

# Identifying the UK CAM Supply Chain

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## Disclaimer

This report was generated to be used strategically by government and industry. The study is based on examination of survey, CAM sector knowledge and information that is publicly available regarding organisations involved in CAM in the UK. Efforts have been made to verify data where reasonable.

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## Acronyms

Abbreviation	Definition
AI	Artificial Intelligence
ASDE	Authorised Self-Driving Entity
CAM	Connected and Automated Mobility
CCAV	Centre for Connected and Autonomous Vehicles
OEM	Original Equipment Manufacturer
RTO	Research Technology Organisation
SME	Small and Medium-sized Enterprise
DCMS	Department for Digital, Culture, Media and Sport
VCA	Vehicle Certification Agency



"The UK is on its way to becoming a world leader in the development and deployment of Connected and Automated Mobility (CAM) technologies, with the potential to generate substantial societal and economic benefits across the UK. Understanding the state of the UK CAM supply chain and having access to a common framework which identifies areas of strength, opportunities and investment is critical to the UK realising this potential.

Zenzic's report explores the current landscape of the UK CAM supply chain, whilst presenting a holistic framework that will allow UK organisations to unlock the potential of connected and automated mobility technologies. The report offers fundamental insights into the key opportunity areas for the UK, that will not only shape the future strategic decisions on CAM, but also place the UK as a competitor on the global stage.

This report is a first step in the collaborative effort that will be required from many sectors within and around the ecosystem in progressing toward the connected and automated mobility services of the future, exploiting the supply chain opportunity, and bringing the UK to full CAM readiness by 2030."

Dr Graham Hoare, Chair, Automotive Council UK

# Executive summary

The UK Connected and Automated Mobility (CAM) sector and supply chain is at a pivotal moment as technologies mature and the sector begins to transition and explore potential deployment opportunities. This research explores the current landscape of the UK CAM supply chain – its strengths, challenges, and areas of opportunities for the UK to be a thriving part in the global CAM supply chain.

This detailed analysis of the UK CAM supply chain has generated strong insights into opportunity areas and topics that warrant further research and exploration, as well as an analytical framework – which splits the supply chain into 12 overarching categories as shown in Figure 1 – providing an asset to sort, analyse and understand the organisations that make up the UK CAM supply chain.

Figure 1 provides an overview of the top-level categorisation and capabilities of the UK CAM supply chain. The largest represented categories are **Engineering Services, Software** and **RTOs/Test Services** and the least represented categories are **Finance, OEM/ASDE** and **Insurance and Legal**.

Table 1 highlights the current UK CAM supply chain strengths that suggests the greatest strengths lie in areas that are not reliant on significant CAPEX. It shows that the strong UK capabilities in CAM lie in **Software** (in

particular, data, AI, safety, and security), **RTOs** (includes academia), **Tools** (simulation is cited as a strength of the UK), **Test Services** (building on CAM Testbed UK in conjunction with engineering services they provide) as well as **Insurance and Legal Services**. At the opposite end of the spectrum, **Hardware** is a very challenging area for the UK - both in terms of vehicle and infrastructure deployment. This speaks to a significant difficulty in being able to scale the manufacturing of CAM **Hardware** - in a global competitive aspect but also with some practical challenges in companies' ability to scale.

Based on the strength of the capability within the UK, UK competitiveness, potential growth and feedback from interviews, Table 2 shows the areas of opportunities for the UK CAM supply chain as well as an indication of the size of the potential for the UK to develop a significant and commercially attractive business activity in that area.

Some opportunities, such as in **Software, RTO** and **Tools**, would seek to maintain and enhance existing UK CAM supply chain strengths whilst others such as **Engineering Services, Communications and Data Infrastructure** and **Operators** have a greater emphasis on driving the UK forward to capitalise on potential growth and impact. For example, the theme of connectivity came

through strongly as an area that has a great deal of potential growth but has yet to be properly exploited. Other areas of note are **Test Services** and **Hardware**. **Test Services** are expected to have a clear and important role in the testing and certification of CAM technologies, so their contribution to the CAM supply chain is critical. It is clear that there is a strong opportunity for their role to increase and become a fundamental building block in the delivery of safe and secure commercial CAM deployments.

However, the research has highlighted that it will be important to ensure that the scope of CAM Testbed UK goes beyond the UK domestic market and that they have opportunities to compete on a global scale.

It should also be noted that many of these **Test Services** also provide **Engineering Services** or act as **RTOs** – which bolsters the opportunity for these organisations.

There are significant, and arguably insurmountable, barriers to the scalability of the **Hardware** organisations. For example higher costs in the UK than compared to China. As such, the opportunity for the UK is to develop niche or nationally critical components as well as the intellectual knowledge (including IP) to create CAM hardware and not in the mass production of hardware components.

Figure 1: UK CAM capabilities by category

Source: Author generated

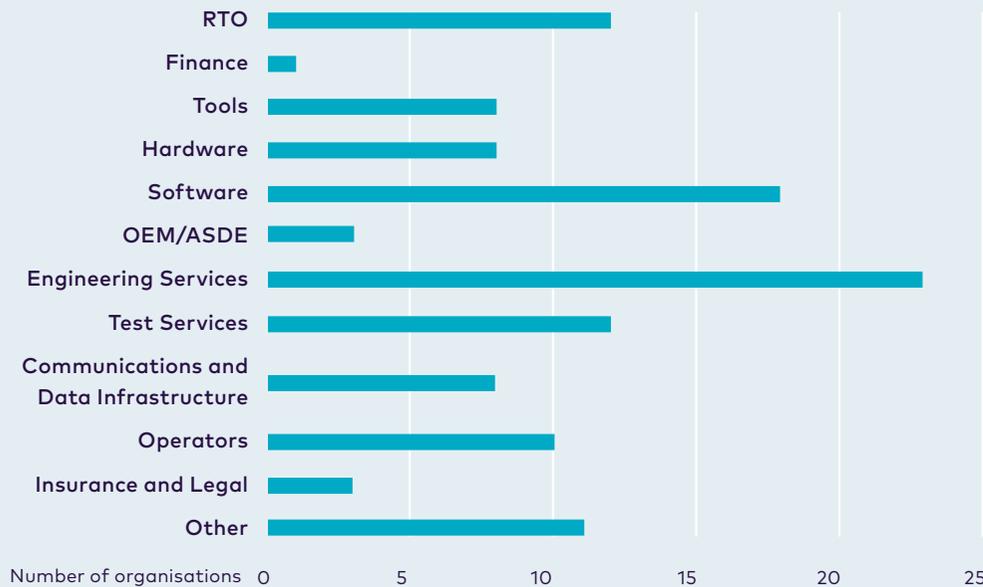


Table 1: Current UK CAM supply chain strengths

Strength	Neutral	Challenge
Software (in particular data, AI, safety and security)	Engineering Services	Hardware Manufacturing (including infrastructure for deployment)
RTO	Communications and Data Infrastructure	
Tools (Simulation, test and analysis)	OEM/ASDE (established & new)	
Test Services	Operators	
Insurance and Legal*	Finance	

Source: Author generated

\*Based on traditional strength rather than CAM specific capabilities

Table 2: Areas of opportunity for the UK CAM supply chain

Category	Potential UK opportunity rating	Comments
Software	+++	In particular data, AI, safety and security
Engineering Services	++/+++	Builds on current strength, focus on areas with (exportable) high value knowledge and "know-how"
Communications and Data Infrastructure	++/+++	Large opportunity for connectivity focused solutions
Tools	++/+++	In particular simulation, test and analysis
Operators	++	In particular operators to drive "the pull"
RTOs	++	
Insurance and Legal	++	Building on traditional UK strengths
(New) OEM/ASDE	++	Potential opportunity in new vehicle segments rather than existing OEMs/segments
Niche Hardware / Understanding of Hardware	+/++	Smaller scale hardware possible, significant challenges to scale. May need to think about critical hardware
Test Services	+	Linked to UK deployment and certification role. Strength is recognised but domestic market is limited compared to global CAM market

Source: Author generated

In addition to the in-depth supply chain insights generated; five core themes emerged from this research.



### **1 Timely, coordinated activities to enable CAM deployment:**

Clarity and transparency over the direction and timeline for future regulatory decisions and actions required is an enabler for deployment. There is an additional challenge in the fragmentation of regulation and policy across different bodies and government departments.

### **2 Collaboration will unlock the UK's CAM development potential:**

Collaboration is needed to join disconnected pockets of expertise, improve visibility and understanding of UK supply chain capabilities, and undertake a "challenge mission" to improve UK competitiveness. Within CAM in the UK, awareness of the skills, knowledge and capabilities of other organisations and players remains a challenge.

### **3 Strong pull from the CAM operation market:**

A strong market pull is needed, in terms of future product requirements, which will draw attention away from short-term demonstrations and trials and onto actual market-oriented development. This pull should also be backed up with early procurement commitments from the market to catalyse the development investments needed now.

### **4 A knowledge-based industry depends on skilled resources:**

There are severe limitations in the availability of skilled resources to undertake the volume of CAM development needed. Few graduates are entering the workforce with the combination of skills needed. Even fewer engineers are available as experienced hires, creating a battle for talent, making recruitment a challenge across the UK-based CAM industry and supply chain. There is also a concern that more in-employment training is required across the CAM supply chain to better understand the capabilities and challenge of the technologies in use. Currently there appears to be some limited understanding leading to inefficiencies.

### **5 Flexible, practical business support for the CAM industry and supply chain:**

Practical support is needed to make working close to deployment locations easier. To date there has been limited small scale business support for CAM organisations.



# What's next?

## Core themes recommendations

**“Pull”** – a strong market pull/product requires targeted use case development, with procurement commitments and nationally coordinated public procurement specifications and should account for appropriate advanced lead times.

**Collaborative strategy** – a long-term CAM strategy to reach deployment with visible and communicated regulations, accounting for sensible lead times and consistently exploited across somewhat fragmented government departments, would be welcomed by the UK CAM industry. The UK CAM roadmap is likely to play a key role in articulating this common vision.

**CAM skills support** - on-the-job training funding, secondment programmes/exchanges funding and academic teaching are some suggestions to explore and enhance the UK CAM supply chain.

**Business support** – there are some practical considerations that need to be examined to enable greater scale within the CAM sector.

The opportunity areas highlighted in Table 2 should be kept in mind as the focus for these recommendations e.g., **Software** – data, AI, safety and security.

There remains a strong need to continue to gather data over time to (a) enhance the accuracy of this analysis (b) track progress over time and (c) to better understand the value and potential growth of the UK CAM supply chain. Zenzic will continue to interact with organisations within the UK CAM supply chain to gather, analyse and distribute insights at a regular cadence. Further activity of work is likely to include:

**1 Data flows** – additional in-depth analysis of flows at a sub-category level should be undertaken to better understand the linkages within the UK CAM supply chain. There are also areas where deep-dives and additional data are required to be able to make more informed strategic decisions.

**2 Value and impact** – further detail and data would be beneficial on:

- a. Value of the sector
- b. Value creation potential
- c. Competitiveness
- d. Potential investment needed

**3 Cross-sector potential** – an area out of scope of this project. Further research is required to understand the skill and CAM potential of other sectors in which the UK is strong e.g., gaming and motorsport.

**4 Further visualisation** – it would be beneficial to have data presented in a more interactive manner to aid analysis as well as exploration and dissemination.

**5 Evaluation** – continued review of the global CAM market is recommended with a view to understand progress as interventions are deployed, as well as develop new recommendations.

This framework has now been adopted by CCAV and the UK Automotive Council to aid in understanding of CAM in the UK for both the government and industry respectively. The framework provides a reusable tool in the analysis and understanding of the UK CAM supply chain as such will continue to be refined with feedback from the UK CAM sector. The intention for this work is to maintain its relevance and impact by regularly updating the underlying data through surveys and research. Zenzic welcomes any organisation who wishes to be included in this analysis to get in touch and complete the survey.

# 1.0 / Overview

## 1.1 Introduction

This study examines current UK CAM supply chain capabilities, its geographic distribution and identifies areas of UK strengths and potential opportunities for the UK. The creation of the analytical framework as part of this analysis allows the outputs to be used to inform future strategic decisions for the development of a UK based CAM supply chain. To aid in the clarity of insights, this project has been tightly bound as such:

### *In scope*

- Initial mapping and assessment of the current "state of play" for the CAM UK supply chain to provide an informed view of current UK capability
- Development of an analytical framework to enable greater clarity on the areas of investment, opportunities and UK strengths. This includes:
  - Exploration of the strengths of UK capability within the global landscape
  - Initial assessment of the needs of the CAM sector; identify the capabilities required to secure high value UK capability and gaps of capabilities/data

### *Out of scope*

- Detailed planning or delivery of follow-on activities and interventions including the creation of an investment case or project scoping etc
- Understanding the lessons from other sectors and which sectors have the skills and knowledge to pivot into CAM
- Establishing the link between supply chain and early deployment activities
- Analysis of the impact of potential interventions, economic or otherwise

## 1.2 Objectives, outputs and outcomes

### **Objectives:**

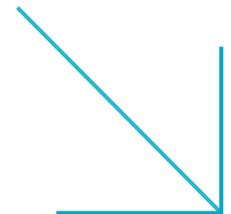
- To understand and map, in detail, the landscape of CAM UK supply chain/ ecosystem
- To develop an analytical framework to provide greater clarity on the areas of investment, opportunities, and UK strengths

### **Outputs:**

1. Report of key findings
2. An analytical framework for government and industry use

### **Outcomes:**

This work will provide a greater understanding of the UK CAM landscape – providing a strong holistic view as well as the ability to explore detailed information. This will provide the key underlying data and method to enable further analysis of the CAM supply chain – leading to an enhancement in the effectiveness of the future interventions. As a result, this enables the development of an insights framework to help understand potential growth, ability to explore and test policy views and future interventions.



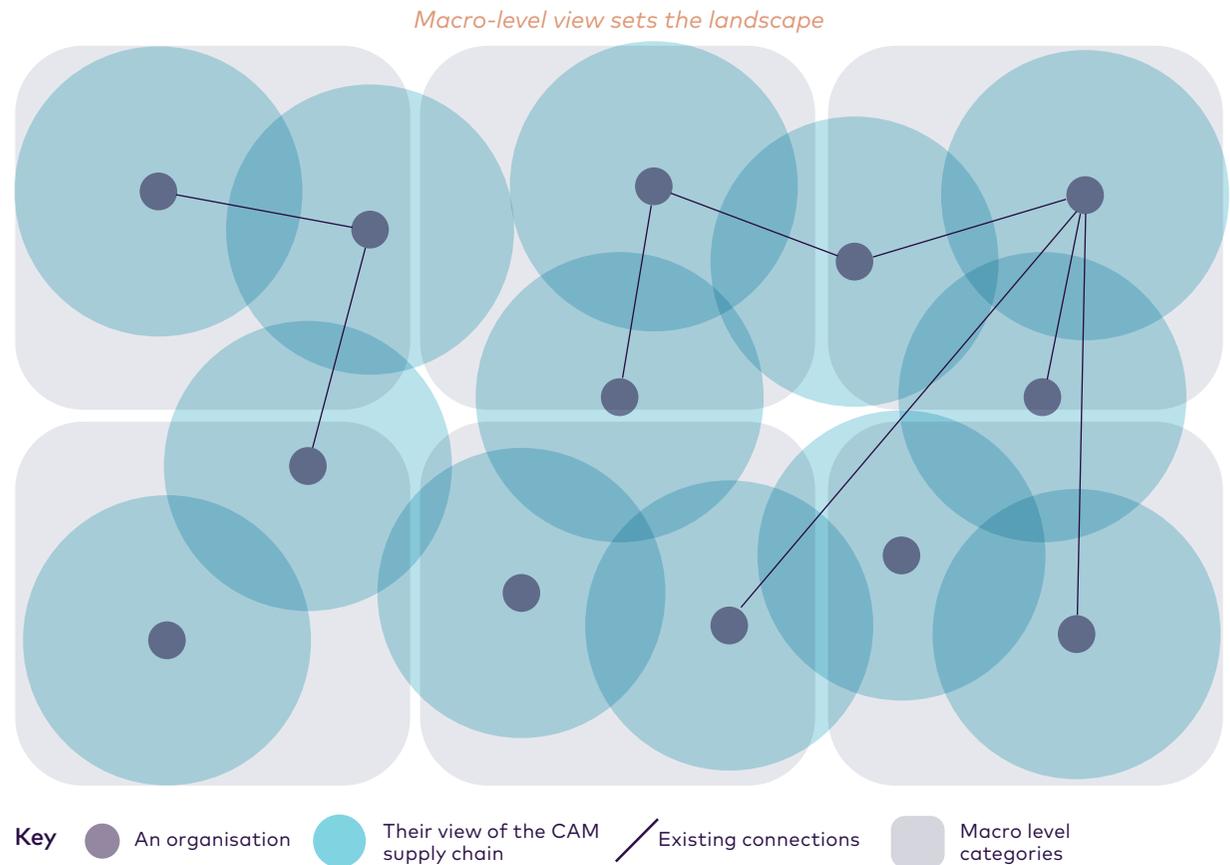


## 2.0 Methodology

This analysis marries a macro-level view of the UK CAM supply chain, which sets out the overarching elements and categories (e.g. **Hardware, Software** etc.), with a micro-level view that generates more detailed data, such as precise roles and linkages as well as indicative growth potential. This approach is illustrated in Figure 2.1.

The data for the macro-level and categorisation was drawn from existing resources such as the UK CAM Roadmap (Zenzic, 2020), WMG’s Value Chain report (WMG, 2019) and Connected Places Catapult (CPC) market forecast report (CPC, 2021) as well as high-level supply chain analysis undertaken by Zenzic in 2021 to support the CCAV’s CSR bid. As a result, Table 2.1 shows the top-level categories that were chosen to best represent the UK CAM supply chain and allow for in-depth analysis – related sub-categories were also generated in the same way. The full list of top-level and their associate sub-categories can be found in Section 3.

Figure 2.1: Approach to uncovering UK CAM supply chain/ecosystem



Source: Author generated

Table 2.1: Top-level CAM supply chain categories

Category
RTO (Research and Technology Organisation)
Finance
Tools
Hardware
Software
OEM/ASDE*
Engineering Services
Test Services
Communications and Data Infrastructure
Operators
Insurance and Legal
Other

Source: Author generated

\*ASDE refers to the Authorised Self-Driving Entity as defined in the Law Commission report (2022)

Collecting the micro-level data required extensive surveying and exploration of the UK CAM supply chain via a bespoke survey of existing contacts and 1:1 interviews with a wide range of stakeholders, which supplemented the macro-level data. As such, an extensive UK CAM supply chain survey was designed, focusing on four areas:

**1 About the organisation –** capture key information regarding UK operational geography, size of organisations, CAM related activities and core underlying CAM skills.

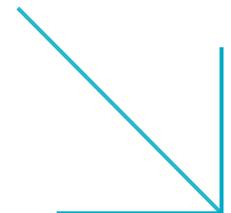
**2 Their role in the UK CAM supply chain i.e. types of customers –** details around who and what type of organisations use their products and/or services.

**3 Their CAM supply chain –** identify requirement i.e. their needs - details around who and what type of organisations supply them with products and/or services.

**4 Interventions –** their views on UK strengths, challenges, and opportunities as well as how to strengthen the UK CAM supply chain.

The online survey ran from 10 Feb to 28 Feb 2022 and the full list of survey questions can be found in Appendix 2.

Bespoke interviews were scheduled with select organisations in their respective sector – this was done to ensure (a) detailed data could be gathered and (b) to allow further exploration into the strengths and challenges of the UK CAM supply chain for each category. Interviews ran from 14 Feb to 11 Mar 2022.



## 3.0 / Categories and framework

### 3.1 Categories

As part of the detailed data gathering, respondents were asked to select a primary top-level category as well as a secondary category, thus capturing a truer representation of UK CAM capabilities. The initial categorisation of the UK CAM supply chain was shared with the project Advisory Group members in February 2022 and their feedback was used to refine this list. This was further refined by feedback from the Automotive Council's CAM Supply Chain group.

Previous literature and research, such as CPC's market forecast report that looked the hardware and software components of Connected and Autonomous Vehicles (CPC, 2021), was used to generate a set of categories and sub-categories that provides a holistic and reflective overview of the CAM sector. Table 3.1 shows the full list of top-level and respective sub-categories. Full descriptions for each category and sub-category are provided in Appendix 1.

**Hardware** represents the physical components that are used within CAM related technologies – the list of sub-categories focused on the most CAM related components.

**Software** is split into five main areas – mapping & path planning, control systems, connectivity/V2X, HMI software and data & cyber security – which represent the critical software elements of CAM technologies.

**Engineering Services** contain traditional automotive vehicle development services as well as more CAM related activities, such as simulation and safety case/auditing.

**Finance** is split between public and private funding streams.

**Research and Technology Organisation** sub-categories align with the definitions developed by the Department for Business Innovation and Skills in 2015 (BIS, 2015).

**Test Services** reflect the different testing environments found within the comprehensive testing facilities of CAM Testbed UK (CAM Testbed UK, 2022).

**Tools** represent the main toolsets utilised for the development and deployment of CAM technologies and services e.g., simulation software or testing tools such as crash test soft targets.

**Operators** and the **OEM/ASDE** categories both represent the main use cases/deployment domains expected for CAM technologies.

**Insurance and Legal** also includes regulator/consumer testing.

**Communications and Data Infrastructure** not only includes communication infrastructure categories, but also includes data/web services that support the processing and storage of the vast amount of data generated by CAM technologies.

Finally, **Other** category relates to consultancies as well as EV charging infrastructure.



Table 3.1: Top-level CAM supply chain categories and sub-categories

Category	Sub-categories
Hardware	Cameras / RADAR / LIDAR / Onboard Mapping Hardware / Odometry sensors / Ultrasonic sensors / Sensor supporting hardware / Embedded controls hardware / Passive control systems and computing components / ECU hardware / Other electronic & architecture / V2X equipment / Cyber secure modem / Safety related HMI hardware / Localisation hardware / Drive by wire / GNSS and IMU / Powertrain/propulsion hardware / Actuators
Software	<b>Mapping &amp; path planning:</b> Computer programming / Computer consultancy / Data processing and hosting / Other IT technology <b>Control systems:</b> Computer programming / Computer consultancy / Data processing and hosting / Other IT technology <b>Connectivity/V2X:</b> Computer programming / Computer consultancy / Data processing and hosting / Other IT technology <b>HMI software:</b> Computer programming / Computer consultancy / Data processing and hosting / Other IT technology <b>Data &amp; cyber security:</b> Computer programming / Computer consultancy / Data processing and hosting / Other IT technology
Engineering Services	Vehicle development / Simulation / Security / Infrastructure / Safety cases/auditing / Other services
Finance	Private funding e.g. Venture Capital / Public funding body
RTO	Academic Institution / Research organisation / Public Sector Research Establishments (PSREs) / Public Research Organisations (PROs) / Other RTO e.g. Catapults
Test Services	Controlled environment / Semi-controlled environment / Public environment / Other
Tools	Simulation / Testing / Mapping services / Other
Operators	Passenger Transit / Freight & Logistics / Last mile delivery / Highway Authority / Personal mobility
Insurance and Legal	Insurance / Legal / Regulatory/Consumer testing
Communications and Data Infrastructure	Data/web services / Communication infrastructure / Mapping /geospatial / Low latency communication infrastructure
OEM/ASDE	Passenger Transit / Long-haul freight (>10km) / Short-range deliveries (<10km) e.g last mile / Personal mobility
Other	Consultancy / EV charging/infrastructure / Other

Source: Author generated

### 3.2 Analytical framework

As part of this project, an analytical framework was developed to facilitate the generation of insights for strategic decision making. The first step was to create a comprehensive list of categories and sub-categories to be able to understand the capabilities, skills, and strengths of the UK CAM supply chain, as shown in Table 3.1. It should be noted that the list of categories excluded government and/or regulatory bodies as a category.

Figure 3.1 illustrates a hypothesis for how these categories fit together moving through development to deployment within the UK CAM Supply chain, with the thickness of each category indicating the intensity of

activities at that point in the supply chain. It outlines a working theory about how the categories within the supply chain interact across the development and deployment of CAM technologies. Figure 3.1 illustrates the hypothesis that there is greater input/intensity of the technology development categories (**Hardware, Software, Engineering Services, Test Services** and **Tools**) earlier on, with the relative input falling in the deployment phase but with **Operators, Insurance and Legal** and **Communications and Data Infrastructure** becoming more prominent. Through interaction with key stakeholders this hypothesis was tested by the delivery team, which shows more complex interlinkages and supply chain – this is illustrated in Figure 3.2.

Figure 3.2 shows a more detailed view of the interlinkages within a CAM deployment supply chain at a top level and sub-category perspective. Rather than a more linear view as shown previously in Figure 3.1, there is greater interdependence and complexity. Unlike traditional automotive supply chains, the top of a CAM deployment chain is the Operator (as opposed to an OEM) which in turn is fed by the **Communications and Data Infrastructure, OEM/ASDE** and **Finance** categories. Interestingly, the **OEM/ASDE** tends to be supplied by a Tier 1/ADS platform (that combines **Software, Engineering Services** and **Hardware** into a compelling offering), as well as flows from **Tools, Test Services, Insurance and Legal** and **Engineering Services**.

Figure 3.1: Hypothesis on how categories are present in the UK CAM supply chain to support development and deployment

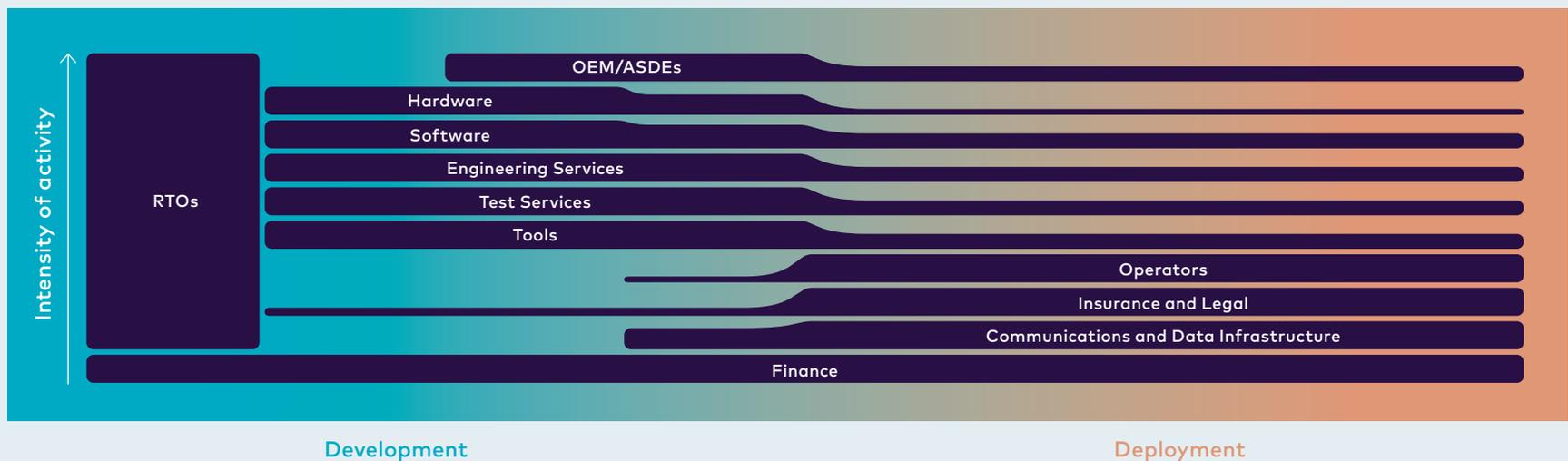
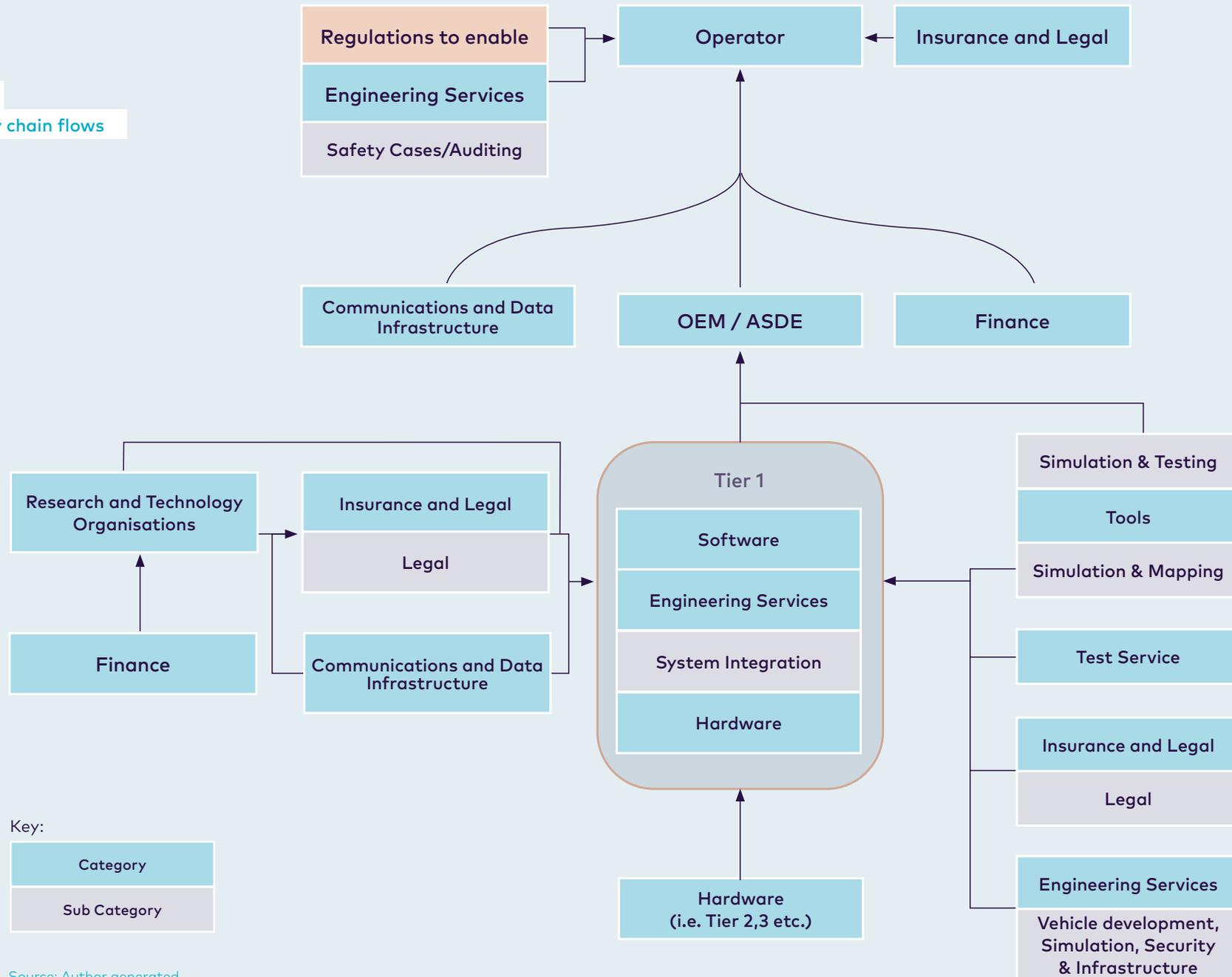
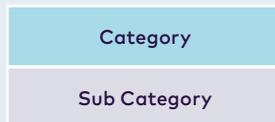


Figure 3.2:  
CAM supply chain flows



Key:



Source: Author generated

### 3.3 Data

The analytical framework is designed to allow the generation of insights to support strategic decision making and to allow for continued and repeated analysis in the future. As such the main data variables gathered and explored through this analysis were:

- Geographic distribution of UK CAM activity
- Top-level (primary & secondary) category and sub-categories
- Size of organisation, as well as CAM related activities (personnel and turnover)
- Core CAM skills that underpin the organisation (based on the CAM skills list created by the Automotive Council)
- Categories of organisations they supply products and/or services to
- Proportion of those they supply that are UK based (%)
- Categories of organisations that they are supplied by
- Proportion of supplier organisations that are UK based (%)
- View on UK competitiveness
- Estimates in growth percentages for CAM related activities in the UK (personnel and turnover)



12

top-level  
categories

79

sub-categories

## 4.0 / High-level findings

### 4.1 Core themes

In addition to the in-depth supply chain insights generated by the data gathering and analysis; five core themes emerged from the interviews:

#### 1 Timely, coordinated activities to enable CAM deployment:

Clarity and transparency over the direction and timeline for the future regulatory decisions and actions required is an enabler of deployment. The definition of future regulations carries long lead times, while the CAM industry and supply chains require even longer to prepare for future regulations. Through the interviews, clarity and transparency on regulation decision making was endorsed.

In addition, there is the challenge of fragmentation across different bodies and government departments that are related to the development of CAM technologies and services e.g. across DCMS, CCAV, VCA etc. Further collaboration and coordination would be welcomed.

#### 2 Collaboration will unlock the UK's CAM development potential

The UK has pockets of skills and knowledge in CAM-related technologies, some of which are world leading. At present, these pockets do not make up a contiguous or complete supply chain. CAM developers cannot wholly source from a UK-only supply chain, however the majority of UK CAM technology products are supplied to overseas markets. Collaboration is needed to join these pockets, improve visibility and understanding of UK supply chain capabilities, and undertake a "challenge mission" to improve UK competitiveness.

There remains a challenge when it comes to the awareness of the skills, knowledge and capabilities of other organisations and players which can act as a barrier to collaboration e.g. when it comes to responding to CAM related government competitions. There is a strong appetite from the CAM supply chain for events to pull knowledge – collaboration is seen to be key.



### 3 Strong pull from the CAM operation market

Given the long lead times for the CAM industry to develop technology solutions and products, and the limited visibility of future market needs, current developments are very unlikely to meet future requirements. A strong market pull is needed, in terms of future product requirements, which will draw attention away from short-term demonstrations and trials and onto actual market-oriented development. This pull should also be backed up with early procurement commitments from the market to catalyse the development investments needed now.

### 4 A knowledge-based industry depends on skilled resources

CAM technology demands further technical development to fulfil the huge promise that it offers. There are severe limitations in the availability of skilled resources to undertake the volume of CAM development needed. Few graduates are entering the workforce with the combination of skills needed. Even fewer engineers are available as experienced hires, creating a battle for talent, making recruitment a challenge across the UK-based CAM industry and supply chain. There is also a concern that in-employment training is required across the CAM supply chain to better understand the capabilities and challenges of the technologies in use, currently there appears to be some limited understanding leading to inefficiencies – CAM related training courses would mitigate this issue.

In addition, the high proportion of start-ups and SMEs, with very limited staff resources, prevents the CAM industry and supply chain from offering a sufficient volume of on-the-job training opportunities.

### 5 Flexible, practical business support for the CAM industry and supply chain (near-term business support)

The practical aspects of CAM deployment places a greater market support demand on OEM/ASDEs supplier than that which exist to support traditional human driven vehicles. These involve a local onsite and infield presence, which often involves setting up infrastructure, workshops, staff relocation, etc. The high proportion of start-ups or SMEs, with a preference for lean organisations and low fixed costs, find it difficult to support deployment involving long-term commitments to fixed costs in addition to the challenges outlined in core theme (1). Practical support would likely help make working close to deployment locations easier.

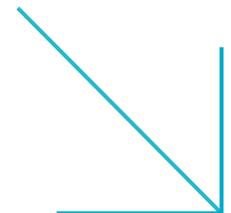


Table 4.1: CAM organisation by primary category and source

Category	Additional	Interviews	Survey Responses	Total
RTO (Research and Technology Organisation)	13	3	7	23
Finance	8	1	0	9
Tools	5	4	4	13
Hardware	18	2	2	22
Software	30	1	15	46
OEM/ASDE	23	2	2	27
Engineering Services	26	2	10	38
Test Services	2	3	5	10
Communications and Data Infrastructure	12	0	7	19
Operators	13	2	5	20
Insurance and Legal	12	1	1	14
Other	0	0	9	9
<b>Grand Total</b>	<b>162</b>	<b>21</b>	<b>67</b>	<b>250</b>

Source: Author generated <sup>1</sup>The additional organisations identified were categorised by the project delivery team at a primary category level. No additional data was recorded beyond this categorisation

## 4.2 UK CAM supply chain overview

The source of data explored within the project came from one of three sources (1) responses to the survey (2) a 1:1 interview or (3) additional organisations based on resources such as the UK CAM Roadmap to 2030 (Zenzic, 2020)

Organisations self-categorise and reflect where they see themselves within the UK CAM supply chain (with some data cleaning reallocating a handful of organisations)<sup>1</sup>. Table 4.1 breaks down the 250 organisations identified within the UK CAM supply chain by top-level (primary) category. The categories with the largest representation are **Software** (46), **Engineering Services** (38) and **OEM/ASDE** (27) whereas **Finance** (9), **Test Services** (10) and **Tools** (13) had fewest organisations.

Some caution should be used when drawing conclusions from this full list of organisations as the level of involvement, maturity and size of the organisation within CAM is not known. As such, Figure 4.1 provides a stronger representation of the UK CAM capabilities, showing the breakdown of organisation when primary and secondary top-

level categories are combined within the detailed data; now the largest represented categories are **Engineering Services** (23), **Software** (18) and **RTOs and Test Services** (12 each). With least representation from **Finance** (1), **OEM/ASDE** and **Insurance and Legal** (3 each). It is interesting to note that **Engineering Services** has the greatest proportion of organisation in terms of secondary category (53%) followed by **Hardware** (50%) and **Test Services** (42%), suggesting that these capabilities cut across other categories within the UK CAM supply chain. Figure 4.2 breakdown the secondary category representation by primary category – in other words, where organisations have said they have a certain secondary category (e.g. **Software**), Figure 4.2 shows what the corresponding primary categories are – unsurprisingly – **Engineering Services** feature prominently as primary category particularly for **Tools, Software** and **Test Services**.



Figure 4.1: CAM capabilities within the detailed data (primary and secondary) by category

Source: Author generated

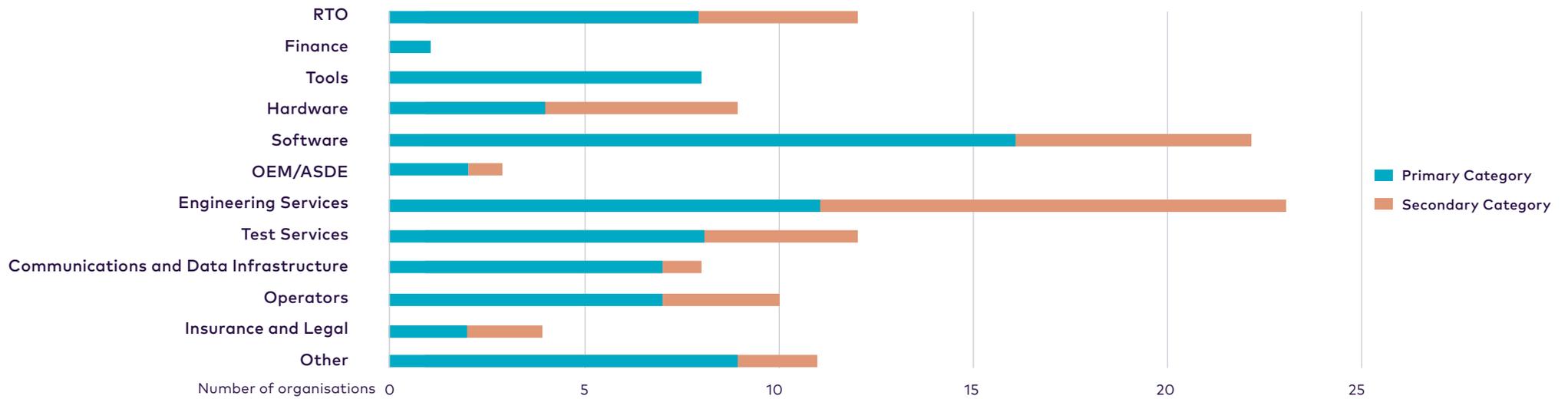
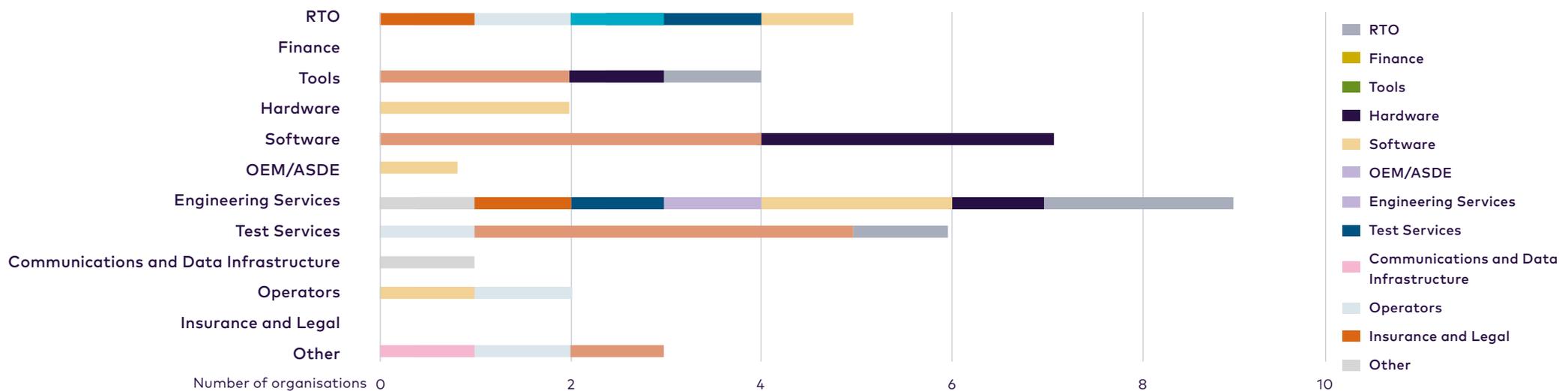


Figure 4.2: UK Supply chain secondary category capabilities broken down by primary category

Source: Author generated



Figures 4.3 and 4.4 shows the geographic distribution of identified organisations within the CAM supply chain. Both figures show a concentration of activity in the South East, West Midlands, London and to a lesser extent, the South West. Figure 4.3 represents the main location of organisation’s UK activity, whereas Figure 4.4 represent the distribution of all CAM organisation capabilities across the UK – for example, an organisation may have its primary base of operations in London (this would be shown in Figure 4.3) but may operate in additional regions such as the South East or South West England (this would be shown in Figure 4.4).

**Figure 4.3:**

**Map of main UK locations by primary category**

**High-level Category**

- RTO (Research and Technology Organisation)
- Finance
- Tools
- Hardware
- Software
- OEM/ASDE
- Engineering Services
- Test Services
- Communications and Data Infrastructure
- Operators
- Insurance or Legal
- Other

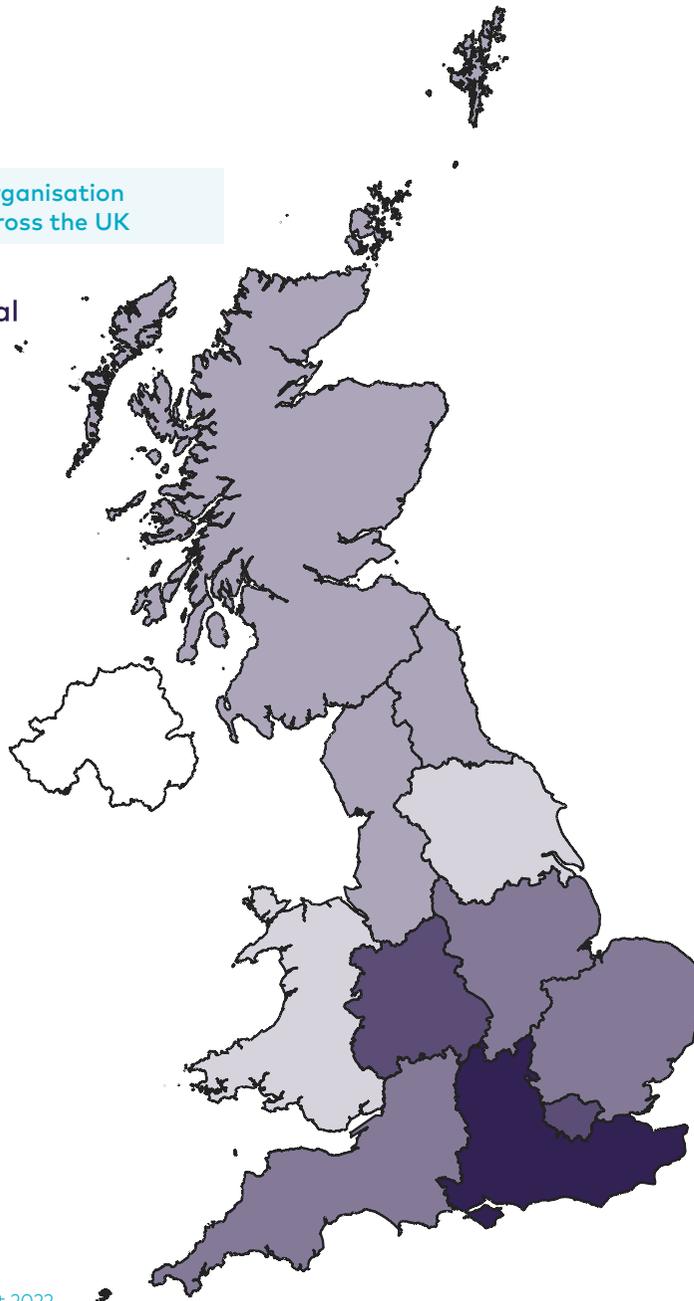
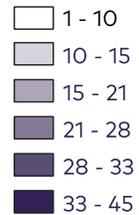


Source: Author generated.  
Contains OS data© crown copyright 2022

Figure 4.4:

Distribution of UK CAM organisation by regional capabilities across the UK

UK CAM organisational capability by region

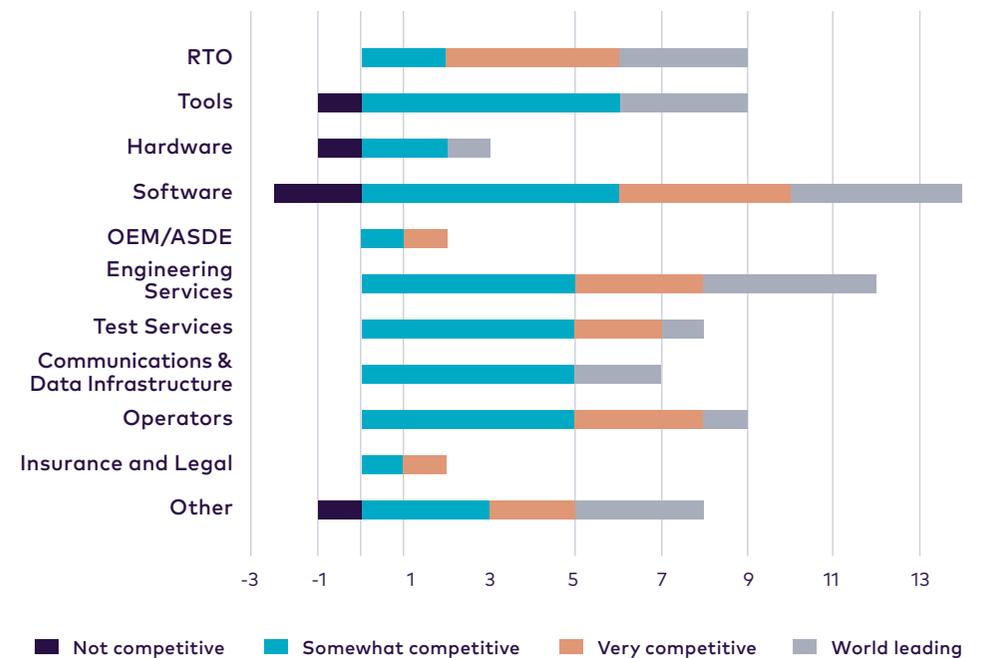


Source: Author generated.  
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Organisations' views on the competitiveness of the UK is shown in Figure 4.5. It indicates that the UK CAM supply chain is strong in **Software, Engineering Services, RTOs and Tools**. Interestingly, **Tools, Hardware, Software and Other** are the only categories for which any respondents indicated that the

UK was not competitive - as **Tools** and **Software** also appear to be areas in which others consider the UK as strong – the reasoning behind this difference of opinion warrants further study.

Figure 4.5: View on UK competitiveness by primary category



Source: Author generated

### 4.3 UK strengths and challenges

This research indicates that the UK CAM supply chain strengths lie in areas that are not reliant on significant CAPEX.

Table 4.2 shows the UK CAM strengths as identified by the project. This is based on in-depth interviews, views on UK competitiveness and growth potential for the UK CAM supply chain. It shows that strong UK capabilities in CAM lie in **Software** (in particular data, AI, safety and security), **RTOs**, **Tools** (simulation capabilities are cited as a strength of the UK), **Test Services** (building on CAM Testbed UK in conjunction with engineering services they provide) as well as **Insurance and Legal Services**<sup>2</sup>. At the opposite end of the spectrum, participants viewed **Hardware** as the UK's least strong area of CAM both in terms of vehicle and deployment infrastructure. This speaks to a significant challenge in being able to scale in the manufacturing of CAM **Hardware** both in a global competitive aspect but also with some practical challenge in companies

being able to scale. Other categories of note are **Finance**, **Engineering Services** and **Communications and Data Infrastructure**. Despite limited data on **Finance** there were private organisations that were identified as having an active interest investing into CAM technologies and services and the UK has a relatively strong public financing system via government (local and national) competitions (and Innovate UK programmes). There is embedded strength within **Engineering Services** and **Communications and Data Infrastructure**, for example in traditional vehicle development or with communication infrastructure respectively, however interviewees and survey responses indicate that this potential for CAM has yet to be fully leveraged in the UK.

Table 4.2: Current UK CAM supply chain strengths

Strength	Additional	Challenges
Software (in particular Data, AI, Safety and Security)	Engineering Services	Hardware Manufacturing (including Deployment Infrastructure)
RTO (Research and Technology Organisation)	Communications and Data Infrastructure	
Tools (Simulation, Test and Analysis)	OEM/ASDE (established & new)	
Test Services*	Operators	
Insurance and Legal†	Finance	

Source: Author generated

\*Backed by strong research/engineering skills

†Based on traditional strength rather than CAM specific capabilities

<sup>2</sup> This is mainly based on traditional UK strengths rather than CAM specific insurance and/or legal activities



#### 4.4 Areas of opportunity for the UK

Based on the core themes, interviews and survey data, Table 4.3 shows the areas of opportunities for the UK CAM supply chain as well as an indication of the potential size for the UK to develop a significant and commercially attractive business activity in that area.

It should be noted that this does not necessarily mean that these areas require government intervention. The size of the potential has not been quantified (although some estimates are provided in Section 4.5) as this is out of scope for this project. A category has been deemed to be an opportunity area through a combination of:

- 1 **The strength of the capability within the UK** (i.e. UK presence, number of organisations etc)
- 2 **UK competitiveness**
- 3 **Potential growth** (personnel and turnover)
- 4 **Feedback from the interviews**

Table 4.3: Areas of opportunity for the UK CAM supply chain

Strength	Additional	Comments
Software	+++	In particular data, AI, safety and security
Engineering Services	++/+++	Builds on strength, focus on areas with (exportable) high value knowledge and "know-how"
Communications and Data Infrastructure	++/+++	Large opportunity for connectivity focused solutions
Tools	++/+++	In particular simulation, test and analysis
Operators	++	In particular Operators to drive "the pull"
RTOs	++	
Insurance and Legal	++	Building on traditional UK strengths
(New) OEM/ASDE	++	Potential opportunity in new vehicle segments rather than existing OEMs/ segments
Niche Hardware / Understanding of Hardware	+/++	Smaller scale hardware possible, significant challenges to scale. May need to think about critical hardware
Test Services	+	Linked to UK deployment and V&V role. Strength is recognised by domestic market is limited vs global CAM market

Source: Author generated



## Software

This is seen as a strong area of opportunity for the UK CAM supply chain; in particular data, AI, safety and security building on the current strengths that exist. The data indicates that there is strong expertise and growth potential for UK based organisations.

## Engineering services

The UK CAM supply chain has a strong presence of **Engineering Services** and this speaks to a generation of strong (often digital) knowledge and "know-how" for CAM development. There appears to be strong growth potential for the UK in this category.

## Communications and data infrastructure

Connectivity was a strong theme that ran through the interviews as well as survey data with the sentiment being that the UK CAM market has yet to tap into the benefits of connectivity proper. There is a suggestion that several "quick wins" could come in the form of capitalising on relatively strong connectivity capabilities.

## Tools

The importance of simulation for the development, testing, analysis and ultimately certification of CAM technologies was articulated strongly during the interviews. The UK has an opportunity to build on its simulation and testing strength.

## Operators

Seen as a critical part to enable the "pull", operators are an important element of the UK CAM supply chain as the UK desires to move away from demonstrations and trials to more early deployment initiatives. It is clear that the Highway Authorities, one aspect of operators, would benefit for additional support to foster solutions that use CAM innovations.

## RTOs

Building on a recognised strength of the UK CAM supply chain, **RTOs** are seen as an important part of research and development of CAM technologies.

## Insurance and Legal

Whilst data in this survey from Insurance/Legal organisations was limited, this category was one that often featured in conversations around opportunity areas. There is an expectation that the inherent strength of these sectors in the UK will transfer to over to CAM. However, further work is needed to better understand how this will/could happen in the future.

## (New) OEM/ASDE

Whilst the UK is limited on traditional automotive OEM, there is an opportunity for the UK CAM supply chain to establish new **OEM/ASDE(s)** in innovative/disruptive use cases. There is strong growth potential in this category although challenges remain to be able to unlock this potential.



## Test Services

**Test Services** are expected to have a clear and important role in the testing and certification of CAM technologies, so their contribution to the CAM supply chain is critical. It is clear that there is a strong opportunity for their role to increase and become a fundamental building block in the delivery of safe and secure commercial CAM deployments.

However, the research has highlighted that it will be important to ensure that the scope of CAM Testbed UK goes beyond the UK domestic market and that they have opportunities to compete on a global scale.

It should also be noted that many of these **Test Services** also provide **Engineering Services** or act as **RTOs** – which bolsters the opportunity for these organisations.

## Niche hardware/understanding of hardware

There appears to be an opportunity for the UK in **Hardware** with strong potential growth estimates and a relatively strong number of organisations in the UK CAM supply chain. However, there are significant, and arguably insurmountable barriers to the scalability of the **Hardware** organisations e.g. higher costs in the UK than other regions, such as China. As such, the opportunity for the UK is to develop niche or critical components and not in the large scale production of hardware components. A further opportunity arises in the potential to better understand the capabilities and shortcoming of hardware helping to overcome a skills and knowledge concerns.

## 4.5 Category-level data summary

Figures 4.6 and 4.7 show the proportion of UK based suppliers (supplied by) for each category as well as the proportion of customers/ consumers of that category that are UK based (supply to). They show clear trends across all categories in terms of which serve a domestic market e.g. **Operators, OEM/ASDE, RTOs** and **Test Services**.

In addition, the data also indicates that categories such as **Software, Tools** and **Communications and Data Infrastructure** show more export potential. These figures also highlight the differences in which categories are more dependent on supplied from outside the UK e.g., **Hardware, Tools** and **OEM/ASDE**.

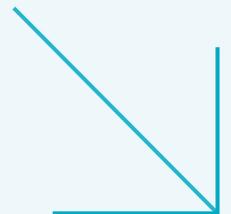
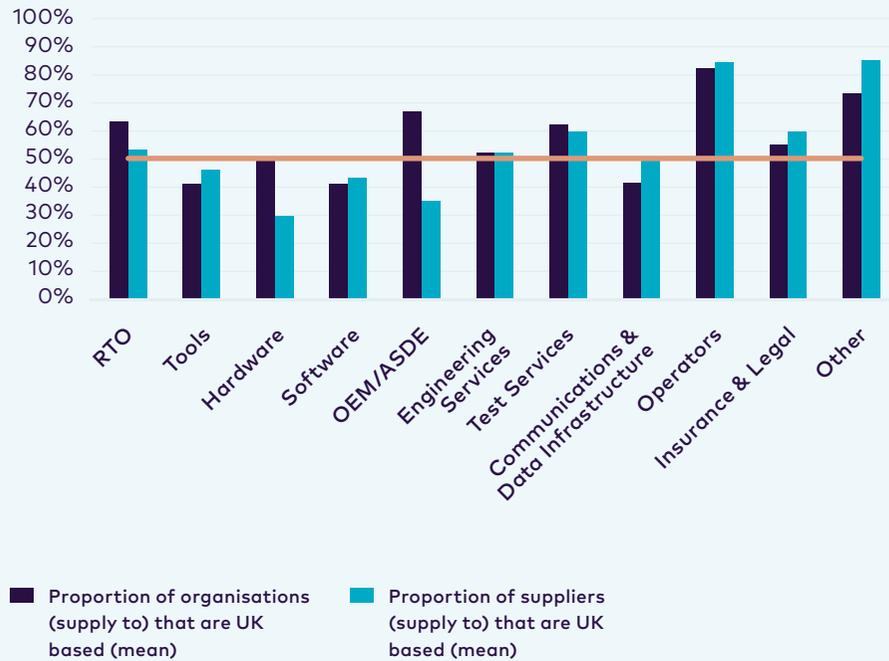


Figure 4.6:

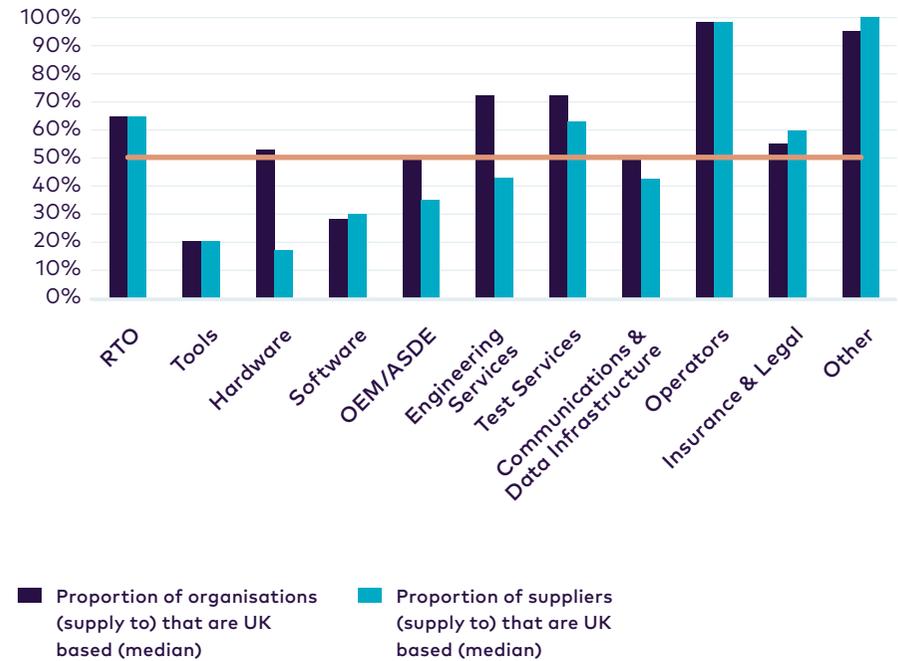
Proportion of UK based suppliers (supplied by) and consumers (supply to) by category (mean)



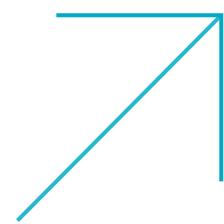
Source: Author generated

Figure 4.7:

Proportion of UK based suppliers (supplied by) and consumers (supply to) by category (median)



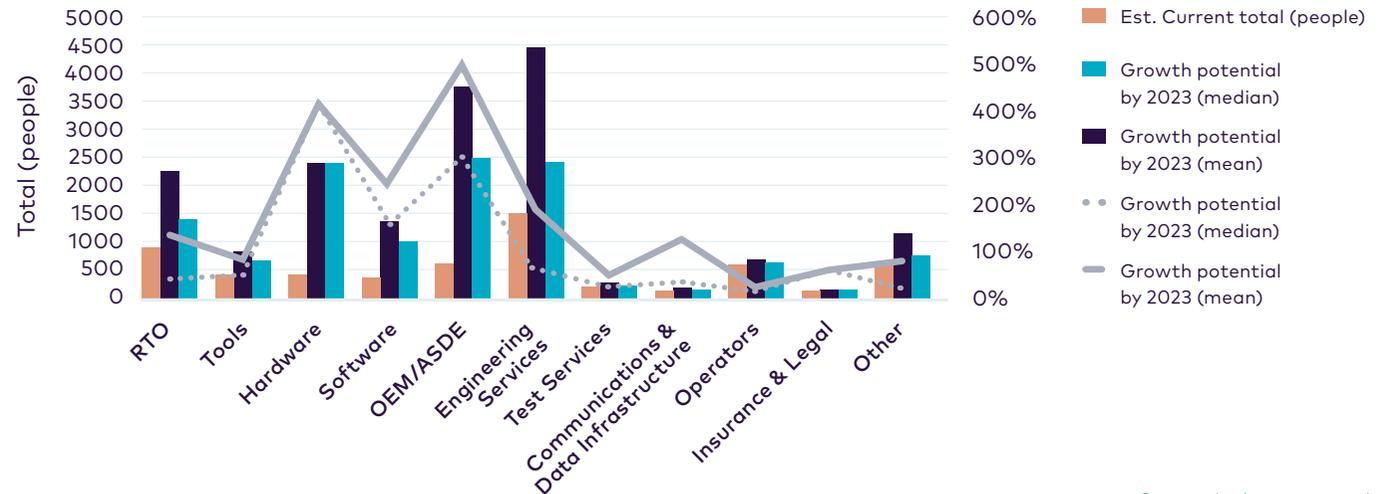
Source: Author generated



Figures 4.8 and 4.9 estimates the total number of people that will be involved in CAM related activities by 2030 and total turnover for the same timeframe by category. The data suggests:

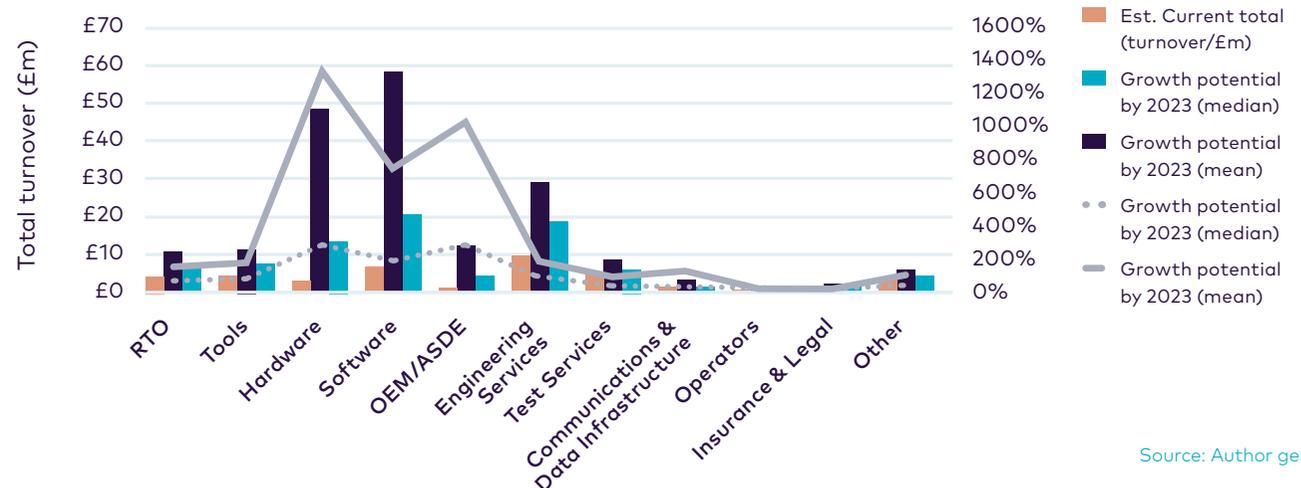
- 1 The expectation is that there is unlikely to be much growth in personnel from **Test Services, Communications and Data Infrastructure, Operators** and **Tools** categories (Figure 4.8)
- 2 Larger growth in personnel is expected in **OEM/ASDE, Engineering Services, RTO, Hardware, and Software** (Figure 4.8)
- 3 Turnover tells a slightly different story with large growth in turnover expected for **Software, Hardware** and **Engineering Services** whilst the other categories are more subdued (Figure 4.9)

**Figure 4.8:**  
Estimates of total people involved in CAM related activities by category and growth potential by 2030



Source: Author generated

**Figure 4.9:**  
Estimates of total turnover involved in CAM related activities by category and growth potential by 2030



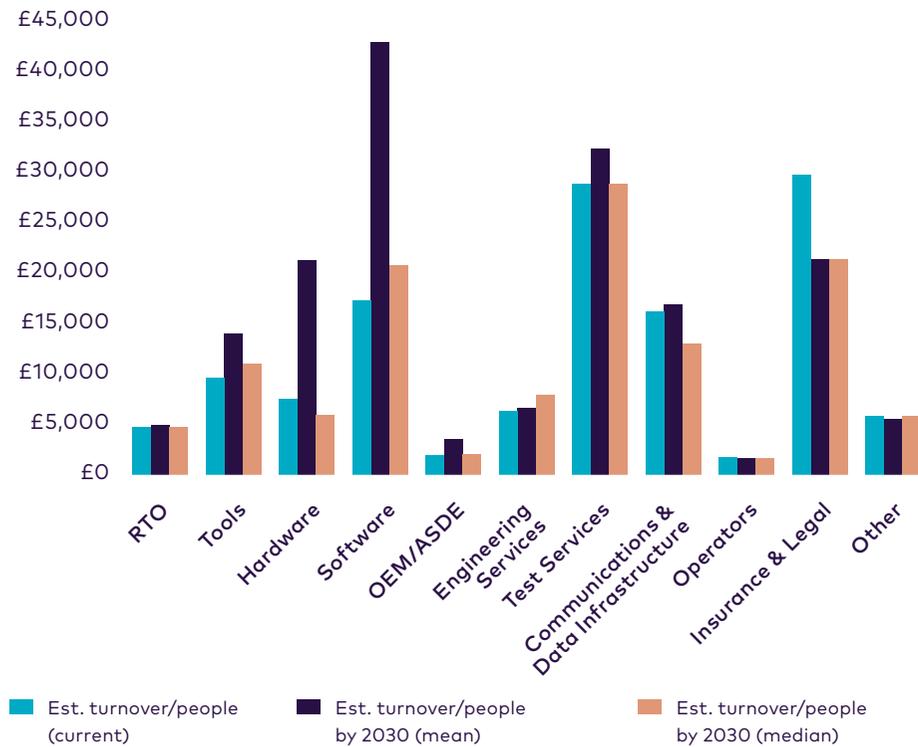
Source: Author generated

However, Figure 4.10 estimates the relative value per head count for each category – a proxy for high vs low value job growth. Figure 4.10 suggests that the most “valuable jobs” are likely to be in **Software, Test Services** and **Insurance and Legal** respectively,

with **Communications and Data Infrastructure, Hardware and Tools** in the next bracket. These figures require further research but gives an indication as to where high value may be generated within the UK CAM supply chain.

Figure 4.10:

Estimates for the average turnover/personnel by category – current and by 2030





250

organisations  
identified in the

UK CAM supply chain

Strongest UK opportunities in **Software,**  
**Engineering Services, Communications**  
and data infrastructure and **Tools**

## 5.0 / Conclusions and next steps

### 5.1 Conclusions

This analysis provides a common framework by which to understand the UK CAM supply chain as well as explore the interlinkages between the categories identified. This report helps showcase the geographic distribution of CAM capabilities across the UK, identify strengths (see Table 5.1) and examined the potential outlook in terms of growth to help determine areas of opportunity for the UK within the global UK supply chain.

Table 5.1: Current UK CAM supply chain strengths

Strength	Additional	Challenges
Software (in particular data, AI, safety and security)	Engineering services	Hardware manufacturing (including deployment infrastructure)
RTO (Research and Technology Organisation)	Communications and Data Infrastructure	
Tools (simulation, test and analysis)	OEM/ASDE (established & new)	
Test Services*	Operators	
Insurance and Legal†	Finance	

Source: Author generated

\*Backed by strong research/engineering skills

†Based on traditional strength rather than CAM specific capabilities

The UK's strongest strengths and opportunities appear to be in areas of the CAM supply chain that are less reliant on significant CAPEX – as show in Table 5.2. Therefore, this report recommends that these areas should be the priority focus of future interventions – as well as provide a steer within the industry as to where there are strong opportunities for the UK.

Table 5.2: Opportunity areas for the UK CAM supply chain

Category	Potential UK opportunity
Software	+++
Engineering Services	++/+++
Communications and Data Infrastructure	++/+++
Tools	++/+++
Operators	++
RTOs	++
Insurance and Legal	++
(New) OEM/ASDE	++
Niche Hardware/Understanding of Hardware	+/++
Test Services	+

Source: Author generated



## 5.2 What next

There are a number of recommendations and next steps that could be undertaken to validate some further insights generated from this project, generate more insights and build on the CAM Supply chain framework to inform strategic decisions.

### 5.2.1 The core themes recommendations

**"Pull"** – a strong market pull/product requires targeted use case development, with procurement commitments and nationally coordinated public procurement specifications and should account for appropriate advanced lead times.

**Collaborative strategy** – a long-term CAM strategy to reach deployment with visible and communicated regulations, etc, accounting for sensible lead times, and consistently exploited across somewhat fragmented government departments would be welcomed by the UK CAM industry. The UK CAM roadmap is likely to play a key role in articulating this common vision.

**CAM skills support** - on-the-job training funding, secondment programmes/exchanges funding and academic teaching are some suggestions to explore and enhance the UK CAM supply chain.

**Business support** – there are some practical considerations that need to be examined to enable greater scale within the CAM sector.

### 5.2.2 Data to enable insights

There remains a strong need to continue to gather data over time to (a) enhance the accuracy of this analysis (b) track progress over time and (c) to better understand the value and potential growth of the UK CAM supply chain. Zenzic will continue to interact with organisations within the UK CAM supply chain to gather analysis and distribute insights at a regular cadence. Further activity of work is likely to include:

**Data flows** – additional in-depth analysis of flows at a sub-category level should be undertaken to better understand the linkages within the UK CAM supply chain. There are also areas where deep-dives and additional data are required to be able to make more informed strategic decisions.

**Value and impact** - further detail and data would be beneficial on:

- a. Value of the sector
- b. Value creation potential
- c. Competitiveness
- d. Potential investment needed

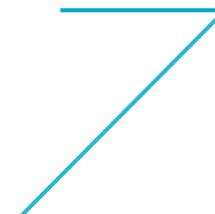
**Cross-sector potential** – an area out of scope of this project, further research is required to understand the skill and CAM potential of other sectors in which the UK is strong e.g., gaming and motorsport.

**Further visualisation** – it would be beneficial to have data presented in a more interactive manner to aid analysis as well as exploration and dissemination.

**Evaluation** - continued review of the global CAM market is recommended with a view to understand progress as interventions are deployed as well as develop new recommendations.

This framework has now been adopted by CCAV and the UK Automotive Council to aid in understanding of CAM in the UK for both the government and industry respectively. The framework provides a reusable tool in the analysis and understanding of the UK CAM supply chain as such will continue to be refined by feedback from the UK CAM sector.

The intention for this work is to maintain its relevance and impact by regularly updating the underlying data through surveys and research. Zenzic welcomes any organisation who wishes to be included in this analysis to get in touch and complete the survey.





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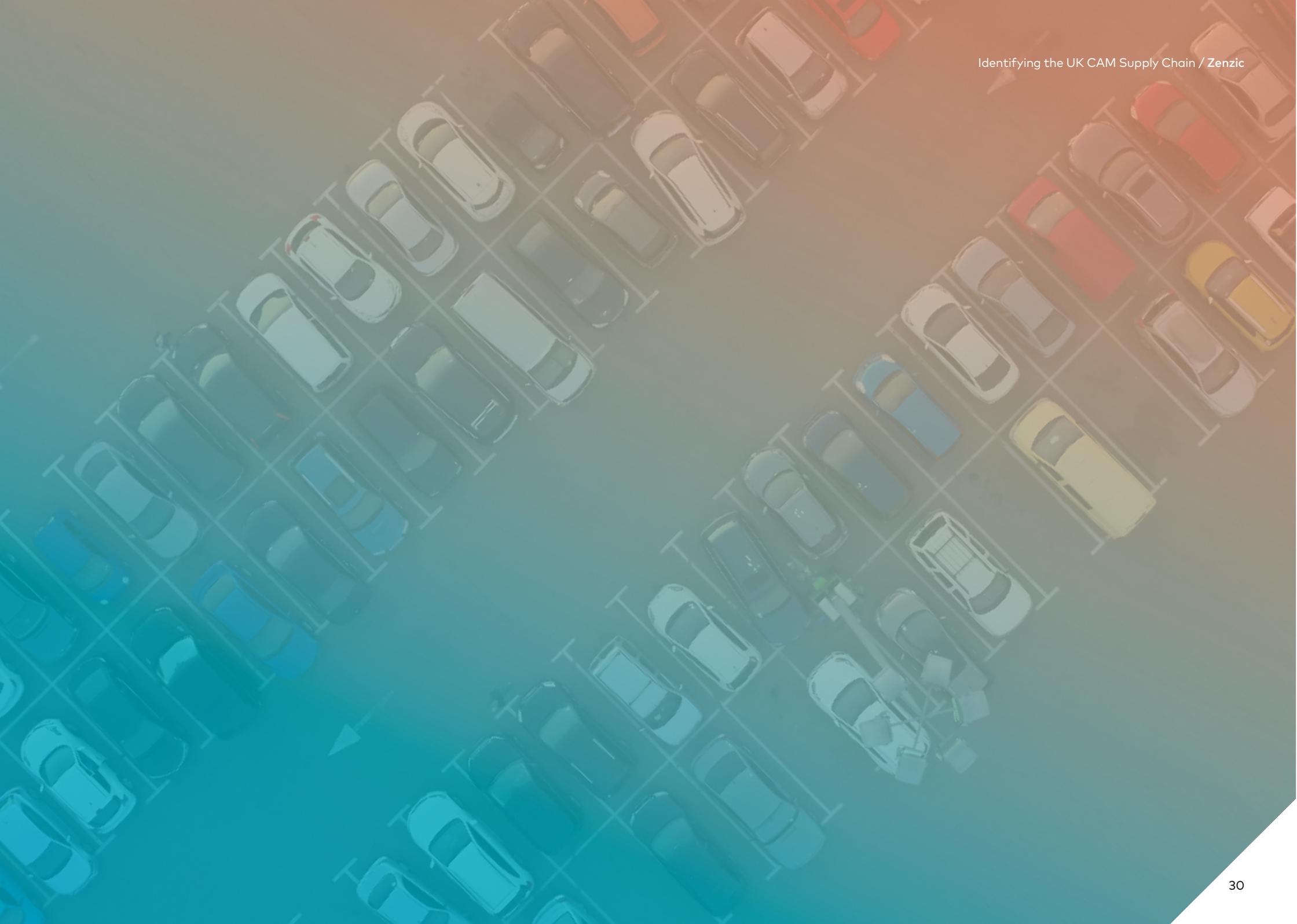
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# 7.0 / Appendix

## Appendix 1 - Full category list

Category	Sub-category	Description
Hardware	Cameras	Vision-based sensor system
	RADAR	Extrinsic object detection system using radio waves
	LIDAR	Extrinsic sensor using laser light detection
	Onboard Mapping Hardware	Storage device for maps held on vehicle
	Odometry sensors	Vehicle sensor for determining the precise movement of the vehicle its based on for example wheel rotation.
	Ultrasonic sensors	Extrinsic short-range sensor
	Sensor supporting hardware	Specific hardware to support sensors on a vehicle such as specific power supplies or processing capabilities
	Embedded controls hardware	Hardware to control of one or more components of the vehicle hosted on those components
	Passive control systems and computing components	Control systems and their components on the vehicle, which are not actuating physical systems. An example may be driver monitoring.
ECU hardware	Electronic Control Unit – controls one or more of the electrical systems in a vehicle	

Category	Sub-category	Description
Hardware	Other electronic & architecture	On-board electronics forming part of an overall EE architecture for the vehicle
	V2X equipment	Equipment supporting the communications to and from the vehicle, including: infrastructure, other vehicles and pedestrians
	Cyber secure modem	Hardware which is cyber secure that protects it from malicious attack. This hardware is a gateway that enables the vehicle to connect to the external world to send and receive data.
	Safety related HMI hardware	Displays, audible notifications or haptic notifications
	Localisation hardware	Hardware which enables the vehicle to know its exact location on a map and its surroundings.
	Drive by wire	The control of vehicle actuators, such as propulsion, braking and steering by use of electronic and electro-mechanical systems in place of traditional all mechanical solutions
	GNSS/GPS and IMU	Global Navigation Satellite System/Global Positioning System/Inertial Measurement Unit
	Powertrain/propulsion hardware	Hardware and actuators for the propulsion of the vehicle
	Actuators	Devices for the physical operation of vehicle systems such as steering, braking and propulsion
Software	Mapping & path planning - computer programming	Writing and then testing of software for the planning of vehicle motion
	Mapping & path planning - computer consultancy	Consultancy support for the development of path planning software
	Mapping & path planning - other IT technology and services	Supporting services for software development



Category	Sub-category	Description
Software	Mapping & path planning - data processing and hosting	Data and processing support for software development
	Control systems - computer programming	Writing and then testing of software for the control of vehicle systems
	Control systems - computer consultancy	Consultancy support for the development of control systems software
	Control systems - other IT technology and services	Supporting services for software development
	Control systems - data processing and hosting	Data and processing support for software development
	Connectivity/V2X - computer programming	Writing and then testing of software for connectivity and communication
	Connectivity/V2X - computer consultancy	Consultancy support for the development of communications software
	Connectivity/V2X - other IT technology and services	Supporting services for software development
	Connectivity/V2X - data processing and hosting	Data and processing support for software development
	HMI software - computer programming	Writing and then testing of software for the Human Machine Interface i.e. the display of information and sound/haptic alerts
	HMI software - computer consultancy	Consultancy support for the development of HMI software
	HMI software - other IT technology and services	Other IT services for the development of HMI software
	HMI software - data processing and hosting	Data hosting and processing for for the development of HMI software
Data & cyber security - computer programming	Writing and then testing of software for security against cyber attack	

Category	Sub-category	Description
Software	Data & cyber security - computer consultancy	Consultancy support for the development of path planning software
	Data & cyber security - other IT technology and services	Supporting services for software development
	Data & cyber security - data processing and hosting	Data and processing support for software development
Finance	Private funding e.g. VC	Funding from a private investor
	Public funding body	Funding from a public body
Engineering Services	Vehicle development	The design, development, modification and validation of a vehicle
	Simulation	Providing simulation methods, tools and processes
	Security	Providing security services for cyber security and resilience
	Infrastructure	Providing engineering services for infrastructure such as comms networks
	Safety cases/auditing	Providing services for functional safety, SOTIF, safety cases and auditing
	Other services	
Research and Technology Organisation	Academic Institution	University whose primary activity is research
	Research organisation	Private organisation whose primary activity is research
	Public Sector Research Establishments (PSREs)	Institutes sponsored directly by government departments or UK Research Councils



Category	Sub-category	Description
Research and Technology Organisation	Public Research Organisations (PROs)	Public research organisations including those that set standards to government and business
	Other RTO e.g Catapults	Public research groups focussed on specific groups such as SMEs
Tools	Simulation	Tools for the creation and use of simulation models
	Testing	Tools to enable testing and measurement
	Mapping services	Tools to enable location and/or mapping
	Other	
Operators	Passenger Transit	Operators serving the movement of passengers (e.g., bus services)
	Freight & Logistics	Operators concerned with the movement of goods to service other sectors
	Last mile delivery	Last mile in supply chain management and transportation planning is the last leg of a journey, comprising the movement of people and goods from a transportation hub to a final destination.
	Highway Authority	An organisation that is responsible for the maintenance of public roads
	Personal mobility	Operators offering mobility solutions for the individual
Insurance and Legal	Insurance	Provision of protection against accident and damage for stakeholders in the operation and use of AVs
	Legal	Expertise in interpreting and then giving guidance on compliance with legislation
	Regulatory/Consumer testing	Testing for conformance to regulation Testing to give consumer assurance

Category	Sub-category	Description
Communications and Data Infrastructure	Data/web services	Service and data exchange between two devices connected to each other via the internet
	Communication infrastructure	Offboard communications equipment for network communications
	Mapping /geospatial	Mapping and/or geospatial (locational) services
	Low latency communication infrastructure	Communication network equipment to enable the high-speed communication of data to support near real-time performance.
OEM/ASDE	Passenger Transit	Makers of vehicles for the movement of people in larger numbers (e.g., Bus)
	Long-haul freight (>10km)	Vehicle designed for carrying larger loads over longer distances
	Short-range deliveries (<10km) e.g last mile	Vehicle designed for carrying smaller loads over shorter distances
	Personal mobility	Vehicle designed for the transport of the owner for their purposes
Other	Consultancy	Role performed by organisation(s) to provide expert advice in a given field.
	EV charging/infrastructure	Public and private facilities for the charging of electric vehicles
	Other	



## Appendix 2 - Survey questions

### Section 1: About your organisation

1. Organisation Name
2. CAM supply chain category; please select the category that fits you best
  - a. If hardware what Tier?
  - b. Sub-categories
3. Secondary CAM supply chain category
  - a. If hardware what Tier?
  - b. sub-categories
4. The region(s) where your organisation is based in the UK
5. Postcode for the location of your main UK operations
6. Size of your organisation - number of employees
7. Size of your organisation - approximate annual turnover
8. Number of employees involved in CAM related activities based within the UK
9. Approximate annual turnover of CAM related activities based within the UK
10. What are the core skills that underpin your organisation?

### Section 2: Your role in the UK CAM supply chain

1. Do you supply products or services to any of the following categories? (and sub-categories)
  - a. Hardware
  - b. Software
  - c. Engineering Services
  - d. Finance
  - e. Research and Technology Organisation
  - f. Test services
  - g. Tools
  - h. Operators
  - i. Insurance and Legal
  - j. Communications and Data Infrastructure
  - k. OEM/ASDE
  - l. Other
2. Are there any types of organisations that you would like to supply for which you currently do not?
3. What proportion of those you supply are based within the UK? Please provide an approximate % figure
4. Who are your key CAM customers? Please provide the name of organisations
5. Which other types of organisations (non-customers) in the UK CAM ecosystem do you most regularly work with?
6. Please describe your USPs for CAM?
7. Have you been involved in any UK government funded CAM related trials and/or R&D in the UK? Please state all trials/R&D projects



**Section 3: Your CAM supply chain requirement**

1. Do you use products or services from organisations that provide (and sub-categories):
  - a. Hardware
  - b. Software
  - c. Engineering Services
  - d. Finance
  - e. Research and Technology Organisation
  - f. Test services
  - g. Tools
  - h. Operators
  - i. Insurance and Legal
  - j. Communications and Data Infrastructure
  - k. OEM/ASDE
  - l. Other
2. Which of these suppliers are UK based?
3. Why did you elect to procure from these suppliers? (e.g. technical specifications, cost, lead times, cooperation model, etc.)
4. What proportion of your CAM suppliers are UK based? (%)
5. Is your current supply chain needs entirely met by UK based companies?
6. Could your current supply chain needs be met by UK based companies?
7. What would make you switch suppliers to these UK companies?
8. What areas do you believe there is a

strong opportunity for UK suppliers? (and sub-categories)

- a. Hardware
  - b. Software
  - c. Engineering Services
  - d. Finance
  - e. Research and Technology Organisation
  - f. Test services
  - g. Tools
  - h. Operators
  - i. Insurance and Legal
  - j. Communications and Data Infrastructure
  - k. OEM/ASDE
  - l. Other
9. What challenges/barriers do you face in your supply chain?

**Section 4: Interventions**

1. For your category and your selected sub-category/categories, how competitive is the UK?
2. For your category and your selected sub-category/categories, what is your estimate for the expected global CAM market share by 2025 (%)?
3. Please estimate your expected UK CAM market share by 2025 (%)
4. Which areas of the UK CAM supply chain could benefit from further government intervention? (multi-select)

- a. Hardware
  - b. Software
  - c. Engineering Services
  - d. Finance
  - e. Research and Technology Organisation
  - f. Test services
  - g. Tools
  - h. Operators
  - i. Insurance and Legal
  - j. Communications and Data Infrastructure
  - k. OEM/ASDE
  - l. Other
5. What government interventions would you advocate?
  6. In your view, where is the biggest opportunity for the UK in CAM?
  7. Based on your current market projections for CAM, how do you estimate the potential for growth of your organisation by 2030
    - a. Percentage growth in number of personnel working on CAM projects/activities?
    - b. Percentage growth in turnover associated with CAM projects/activities? Please enter 0 if this is not applicable
  8. Are there any other comments you wish to make about the UK CAM supply chain?

# ZENZIC<sup>2</sup>

SELF-DRIVING REVOLUTION



## ACCELERATING THE SELF-DRIVING REVOLUTION