoring information including Benefit Realisations documents, final reports and other project documentation of the 5GTT programme. This data was reviewed, amongst other, to document the level of match-funding, evidence project activities, project outputs (including progress against Technology Readiness Levels, jobs) and outcomes.

### 5. Interviews

The ITT for this evaluation set out requirement for a number of semi-structured qualitative interviews to be carried out with DCMS staff, and external delivery partners and other stakeholders. The aim was to talk to a broad and representative range of stakeholders who had interacted with the programme in different ways.

We conducted 79 qualitative interviews with different stakeholder groups as summarised in the table below:

**Table 2: Qualitative interviews by stakeholder group**

	ITT Target	Number of Interviews Conducted
Funded projects	31 initial project lead interviews + 15-30 case study follow ups	51
Phase 1 projects	6	6
5GUK Test Networks	3	2
Unsuccessful applicants	10	13
DCMS Staff	15	15 + 7 <sup>2</sup> familiarisation interviews
Partner organisations involved in more than one project	5	3
Wider Ecosystem	5	9

In total we conducted 98 interviews. Some interviewees fell into more than one category – for example the Digital Catapult were the lead organisation on one funded case study project, in the

<sup>2</sup>Four of the people interviewed as part of the familiarisation stage were also interviewed as part of the main fieldwork.

consortium for two others (including another case study), were in a consortium for an unfunded project and are therefore involved in more than one project and part of the wider ecosystem so a bespoke topic guide was prepared for the interview covering all aspects of their involvement in the 5GTT programme.

Separate topic guides were developed for each stakeholder group; these are included in Annex F. These were developed to guide the discussion, but interviewers were able to prompt as necessary and investigate topics of interest to individual stakeholders in greater depth.

All but one of the Phase 1 projects secured further funding in later 5GTT competitions, so we interviewed them but interviews focused more on their later projects and we sent a follow up email asking the following questions about the phase 1 project:

- To what extent would the Phase 1 project have happened anyway if you had not been successfully funded at that stage?
- How were lessons learned in your Phase 1 project carried forward into the subsequent project?
- To what extent would what you achieved have been possible on other network technologies?
- Are the networks and use cases set up in your Phase 1 project still in use?

We conducted a standalone interview with the Phase 1 project that did not receive further funding in later rounds. Only one consortium did not respond to the request for further information about the earlier project (5G Rural First/New Thinking).

It was difficult to encourage engagement from the unfunded applicants. The reason for this were

- A loss of institutional memory
- Difficulties identifying contact details for main application leads
- A lack of incentives to engage

Companies who were involved in funded projects as well as unfunded projects were often reluctant to focus exclusively on the unfunded projects and keen to talk about successes. We identified just under 60 unfunded applicant firms and contacted each at least three times by email and phone, and only four agreed to be interviewed. Additional interviews in this cohort were arranged by a DCMS officer, who was able to ask colleagues for advice on who would be more likely to respond and leverage some more direct influence.

## 6. Surveys

We designed and launched online surveys. The survey questionnaires developed are included in Annex F. The survey questionnaires align with the Theory of Change and KPIs. KPIs selected reflect the initial short-term benefits and/or expected outcomes and impacts.<sup>3</sup> Survey

---

<sup>3</sup> These KPIs detailed in the Methodological Plan are i) new solutions or applications developed, ii) increased awareness of 5G, iii) revenue, iv) R&D expenditure v) future R&D expenditure vi) equity raised vii) total equity viii) expected future equity growth, ix) FTE, and x) expected FTE. It is proposed that the KPIs are mainly sourced from secondary database

questionnaires were carefully designed to ensure maximum response rates across the various stakeholders we were looking to engage with:

- **Wider 5G Ecosystem Survey** - This survey was designed to collect data on the benefits of the 5GTT programme and the wider network on the network members and on the wider economy (see Annex B for summary results). The survey was sent out in August and kept open for around six weeks. After removing duplicates and blank responses, the total number of respondents that filled in (part of) the survey questionnaire was 136.
- **Funded participants survey (firms)** – This survey was designed to collect information about current and expected performance of beneficiaries that can be attributed to the 5GTT. A survey was sent across to firms which were part of consortia which took part in the DCMS testbeds and trials programme and received funding. RSM worked closely with DCMS to collate a list of firms who received funding as either part of a phase 1 or a phase 2 project. Most of this contact information was collected from the monitoring information. This survey was sent to 190 firms of the 211 that took part. We aimed to generate a sample size of at least 50 respondents, but the final number of responses generated was 34 (partial responses). As we did not generate a sufficiently large sample size, we were not able to carry out quasi experimental analysis. We were able to generate summary statistics for this cohort to help inform the qualitative analysis for some indicators.
- **Unsuccessful applicants** – RSM worked with DCMS to develop a list of 214 firms who applied for funding but were ultimately unsuccessful. This process generated **105** contacts. Data was collected for 13 firms.
- **Non-applicant firms** - We developed a list of **1,905** non-applicant firms, drawing on data from Orbis, Beauhurst and desk research, targeting firms that match characteristics of the funded firms. We have not collected enough data from this target sample to merit inclusion in the report.
- **Omnibus survey** - This survey was developed and sent to SMEs that are part of the Opinion Panel. Data was collected for 500 firms. The purpose of this data collection effort was to gain insight into the perceived added value of 5G to **SMEs** active in a broad(er) range of sectors. The survey would also help to establish external validity of the economic modelling (i.e. do other firms see similar value in 5G?).

The main report details the challenges in collecting data along with recommendations for how to address these challenges in future evaluations.

## 7. Secondary data

### Company data - Orbis

Secondary data mainly builds on Orbis, which covers firms that report to Company House. The analysis is used to gauge the extent to which a comprehensive overview of company data can be retrieved for those firms that took part in the 5GTT programme.

---

such as Beauhurst and Orbis. KPIs such as awareness of technological adoption and expected growth in equity would have to be obtained through surveys.

Out of the 192 firms that participated in the programme, we found data in Orbis for 188 firms, although not all firms have data on all variables. These 188 firms include 18 of the 22 firms that participated in both phases.

Table 3 presents the number of firms for whom we have turnover, employment, and sector data from Orbis for each year from 2012 to 2021. Table 3 separately presents the firms that participated in phase 1 and phase 2. Data from 2020 on turnover is available for a total of 76 firms, out of which, 19 uniquely participated in phase 1, 52 uniquely participated in phase 2, and 5 firms participated in both phases. For the same year data on employment is available for a total of 154 firms.

We find that several firms have gaps in their reporting, for example, out of the 188 firms from Orbis, 31 have continuously reported turnover data from 2012 to 2021 and 43 firms have continuously reported turnover data from 2018 to 2021. As for FTE, these figures are 30 for 2012 to 2021, and 88 for 2018 to 2021, respectively.

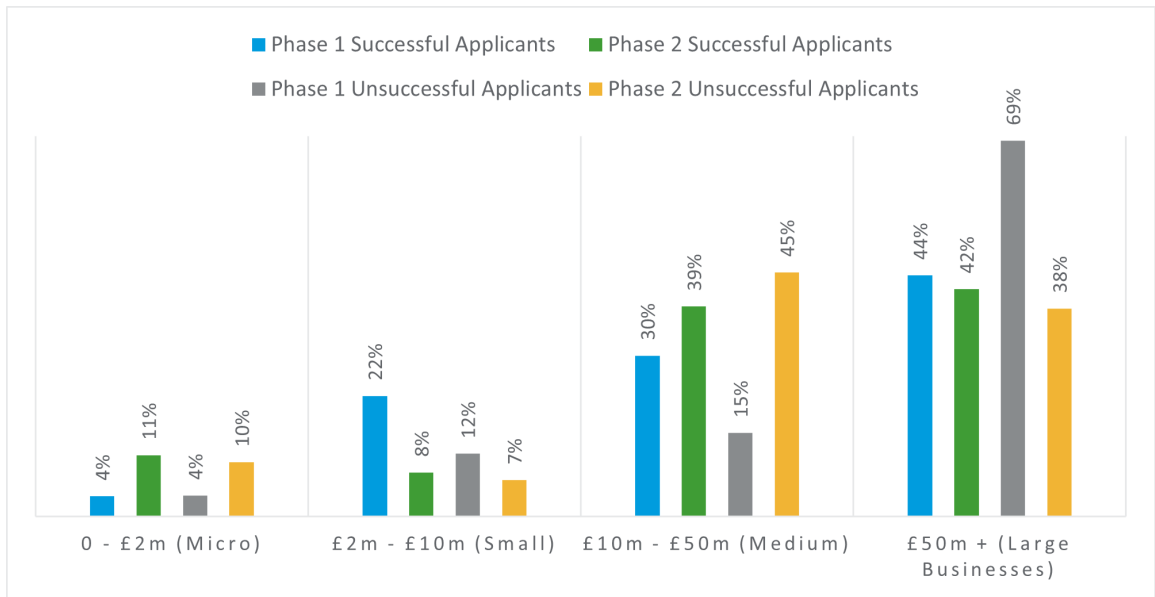
**Table 3 Overview of participant firms**

Firms with Data \ Year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Turnover</b>	Phase 1 only	14	15	15	17	18	18	20	18	19	10
	Phase 2 only	33	34	36	37	38	43	45	46	52	36
	Phase 1&2	4	5	4	4	4	5	5	5	5	4
	<b>Total</b>	<b>51</b>	<b>54</b>	<b>55</b>	<b>58</b>	<b>60</b>	<b>66</b>	<b>70</b>	<b>69</b>	<b>76</b>	<b>50</b>
<b>Employment</b>	Phase 1 only	11	13	13	20	32	34	36	37	36	22
	Phase 2 only	30	29	34	38	58	73	86	93	102	78
	Phase 1&2	4	6	4	5	12	16	15	13	16	12
	<b>Total</b>	<b>45</b>	<b>48</b>	<b>51</b>	<b>63</b>	<b>102</b>	<b>123</b>	<b>137</b>	<b>143</b>	<b>154</b>	<b>112</b>
<b>Sector</b>	Phase 1 only	47	47	47	47	47	47	47	47	47	47
	Phase 2 only	123	123	123	123	123	123	123	123	123	123
	Phase 1&2	18	18	18	18	18	18	18	18	18	18
	<b>Total</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>	<b>188</b>

Source: RSM analysis based on data from DCMS and Orbis

The 5GTT projects have involved 192 firms (businesses). 41 of these uniquely participated in phase 1 and 141 uniquely participated in phase 2. 22 firms participated in both phase 1 and phase 2 projects and may have benefitted relatively more from the programme. Project participants also includes 33 firms that received no DCMS funding despite being part of a funded consortium.

**Figure 4: Turnover of applicant firms (2018)**

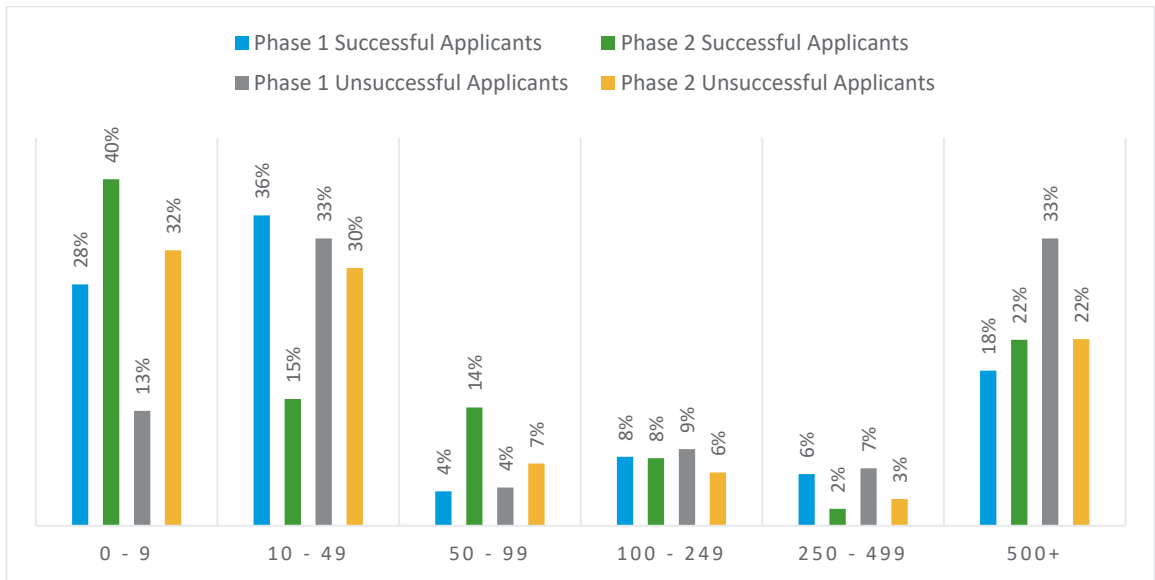


Source: RSM analysis based on data from DCMS and Orbis  
 N = 25;50;26;51

The Figure above provides a breakdown of firms based on their turnover in the baseline year (2018). Out of the firms for which we could source turnover data from secondary sources, most of the phase 1 applicants, both successful and unsuccessful, were large businesses, followed by medium, small, and micro sized firms. In phase 2 of the programme, the gap between the proportion of medium and large sized firms that applied both successfully and unsuccessfully is much smaller. A larger proportion of micro sized firms (turnover ≤ £ 2m) were funded in phase 2 compared to phase 1, which signifies a wider spread in the types of firms that benefitted in the latter phase of the programme.

Figure 5 presents the breakdown of the firms for which we sourced employment data. The majority of firms in all samples, except the unsuccessful applicants in Phase 1 (for whom this proportion is 46%), employed less than 50 staff. A significant proportion (40%) of successful applicants to Phase 2 of the programme were firms that employed less than 10 staff.

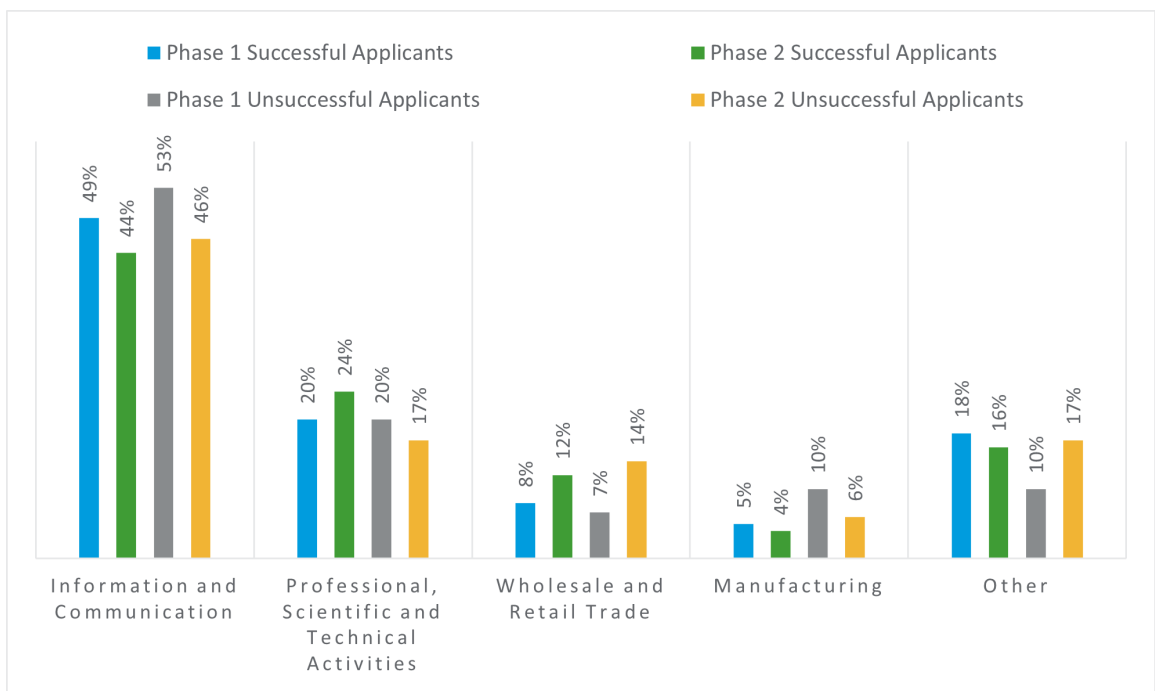
**Figure 5: Number of employees of applicant firms (2018)**



N = 51;101;45;97

Source: RSM analysis based on data from Orbis

**Figure 6: Primary sector of applicant firms (2018)**



N = 65; N = 139; N = 142

Source: RSM analysis based on data from Orbis

The figure above presents a breakdown of applicant firms based on their primary sector of operation (Standard Industry Classification (SIC) codes). The 5GTT programme targeted a range of sectors including agriculture, automotive, transport and logistics<sup>4</sup>. A majority of the firms belong to 'Information and Communication' sector and 'Professional, Scientific, and Technical activities' sector. The distribution of business across the sectors is similar in all the three samples, phase 1 successful applicants, phase 2 successful applicants, and phase 2 unsuccessful applicants. A significant proportion of businesses (16% - 18%) belong to 'Other' sectors. This group contains firms belonging to 'Arts, Entertainment, and Recreation', 'Administrative and Support Service', 'Real Estate', 'Financial and Insurance' and 'Transportation and Storage' sectors, among others.

### Complementary desk research

We also conducted complementary desk research of Beauhurst data and other relevant data in the public domain, such as data on the extent of 5G adoption and ranking of UK research. Sources are referenced in the main report. These sources and other secondary data will be relevant to future impact assessment.

## Phase 3: Analysis, synthesis, and reporting

This phase included the analysis and triangulation of data collected. A Theory Based Approach, contribution analysis, was used to assess the contribution of the programme to observed results and outcomes. This approach has been key to assert the level of attribution to the 5G programme (vis-à-vis what would have occurred anyway by other means).

**Table 4 Evidence from contribution analysis**

Contribution analysis component	Summary of our approach
Assess the extent to which expected outputs, outcomes and impacts are realised	Key Performance Indicators are identified that capture progress along the impact pathways of the Theory of Change. We are transparent in identifying areas where more time will be needed for the full impact to be realised. The analysis has been comprehensive (it covers all impact pathways set out in the Theory of Change). However, in some areas we identified less robust evidence, for example, in relation to the impact of improved security, environmental impact and cost reduction.
Assesses the degree to which outputs, outcomes and impacts are attributable to the 5GTT programme	Case studies apply a contribution score of 0-3. Survey data and interview data for funded applicants is compared with data on unfunded applicants. These outcomes are self-attributed and subject to bias. As a result of data limitations, we were not able to apply quasi-experimental methods to more robustly attribute impact.
<b>Identify unexpected impacts and how these have come about</b>	At the programme level, we have not identified unexpected outcomes and impact that fall outside of the Theory of Change. At a project level, interviewees have identified

<sup>4</sup> [5G by Sector \(uk5g.org\)](http://uk5g.org)

	unexpected results and learnings (unexpected benefit because of collaboration etc.). These are summarised in the main report and case studies. These outcomes are self-attributed and subject to bias.
Identify external factors that have helped and or hindered progress	Interviews included questions on barriers and unintended impacts in relation to Covid-19, EU-Exit, and policies to limit risk from high-risk vendors such as Huawei. The findings in the main report and case studies set out: <ul style="list-style-type: none"> <li>• The effect of the supply of key infrastructure components, to understand if supply chain disruption impacted projects. Evidence is confirmed based on secondary sources where possible.</li> <li>• The effect of the Covid-19 pandemic, to understand the degree to which this has created project delays etc and we understand that there has been some impact at the programme level here.</li> </ul>
Test assumptions behind the ToC (5GTT <b>stimulates wider business activity and the take-up of 5G technology</b> )	External factors are identified that will have influenced progress to address market failures. <ul style="list-style-type: none"> <li>• We used secondary data to gauge the demand for 5G technology within the wider sector.</li> <li>• Evidence from interviews was used to assess the degree to which public concerns or misinformation over 5G are likely to influence wider adoption of 5G technology.</li> </ul>

## 8. Analysis of primary data collection

Notes and/or transcripts from interviews were coded in Nvivo based on a coding framework. The coding framework guided the analysis in line with the Theory of Change.

Evidence from the surveys was summarised alongside other data collected and reviewed.

## 9. Case study coverage and development

Each case study contains:

- A description of how the project was designed and delivered, including looking at test networks deployed and the use cases tested.
- An assessment of project consortium experiences around collaboration; sharing knowledge with the wider ecosystem and experiences with DCMS process.
- A summary of the project's outputs and measurable impacts
- An assessment of the additionality and contribution of the project to the wider programme success measures. This is assessed by a contribution score of 0-3 where
  - 0 = no evidence of activity relating to this impact
  - 1 = evidence of activity, but no evidence of contribution to this impact/additionality of 5G



- 2 = some evidence of contribution to this impact/additionality of 5G
- 3 = strong evidence of contribution to this impact/additionality of 5G

These are based on analysis of Monitoring Information such as project benefit realisation spreadsheets; project final reports; project websites where they exist and interviews conducted with project consortium members.

The full set of Case Studies can be found in Annex E.

## 10. Sustainability Report

While not originally included in the overall specification for this evaluation, DCMS were keen to understand early indications of long-term impacts from the 5GTT programme and the projects that it funded. This is covered in the Sustainability Report (Annex D), which addresses four questions:


- Are the networks that were deployed still in place and in use?
- Were any new products/services developed as part of the 5GTT-funded projects and are these likely to be commercialised?
- How has information about the projects been disseminated more widely and is there evidence of future collaborations?
- Have projects have applied for further funding?

This is based on analysis of BR spreadsheets, final/sustainability reports produced by the different projects and interviews.

## 11. Quality Assurance

We have employed the following procedures to assure the quality of our work:

- **Co-production with DCMS:** Over the course of the evaluation, we held weekly meetings with DCMS to discuss progress and provided a written highlight report. From September 2022 onwards we also held fortnightly meetings specifically to discuss the details of the methodology. We submitted elements of the project to DCMS for review and feedback throughout, such as the project initiation document, draft evaluation plan, the logic model / theory of change, case study selection methodology and suggested sample, qualitative interview topic guides, survey questionnaires, and quantitative methodology. This ensured that the methods used provided the required results for the various interested audiences, and avoided any surprises or misunderstandings in the final outputs.
- **Internal review:** As part of RSM's standard project management procedures, all written outputs were reviewed by the Project Director, Cristian Niculescu-Marcu and overall head of RSM Economics Consulting, Jenny Irwin.
- **External expertise:** We included two academic 5G specialists with direct experience of the 5G programme in our team. They were involved in the evaluation design, have reviewed our



research instruments (questionnaires and interview topic guides), and reviewed finished outputs. They also used their connections in the sector and ecosystem to make introductions to interviewees.

## 2. KEY PERFORMANCE INDICATORS

The KPIs are embedded in the programme Theory of Change / logic model and are listed in full in this Annex. They are linked to the sources used to provide evidence on inputs, activities, outputs, outcomes and impacts. Monitoring data, including management data and data on UK5G progress and end of project reporting, is relevant to all KPIs that provide evidence of progress on inputs and activities. The interviews, which include conversations with DCMS project beneficiaries and other stakeholders, are relevant to provide evidence of progress against inputs, activities, and outputs. Secondary data (such as publicly available 5GTT project documentation) and survey data (UK5G network survey and survey to private sector beneficiaries) helps demonstrate that activities have taken place and outputs have been realised over the course of the programme.

The KPIs embedded in the programme logic model are also used as proxies to capture the extent of 5G adoption and the potential impact thereof. The programme is set up to change the way that beneficiaries and those operating in the wider ecosystem operate. Such changes could be aimed at increasing efficiencies, or allowing for other benefits to emerge which were not possible in previous circumstances (without investment). In the context of this evaluation, the selected **outcome and impact KPIs** will be used to determine whether there have been initial short-term benefits from the 5G Testbeds and Trials programme.

We distinguish between benefits to project beneficiaries and benefits to wider stakeholders (although KPIs are not mutually exclusive). Outcomes and impacts to project beneficiaries are first order benefits; it will take longer for the programme to generate wider outcomes and impacts. As shown in the tables in the Annex, for many of the KPIs we will collect data from three or four different types of sources.

**Table 5 KPIs – Inputs, activities, and outputs**

	Key Performance Indicators	Monitoring data	Secondary data	Surveys	Interviews
Inputs	Government R&D subsidies	✓			
	Private investment	✓			✓
	Applicant resource	✓			✓
	DCMS 5G Team	✓			✓
	Other government resources	✓			✓
Activities	Communication and public awareness	✓		✓	✓
	Testbeds and trials projects	✓		✓	✓
	Procurement of projects	✓	✓		
	International/cross government collaboration	✓	✓	✓	✓
	Engagement with industry, academia and local bodies	✓		✓	✓
	Promote collaborative working	✓		✓	✓
	UK5G Innovation Network	✓	✓	✓	✓
	Monitoring/data collection/evaluation	✓			✓
Outputs	Press materials, publications and information dissemination	✓	✓	✓	✓
	Increased R&D investment from third parties			✓	✓
	Best practice, skills, learning exchanged and applied		✓	✓	✓
	Newly established and sustained organisation collaborations and networks - particularly industry			✓	✓
	Increased project learning/infrastructure	✓	✓		✓

**Table 6 KPIs – Outcome and impacts influencing project participants**

	Key Performance Indicators	Monitoring data	Secondary data	Surveys	Interviews	
	Foster the development of a diverse and varied set of 5G use cases and applications to ensure that the UK and UK businesses are well placed to maximise the benefits of 5G					
	Increased collaboration within the ecosystem		✓	✓	✓	
	Projects generated viable networks that fulfilled the specifications to support the 5G applications required	✓			✓	
	Development of 5G professional knowledge, skills and expertise	✓	✓	✓	✓	
	Funded activities identify/showcase what works	✓		✓	✓	
	Reduced cost and barriers to deployment e.g. infrastructure, sharing, small cell deployment	✓	✓	✓	✓	
	New applications/business models developed/tested	✓	✓	✓	✓	
	Technology/use cases scaled to prove commercialisation of models	✓	✓	✓	✓	
<b>Outcomes</b>	Programme activities have attracted further funding for 5G R&D	✓		✓	✓	
	Security/resilience Measure – 5G networks deployed are more secure than the 4G networks they replace		✓		✓	
<b>Impacts</b>	Development of networks capable of supporting new use cases		✓	✓	✓	
	Knowledge spillover effects	✓	✓	✓	✓	
	Reduction/removal of barriers has accelerated deployment of 5G in the UK	✓	✓		✓	
	Changes to labour requirements	✓			✓	
	Increased revenues for businesses	✓		✓	✓	
	Stimulation of R&D and commercial domestic and international investment beyond funded projects			✓	✓	✓
	Increased certainty over demand/revenue opportunities (e.g. for reduced commercial risk of future investment)	✓		✓	✓	✓

**Table 7 KPIs – Outcome and impacts influencing wider stakeholders**

Key Performance Indicators		Monitoring data	Secondary data	Surveys	Interviews
Help to establish the conditions under which 5G can be deployed in a timely way to drive efficiency and productivity and maximise the chances of the UK being amongst the leading 5G countries					
Outcomes	Generation of 5G activities beyond the scope of the programme	✓		✓	✓
	Programme activities have generated demand/supply certainty and or new viable business models requiring 5G and or related telecoms technologies	✓	✓	✓	✓
	Increased industry participation within ecosystem (e.g. SME/start-ups)	✓	✓	✓	✓
	Development of 5G industry expertise and increased ability to use 5G for commercial activities	✓	✓	✓	✓
	Positive benefits of 5G communicated and increased awareness. The UK is perceived as a leading 5G country	✓	✓	✓	✓
	Information and knowledge is more readily transferred within the 5G ecosystem	✓		✓	✓
	Greater productivity/efficiency enabled by use of 5G technologies	✓	✓	✓	✓
	Increased 5G network deployment preparation and Accelerated and or enhanced deployment of 5G	✓		✓	✓
	Increased diversification in 5G supply chain through openRAN deployment	✓			✓
	Enhanced sustainability of projects/ecosystem		✓	✓	✓
Impacts	Reputation of the UK as a leading 5G national has improved	✓	✓	✓	
	Additional welfare Impacts	✓	✓		✓
	Public service cost savings	✓			✓

The above listed KPIs are still relatively broad for the economic analysis and for assessing impacts on the private sector beneficiaries. We have identified a number of more specific variables linked to a selection of the KPIs. In the table that follows, we have indicated which KPIs and variables are suitable for our interim evaluation, and which could be used in a final evaluation of 5GTT.

**Table 8 KPIs and data**

KPI	Variable	Year	Source	Interim evaluation	Final evaluation
<b>New applications /business models developed /tested</b>	Number of 5G solutions and products generated	Between 2018--2022	Primary/survey	Phase 1 & 2	Yes
<b>Positive benefits of 5G communicated and increased awareness</b>	Binary response determining whether their awareness of 5G has increased	2018-2022	Primary/survey	Phase 1 & 2	Yes
<b>Increased revenues for businesses</b>	Expected growth in turnover	2025 (in three years)	Primary/survey	Phase 1 & 2	Yes
	Turnover	2012-2022	Orbis	Yes phase 1, emerging impacts phase 2	Yes
	Total FTE levels	2012-2022	Orbis	Phase 1 & 2	Yes
	Growth in FTE	2012-2022	Orbis	Yes phase 1, emerging impacts phase 2	Yes
<b>Stimulation of R&amp;D and commercial domestic and international investment beyond funded projects:</b> <ul style="list-style-type: none"> <li>• Future R&amp;D Expenditure</li> <li>• Equity Raised</li> <li>• Total Equity</li> </ul>	Expenditure on 5G R&D	2018-2022	Primary/survey	Yes phase 1, emerging impacts phase 2	Yes
	Expected future 5G R&D expenditure	2025	Primary/survey	Phase 1 & 2	Yes
	Total equity generated	2018-2022	Orbis	Yes phase 1, emerging impacts phase 2	Yes
	Change in equity	2018-2022	Orbis	Yes phase 1, emerging impacts phase 2	Yes

## 3. CONSULTATION TOOLS

This section contains all consultation materials developed for the DCMS 5GTT programme evaluation, including:

- Topics guides for interviews with
  - Recent funded projects
  - Phase 1 projects including 5GUKTN
  - Unfunded projects
  - Stakeholders involved in multiple projects
  - DCMS staff and
  - Wider stakeholders
- Survey questionnaires developed for
  - the UK5G survey which was undertaken in August and September 2022
  - The survey of funded firms who received grant money from DCMS as part of the 5GTT programme
  - the survey of unfunded firms undertaken in November and December 2022 as part of the economic evaluation

## Topic Guides for Qualitative Interviews

### Funded projects (including case studies)

**Interviewer instructions:** First interview with all projects, case study only questions to be explored in more detail in case study interviews

Intro script: Thank you for agreeing to talk to us about your project for the 5GTT programme as part of our evaluation.

Individuals taking part in the research will not be named personally. Your contact details will be stored securely and in compliance with GDPR and these recordings/transcripts will not be shared with DCMS, they are for our analysis only and will be safely disposed of at the end of the project.

**First interview only:** We will provide further information and discuss with you if necessary whether it would be appropriate or necessary to identify your company or organisation in the evaluation report

Please may we have your permission to record (and transcribe) the call?

### General project overview

**Interviewer instructions:** Check BR sheets for project before interview to understand which of the areas in Q2 to focus on.

1. How did you hear about the 5GTT programme? (4,5,6)
2. Can you give us a general overview of what your project was trying to achieve? (19-23)
3. **Case studies only:** As there were a variety of issues addressed through the 5GTT programme, these next few questions are about the specific challenges your project was trying to tackle:

**Interviewer instructions:** Probe on main areas of learning around the following referring back to prep/review of BR sheets(16). For follow up interviews, probe on areas of interest identified in initial interview

- a. Was a 5G network used to conduct trials? If not, what work arounds were you able to use? What value did 5G add/would 5G have added?
- b. Did your project aim to increase revenues or profits (20) or was the focus more on using of 5G technologies to enable greater productivity/efficiency (22)?
- c. Did your project aim to deploy openRAN? (21) Did this happen as planned?
- d. changes to labour requirements – what were these? (23)
- e. Were there any environmental impacts you were interested in learning more about (eg energy efficiency of data transfer/better logistics planning/management for moving assets around?)



- f. Did you anticipate any impacts on the security/ resilience of the network? (TC5)
- 4. To what extent has your project identified and reduced/removed barriers to wider deployment of 5G technologies (39)
- 5. To what extent has your project demonstrated how 5G technologies can be used more effectively? (TC3)
- 6. How has learning and best practice from your project been shared (17)
  - g. Among project partners
  - h. Within the ecosystem? (40)
  - i. More widely? (14)
- 7. Has the sharing of information and knowledge become more effective as a result of the 5GTT programme?
- 8. Do you have plans for further development eg further R&D spending, commercialisation, spin outs? (15,31,35,38)
- 9. **Initial Interview Only:** What was your initial timeline, and did it change? (3)
  - a. What was the reason for this?
- 10. Did the following have any impact on your project?
  - a. COVID-19
  - b. Brexit
  - c. Regulations to limit risk around High Risk Vendors such as Huawei?
- 11. **Case studies only:** We do have your lessons learned from the BR sheets, but were there any particular areas where you were less successful? (32)
  - a. Reasons/lesson learned on this?
- 12. Were there any unintended consequences or unexpected outcomes for your project? (43)
- 13. How many people were involved in delivering your project? (FTE) Were there any staffing issues or particular gaps in expertise? (3)

**Interviewer instructions:** for case study follow ups focus on information for their organisation, consortium leads usually know about this for their own organisation and have a good idea overall, same for Q17.

- 14. **Case studies only:** Did you receive funding for the project from other sources aside from the 5GTT programme (2&3)
  - a. What sources and how much? (2&3)

- b. Would you have received this additional funding without the 5GTT programme funding?
15. Without the 5GTT programme, would this project have happened anyway? (36)
- a. If yes, what did the 5GTT programme allow you to do differently?/do more of? (48)
  - b. If no, were you looking at implementing any other plans for deploying 5G or improving your readiness for 5G deployment as an organisation? (39)
  - c. To what extent would the use case developed as part of your project been possible on previous generation networks? (42, TC9)
16. What happens now? (45) Asking about the things below – you have developed a new thing so what do you do with it?
- a. Has the network (if you had one) been left in place? Are there plans to re-use or upgrade it? (36)
  - b. Have any new products or services been developed as a result of this project? (26,27)
  - c. What, if anything, are the barriers to the further development of these new products/services? (32, 39)
  - d. Have the technologies developed as part of this project bought the UK closer to the development of a new sort of industry? (44)
17. New job roles created with your organisations? (28)
- a. Are these permanent or just for while the project was funded? If the latter, do you know what people have moved on to? (29)

## Your consortium

**Interviewer note:** They might want to give us a lot of detail here so try to keep things moving. Review after first five interviews if we are getting too bogged down here.

18. **Initial interview only:** Who are the key partners in your consortium? (9,10,11,18)

- a. Is this as originally planned or have there been any changes?

19. **Case studies only:** Please give us a brief overview of what role each partner played. (30)

For follow ups, ask specifically about the case study interviewee organisation's role specifically.

- a. for the application
- b. over the course of the project
- c. How well did your consortium work? Were there any issues with the number of partners?

20. **Case studies only:** Did this consortium (or parts of this consortium) work on other projects together before your 5GTT project? (9,10,11,18)

- j. Were there any issues working with new partners?
- 21. **Case study initial interview only:** Were there any changes in your consortium over the course of the project? (18,30)
  - a. why?
- 22. **Case studies only:** Are there any plans for further collaboration within this consortium around products and services relating to 5G? If yes, please tell us more. (34-36)
- 23. **Case studies only:** Has being involved in the 5GTT programme helped you to identify new partners to work with? (40,42)
  - a. If yes, please tell us more.
  - b. Has it strengthened existing collaborations? If yes, please tell us more.
  - c. What has been particularly effective/helpful for identifying new partners?

### Overall 5GTT programme

- 24. How effective has the marketing and communications around the 5GTT programme been? (14)
- 25. How effective and efficient was the application process for the 5GTT programme? (4)
  - a. Any lessons or feedback for any similar programmes in the future?
- 26. How effective were DCMS in supporting the delivery of your project? (4)
- 27. How effective and efficient was the process for benefits realisation reporting? (13)
  - a. Any lessons or feedback for any similar programmes in the future?
- 28. How effective has the 5GTT programme been in
  - a. Helping to establish the conditions under which 5G can be deployed more quickly and cost efficiently? (48, TC4)
  - b. Fostering the development of a diverse and varied set of 5G use cases and applications to ensure UK businesses were well placed to maximise the benefits of 5G (49)
  - c. Promoting collaborative working across the 5G ecosystem? (30)

### Marketing and communications

- 29. How have you interacted with the UK5G Innovation Network? (12)
  - a. How effective and efficient has this been?
  - b. Has this enhanced your knowledge of other companies in the 5G ecosystem? (TC1, 40)

30. How has the 5GTT programme engaged with academia/public services/industry? (10)

## 5G in the UK

**Interviewer instructions:** These are some initial 'wrapping up' questions to get views on the sector as a whole.

31. What is your perception of 5G in the UK? What do we do well and not so well?

32. What is your perception of the demand for 5G in the UK? (24,44)

- a. From businesses? (44)
- b. From general public? (46)

33. What are the main barriers to 5G deployment in the UK? (39)

- a. How have these changed in the last 5 years?

34. To what extent is the UK perceived as a leading 5G country (24,37)

- a. In terms of its readiness for deployment? (25)
- b. As a centre for 5G research and development? (35)
- c. How has this changed in the last 5 years?

## Phase 1 projects

**Interviewer instructions:** First interview with all projects, case study only questions to be explored in more detail in case study interviews

Intro script: Thank you for agreeing to talk to us about your project for the 5GTT programme as part of our evaluation.

Individuals taking part in the research will not be named personally. Your contact details will be stored securely and in compliance with GDPR and these recordings/transcripts will not be shared with DCMS, they are for our analysis only and will be safely disposed of at the end of the project.

**First interview only:** We will provide further information and discuss with you if necessary whether it would be appropriate or necessary to identify your company or organisation in the evaluation report

Please may we have your permission to record (and transcribe) the call?

**Note for analysis:** Numbers in brackets are to check against Logic model or economic transmission numbers of the ones starting “TC” and show which LM boxes these questions help to address. A current version of these is included at the bottom of this discussion guide.

## General project overview

**Interviewer instructions:** Check BR sheets for project before interview to understand which of the areas in Q2 to focus on.

1. How did you hear about the 5GTT programme? (4,5,6)
2. Can you give us a general overview of what your project was trying to achieve?
3. As there were a variety of issues addressed through the 5GTT programme, these next few questions are about the specific challenges your project was trying to tackle:

**Interviewer instructions:** Probe on main areas of learning around the following referring back to prep/review of BR sheets(16)

- a. Was a 5G network used to conduct trials? If not, what work arounds were you able to use? What value did 5G add/would 5G have added?
  - b. What was the primary benefit of the project? Did you have any impact on revenue/profits for the university?
  - c. Changes to labour requirements – what were these? (23)
  - d. Were there any environmental impacts you were interested in learning more about (eg energy efficiency of data transfer/better logistics planning/management for moving assets around?
  - e. Did you anticipate any impacts on the security/ resilience of the network? (TC5)
4. To what extent has your project identified and reduced/removed barriers to wider deployment of 5G technologies (TC2)
  5. To what extent has your project demonstrated how 5G technologies can be used more effectively? (TC3)

6. Can you kindly provide some comments on how you found partner and wider sector engagement throughout the project?
7. How has learning and best practice from your project been shared (17)
  - a. Among project partners.
  - b. Within the ecosystem? (S4)
  - c. More widely? (14)
8. Has the sharing of information and knowledge become more effective as a result of the 5GTT programme?
9. To what extent has the 5GTT programme stimulated R&D investment around 5G in the UK? (37, S2)
  - a. To what extent would this have happened anyway?
10. What was your initial timeline, and did it change? (3)
  - a. What was the reason for this?
11. Were there any external factors that had an impact on the delivery of your project? Eg, Brexit, spectrum licences, available of equipment
12. We do have your lessons learned from the BR sheets, but were there any particular areas where you were less successful? (32)
  - a. Reasons/lesson learned on this?
13. Were there any unintended consequences or unexpected outcomes for your project?
14. How many people were involved in delivering your project? (FTE) Were there any staffing issues or particular gaps in expertise? (3)
  - a. In addition, did this project help to develop any sector specific skills and how did these skills help to support UK industry?
15. Did you receive funding for the project from other sources aside from the 5GTT programme (2&3)?
  - a. What sources and how much? (2&3)
  - b. Would you have received this additional funding without the 5GTT programme funding?
16. Without the 5GTT programme, would this project have happened anyway? (38)
  - a. If yes, what did the 5GTT programme allow you to do differently?/do more of? (39)
  - b. If no, were you looking at implementing any other plans for deploying 5G or improving your readiness for 5G deployment as an organisation?

- c. To what extent would the use case developed as part of your project have been possible on previous generation networks? (TC9)
17. What happens now? (S9) Asking about the things below – you have developed a new thing so what have you been able to do with it?
- e. What is the longevity of the initial investment, how did they survive and evolve and what is the current level of maturity? Linked to this do you have plans for further development e.g. additional R&D spending, commercialisation, spin outs? (15,31,37,S2)
  - f. Have any new products or services been developed as a result of this project? (26,27)
  - g. What, if anything, are the barriers to the further development of these new products/services? (32, S3)
  - h. Have the technologies developed as part of this project brought the UK closer to the development of a new sort of industry?
18. Were new job roles created with your organisation then or since as a result of the test network programme with DCMS? (28)
- a. Are these permanent or just for while the project was funded? If the latter, do you know what people have moved on to? (29)

## Your consortium

**Interviewer note:** Keep this section light touch/brief

19. Please give us a brief overview of what role each partner played. (30)
- a. for the application
  - b. over the course of the project
  - c. How well did your consortium work? Were there any issues with the number of partners?
  - d. Amount of value delivered considering the budget distribution
20. Did this consortium (or parts of this consortium) work on other projects together before your 5GTT project? (9,10,11,18)
- a. Were there any issues working with new partners?
21. Were you able to collaborate further on follow up projects or are there any plans for further collaboration within this consortium around products and services relating to 5G? If yes, please tell us more. (36,37,38)
22. Did your involvement in the 5GTT programme helped you to identify new partners to work with? (S4, S6)
- a. If yes, please tell us more.

- b. Has it strengthened existing collaborations? If yes, please tell us more.
- c. What has been particularly effective/helpful for identifying new partners?

## Overall 5GTT programme

23. Overall how successful do you think the 5GTT programme has been? What were the main good things about the programme?
24. How effective was the marketing and communications around the 5GTT programme been? (14)
25. Could you kindly provide some comments on the overall funding process in particular whether you were directly awarded funding or received funding via open competition and your thoughts on this?
26. How effective were DCMS in supporting the delivery of your project? (4)
27. Has the programme helped to increase/speed up the deployment of 5G in the UK? In what way? (32, S3)
- a. To what extent would this have happened anyway (without the 5GTT programme)?
  - b. What are the main barriers to the deployment of 5G in the UK? (S3) and were those different at the time?
  - c. How efficient and effective has the 5GTT programme been in addressing these barriers?
28. Are you aware of any spill-overs from the 5GTT programme into other sectors? (29)

## Marketing and communications

29. How have you interacted with the UK5G Innovation Network? (12)
- a. How effective and efficient has this been?
  - b. Has this enhanced your knowledge of other companies in the 5G ecosystem? (TC1)
30. How has the 5GTT programme engaged with academia/public services/industry? (10)

## 5G in the UK

**Interviewer instructions:** These are some initial 'wrapping up' questions to get views on the sector as a whole.

31. What is your perception of 5G in the UK? What do we do well and not so well?
32. What is your perception of the demand for 5G in the UK? (24/35,S8)
- a. From businesses? (S8)
  - b. From general public? (B)



- 33. To what extent is the UK perceived as a leading 5G country (24/35,S1)
  - a. In terms of its readiness for deployment? (25/34)
  - b. As a centre for 5G research and development? (37)
  - c. How has this changed in the last 5 years?

## Organisations involved in more than one project

Intro script: Thank you for agreeing to talk to us about your project for the 5GTT programme as part of our evaluation.

Individuals taking part in the research will not be named personally. Your contact details will be stored securely and in compliance with GDPR and these recordings/transcripts will not be shared with DCMS, they are for our analysis only and will be safely disposed of at the end of the project.

We will provide further information and discuss with you if necessary whether it would be appropriate or necessary to identify your company or organisation in the evaluation report

Please may we have your permission to record (and transcribe) the call?

### Your funded projects

1. Please tell us about your organisation and how it has been involved in the 5GTT programme? (4,5)
2. How many and which projects were you involved in? What kind of role did you play/ a lead role in any/ or do you specialise in a particular area?
  - a. How is it that you ended up in more than one project? Prompt: was it working with previously established partnerships that you had worked with well before? or another reason?
  - b. Is the same team involved in all your 5GTT projects or are there different people on each one? (29)
  - c. Did you have resourcing issues in working on more than 1 project? what were these and how did you handle these? Were you able to get staff with the expertise required? (23)
  - d. Have any new job roles been created within your organisation as a result of your 5GTT projects ? (28)
  - e. Did any of your projects work better or worse than the other/s and do you know why this was?
  - f. How about issues related to the consortium that you worked in - do you have any comments about working in larger or smaller consortiums? (30)
3. Did the consortiums your worked with on these projects work together before your involvement in the 5GTT programme? (9,10,11,18)
4. Has being involved in the 5GTT programme helped you to identify new partners to work with? (40, 42)
  - a. What has been particularly effective/helpful for identifying new partners?
5. To what extent do the different project you are involved in

- a. complement one another?
  - b. Share knowledge and learning? (40)
6. To what extent have your projects identified and reduced/removed barriers to wider deployment of 5G technologies (39)
7. To what extent have your projects demonstrated how 5G technologies can be used more effectively? (TC3)

**Interviewer note: Check BR sheets before interview for indication of which areas to focus on**

8. To what extent do they focus on
- f. development of networks supporting 5G technologies (19) – (were networks in rural or hard-to-reach areas deployed?)
  - g. Was 5G key to what the project was able to develop? Was a 5G network used to successfully trial your use cases? If not, what did you use? and would this have been possible on a 4G network?
  - h. Did your project aim to increase revenues or profits (20) or was the focus more on using of 5G technologies to enable greater productivity/efficiency (22)?
  - i. Did your project aim to deploy openRAN and did this happen as planned? (21)
  - j. labour requirements (23) – what were these
  - k. Were there any environmental impacts you were interested in learning more about (eg energy efficiency of data transfer/better logistics planning/management for moving assets around? (TC8)
  - l. Did you anticipate any impacts on the security/ resilience of the network? (41)
9. Have any new products or services been developed as a result of the 5GTT projects (45)
- a. Do you have plans for further development? Eg further R&D spend, commercialisation, spin outs? (15,31, 35, 38)
  - b. What if anything are the barriers to the further development of these new products/services? (32,39)
  - c. Have the technologies developed as part of this project brought the UK closer to the development of a new sort of industry?
10. How has learning and best practice for your projects been shared (17)
- a. Within your organisation
  - b. Among project partners

- c. Within the ecosystem
  - d. More widely
11. Were there any unintended consequences or unexpected outcomes from your projects? (32)
12. Were all the applications you submitted for funding from the for 5GTT programme successful? (33)
- a. If no, why were unsuccessful applications unsuccessful?
  - b. What barrier were unsuccessful applications trying to address?

### Programme processes

13. How were the competitions for the different tranches of funding publicised? (6)
- a. How has this changed over different competition phases?
14. How effective and efficient was the application process for the 5GTT programme? (4)
- a. Any lessons or feedback for any similar programmes in the future?
15. Did your projects meet their milestones on time and in line with anticipated budget? (3,13)
- a. How efficient and effective were DCMS in dealing with any changes to this?
16. Did the following have any impact on your projects?
- a. COVID-19
  - b. Brexit
  - c. Regulations to limit risk around High Risk Vendors such as Huawei?
17. How effective and efficient was the process for benefit realisation reporting? (13)
- a. Any lessons or feedback for any similar programmes in the future?

### The 5GTT programme

18. How was the overall 5GTT programme designed to
- a. Help to establish the conditions under which 5G can be deployed (48)
  - b. Foster the development of a diverse and varied set of 5G use cases and applications to ensure UK businesses were well placed to maximise the benefits of 5G (49)
  - c. Promote collaborative working across the 5G ecosystem? (30)
19. Without the 5GTT programme would these projects have happened anyway? (36)
- a. What did the 5GTT programme allow you to do differently?/do more of? (48)

- b. To what extent would the projects you have been involved in been possible on previous generations networks? (45)
  - c. Were you looking at implementing any other plans for deploying 5G or improving your readiness for 5G deployment as an organisation? (37)
20. Has the 5GTT programme helped to increase/speed up the deployment of 5G in the UK? In what way? (32, 39)
21. Have there been any spillovers from the 5GTT programme into other sectors? (29)
22. To what extent has the 5GTT programme stimulated R&D investment around 5G in the UK? (35, 38)


## Marketing and communications

23. How effective has the marketing and communications around the 5GTT programme been? (14)
24. How have you interacted with the UK5G Innovation Network? (12)
- a. How effective and efficient has this been?
  - b. To what extent has it enhanced your knowledge of other companies in the 5G ecosystem? (40)
25. How has the 5GTT programme engaged with academia/public services/industry? (10)
26. What has been effective at supporting collaborative working across the 5G ecosystem and beyond? (11,18)
27. How has learning from the funded projects been shared within the ecosystem and more widely? (16)

## 5G in the UK

**Interviewer instructions:** These are some initial 'wrapping up' questions to get views on the sector as a whole. Q29 is asked across all stakeholder groups – higher priority group for this? Q32 is of interest to DCMS so please also ask this.

28. What is your perception of 5G in the UK - what do we do well and not so well?
29. To what extent is the UK perceived as a leading 5G country? (24,37)
- a. In terms of its readiness for deployment? (25)
  - b. As a centre for 5G research and development? (35)
30. What are the main barriers to 5G deployment in the UK? (39)
- a. How have these changed in the last 5 years?



31. What is your perception of the demand for 5G in the UK? (24,44)

a. From businesses? (44)

b. From general public? (46)

## Topic Guide – Non funded projects

**Intro script:** Thank you for agreeing to talk to us about your project for the 5GTT programme as part of our evaluation.

Individuals taking part in the research will not be named personally. Your contact details will be stored securely and in compliance with GDPR and these recordings/transcripts will not be shared with DCMS, they are for our analysis only and will be safely disposed of at the end of the project.

We will provide further information and discuss with you if necessary whether it would be appropriate or necessary to identify your company or organisation in the evaluation report

Please may we have your permission to record (and transcribe) the call?

### Your project

1. How did you hear about the 5GTT programme? (4,5,6)
2. Why did you apply to the 5GTT programme?
  - a. How helpful were communications from DCMS in putting your bid together?
3. To what extent would your project have focused on the following?
  - a. Development of networks supporting 5G technologies
  - b. Increasing revenues
  - c. Supply chain Diversification (openRAN) (21)
  - d. Increasing productivity/efficiency (20)
  - e. Reducing costs
  - f. Reducing fuel or energy usage?
  - g. Improving network security and/or resilience? (41)
4. To what extent would project aims have been possible on previous generation networks? (45)
5. What feedback did DCMS provide about why they decided not to fund your project? (8)
6. What happened without the funding from the 5GTT programme? (38)
  - a. What would the 5GTT programme allow you to do differently?/do more of? (48)
  - b. What would you have been able to do with the match funding amount (that was put up together with the DCMS funding amount)? Would you have been able to deliver some aspects of the project? Which ones?
7. Have you taken other actions to speed up the deployment of 5G or improve your readiness for 5G deployment? (39)

- a. If so, what funding did you get?
  - b. What has worked well?
  - c. Was there support or collaboration opportunities that helped to speed up deployment/improve your readiness for deployment
8. Were you able to make progress on developing new 5G technology? (26,27)
- a. Do you have plans to develop these further? (eg through further R&D spending, commercialisation, spinouts etc)
  - b. What value would 5G have added and could these benefits have been achieved on 4G?
9. Who would have been in your consortium? (9,10,11,18)
- a. Had this consortium (or parts of it) worked together on other projects before applying for the 5GTT programme? How did you form this consortium? (9,10,11,18)
  - b. Are there any plans for further collaboration around products and services relating to 5G with the same consortium (or parts of it)? If yes, please tell us more. (34-36)

## Overall 5GTT programme

10. How effective and efficient was the application process for the 5GTT programme? (4)
- a. Any lessons or feedback for any similar programmes in the future?
11. How has learning and best practice from the funded 5GTT projects been shared across the wider 5G ecosystem in the UK? (40)
- a. What has been particularly useful for this?
  - b. How could this be improved?
12. How effective has the 5GTT programme been in
- a. Helping to establish the conditions under which 5G can be deployed more quickly and cost efficiently? (48)
  - b. Fostering the development of a diverse and varied set of 5G use cases and applications to ensure UK businesses were well placed to maximise the benefits of 5G (49)
  - c. Promoting collaborative working across the 5G ecosystem? (30)

## Marketing and communications

13. How effective has the marketing and communications around the 5GTT programme been? (14)
14. To what extent have you interacted with the UK5G Innovation Network? (12)



- a. How effective and efficient has this been?
- b. Has this enhanced your knowledge of other companies in the 5G ecosystem? (40)

## **5G in the UK**

15. What is your perception of 5G in the UK? What do we do well and not so well?

16. To what extent is the UK perceived as a leading 5G country (24,37)

- a. In terms of its readiness for deployment? (25)
- b. As a centre for 5G research and development? (35)
- c. How has this changed in the last five years?

17. What are the main barriers to 5G deployment in the UK? (39)

- a. How have these changed in the last 5 years?

18. What is your perception of the demand for 5G in the UK? (24,44)

- a. From businesses? (44)
- b. From general public? (46)

## DCMS Staff Question Bank

We conducted 15 staff interviews in total, some with individuals and some with groups of staff in the same job roles. The job roles included Portfolio Managers, Programme Managers, Project Managers, TDAs, Finance, Marketing and Communications Officers and people involved in the Benefits Realisation process. Some questions were more relevant to particular job roles, so not all questions were asked of all staff.

**Privacy Statement:** Thank you for agreeing to talk to us about your project(s) for the 5GTT Programme as part of our evaluation. We will be asking questions about processes within the overall 5GTT programme – how projects were set up and supported, what worked well and less well, whether projects were able to achieve their goals, and lessons learned for future delivery of similar programmes. If appropriate, we will also ask questions about the 5G ecosystem in the UK and whether the programme has had impacts on 5G deployment.

We will only be sharing aggregated comments with DCMS from these interviews, and attributing only to the 5GTT Programme team as a whole (and not to individuals or teams). Some observations may be made in the reporting on groups of staff - but these will be much more general in nature eg, general agreement with the approach by PMs. We can send over the report beforehand if you prefer.

Your contact details will be stored securely and in compliance with GDPR and these recordings/transcripts will not be shared with DCMS, they are for our analysis only and will be safely disposed of at the end of the project.

Please may we have your permission to record (and transcribe) the call?

### Your role

1. Please tell us about your role and responsibilities in the 5GTT Programme? (4)
  - a. What has been your role in the 5GTT Programme?
  - b. Were there any individual 5GTT projects you worked on?
  - c. How long have you been involved in the 5GTT Programme?
  - d. Has your role changed over the time you have been involved? If so, how?

### Achieving intended objectives and scope

2. To what extent did the projects you worked on achieve their intended scope and benefits?
  - a. Were your projects able to get their 5G network(s) up and running?
  - b. How about their use case trials?
  - c. How did the original planned scope and scale compare to what they actually achieved?
  - d. How were you able to manage this in terms of communications? (14, 16, 17)

## Programme Communications and Marketing

3. On balance, can you briefly say how effective were communication processes were for supporting the delivery of the programme 5GTT projects? (6)
4. In thinking about the overall 5GTT Programme, can you give me one or two key things where you think the Programme worked well around communications and marketing? (6)
  - a. Can you give a brief example of a project (or portfolio) that delivered well?
  - b. Why do you think it worked so well?
5. Thinking about things that did not work so well:
  - a. Can you give a brief example of a project (or portfolio)?
  - b. Why do you think it didn't work so well?
6. And how about working with individual projects?
  - a. How did you work with projects? What worked well and didn't work well?
  - b. How were you able to get over these challenges?
  - c. What processes could be improved?

## Competitions

7. What aspects of competitions for the different tranches were you involved with?
8. How were the competitions for the different tranches of funding publicised/ market engagement? (6)
9. Were there any particular issues with getting interest in the competitions?
10. Was there any change in this between Phase 1 projects and later competitions?
11. Do you have any other comments around how well competitions were run?

## Application Process

12. How effective and efficient was the application process for the 5GTT programme? (4)
13. Scoring: Can you tell us how you scored the different applications?
  - a. What were you looking for?
  - b. What were the key criteria used? Were there notable differences between the competitions that you are aware of?
14. Timing: Was time taken to review the applications appropriate?
15. Feedback: Did you provide feedback to unsuccessful applicants?

- a. Did you see any evidence of people acting on your feedback (ie, unsuccessful in phase 1, successful in phase 2, or unsuccessful for 5GTT programme but successfully funded for other projects around telecoms)?

16. Any lessons or feedback for any similar programmes in the future?

### **Project Set Up Phase**

17. How were you involved in the project set-up phase eg in finalising grant agreements, agreed budgets etc.

- a. How easy or difficult did you find the project set-up phase, including finalising the grant agreement?
- b. Were there any delays or complications around getting contracts set up and signed off?
- c. What worked well?
- d. What were the main issues? How could these be improved?

### **TDA support**

18. How well were you able to support projects in your capacity as TDA? Were you able to do this to the level you wanted?

- a. What are the main issues generally?
- b. How could this work better?
- c. Where did this work well and do you know why this was?
- d. Were there instances where this was particularly difficult (any examples?) and why was this?

### **Overall Delivery**

19. On balance, can you briefly say how effective were processes for supporting the delivery of 5GTT projects? (4)

20. In thinking about the overall 5GTT Programme and your role, can you give me one or two key things where you think the Programme worked well?

- a. Can you give a brief example of a project (or portfolio) that delivered well?
- b. Why do you think it worked so well?
- c. What things did not work so well?

21. Thinking about the programme as a whole (or your knowledge of it), what are the top issues that caused failure in your view? (eg can you give your top three from the following)

- a. Supply issues with radios or other essential equipment?

- b. Issues with consortium partners or suppliers?
  - c. Developing technology (or suppliers doing so)?
  - d. Management or leadership issues - consortium?
  - e. Issues with DCMS? E.g. requirements of projects or process matters, e.g. project set up and reaching commercial agreements, change management.
  - f. Planning, spectrum licensing or regulation issues?
  - g. Staffing issues or shortages of particular skills?
  - h. External factors such as BREXIT/Covid?
22. On balance, to what extent were projects able to overcome these challenges?
23. If you were to do the programme again, what one thing would you change - or would you like DCMS to change to make it run more smoothly

### **Change Requests**

24. On balance, how far did projects meet their milestones? (most? half? less?)
- a. How were requests for change handled?
  - b. What are the main issues for dealing with change requests?
  - c. How would you change how DCMS deals with changes?
25. How much do you think you learned about 5G during the programme?
- a. around technical issues?
  - b. deployment issues?

### **Benefits Realisation**

26. What are your views of the BR process?
- a. On balance, how well did it work?
27. How much support was needed from projects?
28. Did projects measure the right things?
29. Were there any projects where the BR process worked particularly well?
- a. Why was this?
30. What were the main challenges around BR?
- a. Any particular examples of where it didn't work and why was this?

31. Is there anything you would change?

## Lessons Learned

32. What are your views of the process for gathering Lessons? On balance, how well did it work?

33. How much support was needed from projects?

34. Were there any projects where they recorded lessons particularly well? Why was this?

35. What were the main challenges around Lessons? Any particular examples of where it didn't work and why was this?

36. Is there anything you would change?

## Collaboration

37. Generally how well do you think projects collaborated?

- a. within their consortiums
- b. And outside their consortiums

38. Are there any examples you can give us where collaboration between organisations or projects worked particularly well?

39. How has DCMS supported collaborative working across the 5G ecosystem and beyond? (11,18)

- a. How has the 5GTT programme engaged with academia/public services/industry? (10)
- b. How has DCMS helped to share learning from the funded projects? How could it be improved? (16)

40. Did you deal with UK5G? How well do you think this worked?

41. If you were to do this again, what one thing would you change - or would you like DCMS to do - differently in terms of managing the delivery of projects?

## Working with DCMS Colleagues

42. How could colleagues in DCMS work better together?

43. How could DCMS work better with projects generally?

44. Were you able to establish good working relationships?

- a. Where did this work well?
- b. Why did it work well?
- c. What could be done better?

45. If you were to do this again, what one thing would you change - or would you like DCMS to do - differently in terms of managing the Programme?

## Programme Impacts

46. Has the programme helped to increase/speed up the deployment of 5G in the UK? In what way? (S3)

- a. Can you think of any good examples?
- b. To what extent would this have happened anyway (without the 5GTT programme)?

47. What are the main barriers to the deployment of 5G in the UK? (S3) (already covered?)

- a. How efficient and effective has the 5GTT programme been in addressing these?

48. To what extent has the 5GTT programme stimulated R&D investment around 5G in the UK? Can you tell us about any good examples where this has worked well? (37, S2)

- a. To what extent would this have happened anyway?

49. Have there been any spillovers into other sectors that you are aware of? (29) By spillover we mean impacts on projects or companies not directly supported by the programme, such as dissemination of knowledge to customers, suppliers, or collaborators, or movement of staff with new skills.

50. To what extent is the UK perceived as a leading 5G country? (24/35,S1)

- a. As a centre of excellence for research and development?
- b. In terms of readiness for deployment?

51. What is your perception of the demand for 5G in the UK? (24/35,S8)

- a. From businesses? (S8)
- b. From general public? (B)

52. Do you have any final thoughts on the programme?

## Wider stakeholders

Intro script: Thank you for agreeing to talk to us about the DCMS 5GTT programme as part of our evaluation.

Individuals taking part in the research will not be named personally in our reporting. Your contact details will be stored securely and in compliance with GDPR and these recordings/transcripts will not be shared with DCMS, they are for our analysis only and will be safely disposed of at the end of the project.

**First interview only:** In order to demonstrate that we have been able to reach out a wide range of stakeholders we may name-check the number of stakeholders consulted in relation to the organisations that contributed to this study in our reporting. Would you be happy for your organisation to be named?

Please may we have your permission to record (and transcribe) the call?

**Note for analysis:** Numbers in brackets are to check against Logic model or economic transmission numbers of the ones starting “TC” and show which LM boxes these questions help to address. A current version of these is included at the bottom of this discussion guide.

## General Overview

1. What is your view of the readiness of the 5G ecosystem in the UK? (48)
  - a. What do we do well?
  - b. Is there anything missing or that we need to do much better?
  - c. If you can think of just one or two priorities for the development of 5G in the UK what would these be?
2. Do you think that the UK is a leading 5G country? (24,S1), [If yes, how so? If not, why not and what would it need to do better?]
  - a. In terms of its readiness for deployment? (25)
  - b. As a centre for 5G research and development? (38)
3. What is your perception of the demand for 5G in the UK? (24,S8)
  - a. From businesses? (S8)
  - b. From general public? (B)
  - c. Is the demand for 5G or is it for good connectivity generally?
4. Please tell us about your role at [ORGANISATION NAME]. Have you been involved in the DCMS 5GTT programme? (4,5)
  - a. How did you come to be involved? **If not involved in the DCMS 5GTT programme jump to Q12**



- b. What was your main motivation for becoming involved in the 5GTT programme? (19-23)
  - c. Overall how successful do you think the 5GTT programme has been? What were the main good things about the programme?
5. To what extent do you think the 5GTT programme was designed to:
- a. Help to establish the conditions under which 5G can be deployed (39)
  - b. Foster the development of a diverse and varied set of 5G use cases and applications to ensure UK businesses were well placed to maximise the benefits of 5G (40)
  - c. Promote collaborative working across the 5G ecosystem? (30)
  - d. To the best of your knowledge, were there other aims of the 5GTT programme?
6. What are the main barriers to the deployment of 5G in the UK? (S3)
- a. How effective has the 5GTT programme been in addressing these barriers?
  - b. Could the programme have gone about realising the same outcomes in a more cost effective way?
7. Has the programme helped to increase/speed up the deployment of 5G in the UK? In what way? (32, S3)
- a. To what extent would this have happened anyway (without the 5GTT programme)?
8. Are you aware of any positive or negative spill-overs from the 5GTT programme into other sectors? (29)
9. To what extent has the 5GTT programme stimulated R&D investment around 5G in the UK? (37, S2)
- a. To what extent would this have happened anyway?
10. Have the technologies developed as part of the DCMS 5GTT programme brought the UK closer to the development of a new sort of industry? [if derails, ask if the programme has resulted in innovations within his/her organisation and/or in other businesses] (44)

## Marketing and communications

11. How effective has the marketing and communications around the 5GTT programme been? (14)
12. How have you interacted with the UK5G Innovation Network? (12)
- a. Have you gained new insights through your interactions and were material/events packaged in an accessible and useful way? (How effective and efficient has this been)?
  - b. Has the UK5G Innovation network enhanced your knowledge of other organisations active in the 5G ecosystem?

13. What type of stakeholders are key to drive meaningful change? (42)
  - a. Has the programme resulted in sufficient engagement with these different types of stakeholders? (academia/public services/industry)? (10)
  - b. What aspects of the programme have been particularly effective at supporting collaborative working across the 5G ecosystem and beyond? (11,18)
  - c. How has learning from the funded projects been shared within the ecosystem and more widely? (16)

### **Questions for all, including for people for who have not been involved in 5GTT or who do not have much knowledge of it**

14. Are you aware of any other programmes/projects to improve UK readiness for 5G deployment? (If yes, in view of those other programmes, what aspects would have been useful for the 5GTT programme?)

### **5G in the UK**

15. In your view what are the main issues with deploying 5G? (eg regulation, supply chain, skills/expertise/ other?) (32, 39)
16. What do you think are the challenges for deploying 5G in different environments? (32,39)
  - a. Urban vs rural
  - b. Indoor vs outdoor
17. How well has the 5GTT programme addressed these challenges? (if applicable)

### **Regulation (32,39)**

18. What are the regulatory challenges for deployment of 5G in the UK around the allocation of spectrum?
  - a. Are there examples of other countries where this works well and is there anything the UK should be looking to replicate?
  - b. How well do you think the regulator balances regulation and innovation in this area?

### **Supply chain**

19. How well developed is the supply chain for 5G ready equipment in the UK? (32,39)
  - a. How has this changed in the past 5 years?
  - b. To what extent was Brexit a barrier/opportunity for this?
  - c. To what extent was COVID a barrier/opportunity for this?

20. Are the changes around limiting risks from High Risk Vendors such as Huawei a threat or opportunity? (44)
  - a. To what extent has the 5GTT programme created opportunities for UK-based disruptors in 5G telecoms technologies?
21. What are the barriers for small telecoms companies in the UK for deploying 5G technologies? (44)
  - a. How can these be addressed?
22. How 'ready' for 5G connection is IoT equipment currently used in your industry/sector? (43)

## Surveys

### UK5G (Wider ecosystem) survey

Please take 10-15 minutes to complete our survey to feed into an evaluation of the 5GTT Programme.

RSM has been commissioned by DCMS to carry out the survey which is being distributed to the members of the network by UK5G.

All of your responses will remain anonymous but if you would be willing to share your detail with RSM and/or take part in further fieldwork for the evaluation please provide your name and email address on the questionnaire. All of these details will be stored securely in line with GDPR guidance. Any input you are able to give will be extremely valuable to us.

Your responses will also feed into advice for the new Innovation Network (UKTIN) that is coming into play. So please get involved - we would love to hear from you!

RSM is an organisation with particular expertise in conducting evaluation in this sector. If you have any questions please feel free to contact Polly Jackson at RSM using [polly.jackson@rsmuk.com](mailto:polly.jackson@rsmuk.com)

Thank you

1. This survey is being distributed by UK5G Innovation Network on behalf of DCMS and RSM, the organisation commissioned to conduct an evaluation of the 5GTT programme. RSM will be gathering and analysing your responses. Are you happy to continue?

Yes

No

2. What type of organisation do you work for?

Business

Self-employed

Sub-national UK public sector

National UK public sector

University/Higher Education Establishment

Other (please specify):

3. What sector do you or your organisation primarily work in?

- Information and communications, including telecommunications
- Creative industries, media and sport
- Manufacturing
- Construction
- Transport and logistics
- Health and social care
- Education
- Wholesale and retail trade, accommodation and food services
- Professional, scientific and technical or innovation services
- Public administration – Urban
- Public administration – Rural
- Finance, insurance and real estate
- Primary
- Other (please specify)

4. How many staff does your organisation currently employ?

- 0-9 employees
- 10-49 employees
- 50-99 employees
- 100-249 employees
- 250-499 employees
- 500+ employees

5. Where is the head office of your organisation based?

- North East England
- North West England

- Yorkshire and Humber
- East Midlands
- West Midlands
- East of England
- South East England
- South West England
- London
- Scotland
- Wales
- Northern Ireland
- Outside UK (Please state)

6. Did your organisation apply to the 5GTT programme? \*

- Yes and the project was successfully awarded funding
- Yes but the application was unsuccessful
- Yes and were awarded funding but chose not to utilise this option
- We applied for funding for more than one project and some applications were successful, but others were not
- No
- Not sure

We are conducting extensive fieldwork with funded delivery partners and are conscious of the time we are asking for people to give us their views. For this reason - we will not ask you to complete this additional survey.

- I am happy to continue
- Please take me to the end

7. In your opinion how far has the 5GTT programme run by DCMS succeeded in greater adoption of 5G technologies?

- A big improvement
- A small improvement
- No difference
- Don't know/not sure

8. Has the 5G funding programme accelerated the adoption of 5G technologies in the UK?

- Yes, it significantly accelerated the adoption of said technologies
- Yes, but it only marginally increased adoption
- No, adoption would have occurred at the same rate with or without funding
- Not possible to determine/minimal impact

9. What do you primarily go to UK5G for? (Please tick all that apply)

- Learn about 5G
- Connect with other organisations and individuals
- Stay up to date with the latest 5G news and updates
- Access resources to help and support you with your 5G deployments
- Other (please specify):

10. Since you signed up to the UK5G network, how often have you used the following content?

	Never	Rarely (1-2 times)	Occasionally (3-5 times)	Frequently (6 or more times)	Don't know/can't remember
Read about lessons learned from 5GTT programme projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Responded to someone else's post about collaboration opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Posted on the website about collaboration opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read about the funding opportunities posted on the website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Never	Rarely (1-2 times)	Occasionally (3-5 times)	Frequently (6 or more times)	Don't know/ can't remember
Attended free/paid for training run or publicised by the UK5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attended free/paid for events run or publicised by the UK5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read the magazine [UK5g Innovation Briefing] circulated by the UK5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read the e-newsletters circulated by the UK 5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read articles posted on the website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)					

11. How useful did you find this service?

	Not at all useful	Slightly useful	Moderately useful	Very useful	Don't know/ Can't remember
Read about lessons learned from 5GTT programme projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Responded to someone else's post about collaboration opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Posted on the website about collaboration opportunities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read about the funding opportunities posted on the website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attended free/paid for training run or publicised by the UK5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attended free/paid for events run or publicised by the UK5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read the magazine [UK5g Innovation Briefing] circulated by the UK5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read the e-newsletters circulated by the UK 5G network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Read articles posted on the website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (please specify)					



12. What new knowledge about 5G technologies, and/or 5G use cases have you gained as a result of using the UK5G network? (Please tick all that apply)

- 5G technologies/use cases in general
- Specific technologies
- Specific use case(s)
- 5G technologies/use cases being tested in the 5GTT programme
- 5G technologies/use cases being tested in other publicly funded 5G projects
- Increased knowledge of other firms in the UK 5G ecosystem
- Other (please specify):

13. How, if at all, have you acted upon this new knowledge that you acquired?

---

14. In your experience, has UK5G had sufficient numbers of individuals engaged in the following activities? Individuals and organisations that

	Yes	No	Don't know
Determine 5G policy and/or regulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Carry out 5G R&D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supply 5G goods and/or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buy 5G goods and/or services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhance traditional goods and/or services with 5G technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Raise awareness of how 5G can transform businesses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

15. Are there particular groups missing within the Innovation Network, and where would it be useful to have more representation within the new network?

---

16. Has your use of the UK5G network led to any new and/or enhanced collaborations, partnerships or contracts with other individuals and organisations working with 5G technologies and/or use cases?

Yes

No

17. Please provide further information about this

---

18. What have been or will be the results of these new and/or enhanced collaborations, partnerships or contracts?

---

19. To what extent do you agree or disagree with the following statements about the impact(s) of the UK5G Innovation Network?

	Not at all	To a small extent	To a moderate extent	To a large extent	Don't know
Enhanced results of the 5GTT programme	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhanced the results of other 5G research projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved the reputation of the UK as a global leader in 5G.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Raises awareness of how 5G can transform business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved adoption of 5G	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Higher Investment in 5G	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. To what extent do you agree or disagree with the following statements about the impact(s) of the DCMS 5GTT programme and UK5G Innovation Network?

	Not at all	To a small extent	To a moderate extent	To a large extent	Don't know
Increased collaboration between individuals and organisations working with 5G tech/use cases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accelerated the deployment of 5G tech in the UK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accelerated take up of 5G use cases in the UK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Raised the global reputation of the UK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased investment in 5G	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Not at all	To a small extent	To a moderate extent	To a large extent	Don't know
Rollout of 5G technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stimulated further research into 5G use cases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhanced security or resilience in 5G deployments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Had positive environmental impacts (lower energy for data transferred, better logistics monitoring to improve cost of transporting goods)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Had positive welfare benefits for the public (better access to mobile networks, improvements in safety etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has enhanced/has the potential to enhance the provision of public services in terms of lower costs or better outcomes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Considering the work of UK5G and the wider DCMS 5G Testbed and Trials Programme as a whole, do you agree or disagree with the following two statements

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The UK has maintained or improved its perceived ranking as a leading 5G nation in the past year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The 5GTT has helped improve the UK to improve its international reputation as a leading 5G nation in the past year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

22. As you may know, the current UK5G Innovation Network is now coming to an end. What are the top two things that a new Innovation Network needs to do?

1. \_\_\_\_\_
2. \_\_\_\_\_

23. Do you have any additional comments?

24. Do you want to tell us who you are or remain anonymous?

Yes, I'm happy to tell you who I am

No, I wish to remain anonymous

25. Name \_\_\_\_\_

26. Job \_\_\_\_\_

27. Email \_\_\_\_\_

## Participant Survey

Q1. Please provide the following Information (Free text)

- a. Company / firm name
- b. Company house number
- c. Your name
- d. Job title
- e. Email address

Q2. Has the DCMS project resulted in the development of a solution(s) or process that builds on 5G technology?

- a. Yes, we are ready to bring this to market
- b. Yes, we are ready to deploy this internally
- c. Yes, a partner/spinoff is looking to bring this to market
- d. No, we need additional resources to ensure market readiness
- e. No, we need additional resources to deploy this internally
- f. No, the project has shown that the solution initially envisaged is not fit for purpose
- g. Other

Q3. To what extent would investment in solutions or processes that build on 5G technology have been carried out without DCMS funding?

- a. The same/similar activities would have been implemented using alternative funding within the same/similar time frame
- b. The same/similar activities would have been implemented using alternative funding but time to implementation would have been longer

- c. Some activities would have been implemented using alternative funding within the same/similar time frame
- d. Some activities would have been implemented using alternative funding but time to implementation would have been longer
- e. Other
- f. Not sure

Q4. Following your involvement in the 5GTT project, are you looking for further investment to develop 5G products/solutions and/or conduct further testing?

- a. Yes, and we have sourced external funding for this
- b. Yes, and we have sourced some external funding for this and are looking for more external funding/investment
- c. Yes, we have been able to source internal funding
- d. Yes, but we have not yet sourced funding for this
- e. Yes and no/limited additional funding is needed for this
- f. No

Q5. If relevant, what other sources of funding have you secured towards 5G Technologies since receiving 5GTT funding? (Free Text Range)

Source1 / Funder \_\_\_\_\_; Amount of funding1 \_\_\_\_\_.  
 Source2 / Funder \_\_\_\_\_; Amount of funding2 \_\_\_\_\_.  
 Source3 Funder \_\_\_\_\_; Amount of funding3 \_\_\_\_\_.

Q6. If relevant, following your participation in the 5G Testbeds and Trials programme, how much did your company invest in 5G Related R&D Technologies? (Open)

Q7. In view of the benefits of 5G over 4G, do you think that access to 5G provides or can provide added value to your business?

- 5 – High added value
- 4 – Moderately high added value
- 3 – Some added value
- 2 – Little added value
- 1 – No added value
- Not sure

Q8. What benefits of 5G over 4G are potentially important to add value to your business?

	Speed (download speed is 100x faster)	Lower latency (lag between sending and receiving data)	Device capacity (can support more devices)	Higher Security	Network reliability
1 – Very important					
2 – Important					
3 – Somewhat important					
4 – Low importance					
5 – Not important					
Not sure					

Q9. What was your growth in income over the past 3 years? If growth was negative, please specify this. [Open]

Q10. What do you expect your income growth to look like in the next 3 years? If you are expecting negative growth, please specify this. [Open]

Q11. What percentage of your 2025 income would you consider dependent on 5G technologies? [Open]

Q12. What percentage of your investment in capital and intangible assets has gone towards expenditure on 5G related technologies over the past three years? [Open]

1. £-----[Open]
2. We have had no budget for this

Q13. How much equity did your company raise over the past three years? In addition, what percentage of this investment has been earmarked for investment in 5G related R&D? (Please fill in table below)

	Over the last three years...
Amount	

Number of rounds	
Percentage of Investment in 5G related R&D	

Q14. How satisfied were you with your overall experience of the DCMS 5GTT funding application process?

	Not at all Satisfied	A little bit Satisfied	Partially Satisfied	Mostly Satisfied	Completely Satisfied
Forms and documents associated with the funding application process					
The overall length of time it took to complete the application process					
The overall length of time it took to secure funding					
Communication from the DCMS team on application progress					

Q15. Have you signed up to the UK5G Innovation Network? (Radio Buttons)

- a. Yes
- b. No
- c. Unsure

### Non-participant survey

1. Are you happy for RSM to share your survey responses with DCMS for the purpose of future evaluation? \*

- Yes
- Yes, anonymised
- No

2. Did you sign up to the UK5G Innovation Network?

- Yes
- No
- Unsure

3. Did your business consider applying for funding for the DCMS 5GTT project? \*

- No, we did not hear about the DCMS 5GTT Programme
- No, it did not fit our business plan
- No, we were not eligible for funding
- No, the application process was deemed to be too difficult
- Yes, we applied and were successful
- Yes, we applied but the application was unsuccessful
- Yes, and were awarded funding but chose not to use this option
- Other (please specify)

4. To what extent were you able to progress your 5G project/idea despite not receiving funds from DCMS?

- As originally planned – We were able to carry out the project as we received funding from an alternate external source
- Scaled down but had an alternate external funding source – We had to scale down our project, but completed aspects of it as we received funding from an external source
- Scaled down due to investment being limited within the consortium – We had to scale down our project, but completed aspects of it using internal investment from members of the consortium
- Dropped the Project – We had to scrap the project due to lack of funds

5. Has the project resulted in the development of a solution(s) or process that builds on 5G technology?

- Yes, we are ready to bring this to market
- Yes, we are ready to deploy this internally
- Yes, a partner/spinoff is looking to bring this to market
- No, we need additional resources to ensure market readiness
- No, we need additional resources to deploy this internally
- No, the project has shown that the solution initially envisaged is not fit for purpose



Other (please specify):

6. Which of the following (potential) benefits of using 5G over 4G were you aware of before starting this survey?

	Speed (download speed is 100x faster)	Lower latency (lag between sending and receiving data)	Device capacity (can support more devices)	Higher Security	Network reliability
I was previously aware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was not previously aware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not sure/Don't know	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. To what extent are each of the following benefits of 5G over 4G potentially relevant to your business?

	Speed (download speed is 100x faster)	Lower latency (lag between sending and receiving data)	Device capacity (can support more devices)	Higher Security	Network reliability
1 – Very relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 – Relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3 – Somewhat relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 – Not very relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 – Not relevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not sure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Have you changed your thinking on this in the past three years?

8. On a scale of high added value to no added value, do you think that having access to 5G over 4G can provide added value to your business?

- 4 – High added value
- 3 – Moderate added value
- 2 – Some added value
- 1 – No added value
- There would be a negative added value
- Not sure / Don't know

9. In which of the following business areas, if any, have you considered using 5G over 4G?

- Yes, in relation to the development of products, services or solutions
- Yes, in relation to the improvement of internal processes
- Yes, in relation to other business aspects (research and development)
- No, we have not considered 5G
- No, we have not considered 5G and see no need for this
- Unsure

Are you able to give more details?

10. To what extent do you think your current business and the same business in five years' time could use 5G instead of standard business broadband? Please use the scale provided, where '1' means 'Our business will depend on the use of 5G' and '7' means 'Our business will use standard business broadband'.

	1	2	3	4	5	6	7	Unsure
Current business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Future business	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. How much did your company invest in 5G related R&D technologies?

Total investment (£) in 5G related R&D technologies in the past three years \_\_\_\_\_

Approximately what percentage (%) of investment in capital and intangible assets has gone towards expenditure on 5G related technologies in the past three years? \_\_\_\_\_

12. We are looking to capture differences in attitudes to growth between participants of the 5GTT programme and non-participants. Please provide an estimate of your firms' growth

What was your (%) growth in income over the past 3 years? If growth was negative, please specify this. \_\_\_\_\_

What do you expect your (%) growth in income to look like over the next 3 years? If you are expecting negative growth, please specify this. \_\_\_\_\_

What percentage of your 2025 income do you estimate will be dependent on 5G technologies? \_\_\_\_\_

13. We may have one or two follow-up questions. Please provide your contact information if you are happy for us get in touch.

Name: \_\_\_\_\_

Email: \_\_\_\_\_

**Cristian Niculescu-Marcu**  
**Consulting Director**

25 Farringdon Street,  
London,  
EC4A 4AB

T 44 1223 455726  
Cristian.Niculescu-  
Marcu@rsmuk.com

**Matt Rooke**  
**Associate Director**

2nd Floor, North Wing East,  
City House,  
Hills Road,  
Cambridge,  
CB2 1AB

T 44 1223 455721  
M 07436268348  
Matt.Rooke@rsmuk.com

**Kristine Farla**  
**Associate Director**

25 Farringdon Street,  
London,  
EC4A 4AB

T 44 2032 018472  
Kristine.Farla@rsmuk.com

**rsmuk.com**

The UK group of companies and LLPs trading as RSM is a member of the RSM network. RSM is the trading name used by the members of the RSM network. Each member of the RSM network is an independent accounting and consulting firm each of which practises in its own right. The RSM network is not itself a separate legal entity of any description in any jurisdiction. The RSM network is administered by RSM International Limited, a company registered in England and Wales (company number 4040598) whose registered office is at 50 Cannon Street, London EC4N 6JJ. The brand and trademark RSM and other intellectual property rights used by members of the network are owned by RSM International Association, an association governed by article 60 et seq of the Civil Code of Switzerland whose seat is in Zug.

RSM UK Corporate Finance LLP, RSM UK Legal LLP, RSM UK Restructuring Advisory LLP, RSM UK Risk Assurance Services LLP, RSM UK Tax and Advisory Services LLP, RSM UK Audit LLP, RSM UK Consulting LLP and RSM UK Creditor Solutions LLP are limited liability partnerships registered in England and Wales, with registered numbers OC325347, OC402439, OC325349, OC389499, OC325348, OC325350, OC397475 and OC390886 respectively. RSM UK Employer Services Limited, RSM UK Tax and Accounting Limited and RSM UK Management Limited are registered in England and Wales with numbers 6463594, 6677561 and 3077999 respectively. RSM Northern Ireland (UK) Limited is registered in Northern Ireland at Number One Lanyon Quay, Belfast, BT1 3LG with number NI642821. All other limited companies and limited liability partnerships are registered at 6th Floor, 25 Farringdon Street, London, EC4A 4AB. The UK group of companies and LLPs trading as RSM is a member of the RSM network. RSM is the trading name used by the members of the RSM network. Each member of the RSM network is an independent accounting and consulting firm which practises in its own right. The RSM network is not itself a separate legal entity in any jurisdiction. RSM UK Legal LLP is © 2022 RSM UK Group LLP, all rights reserved