

A satellite night view of Earth showing city lights. The United Kingdom is the central focus, glowing with yellow and orange lights. Other landmasses and city clusters are visible in the surrounding oceans.

Global Market Matrix 2018

– KEY INSIGHTS

We work with
Innovate UK

BRYCE
space and technology

CATAPULT
Satellite Applications

Global Market Matrix 2018

– KEY INSIGHTS

The Satellite Applications Catapult commissioned Bryce Space and Technology Limited to undertake a study to create an annual snapshot of the opportunities for satellite applications, segmented within globally recognized industry sectors. Bryce conducted sector analysis on 41 FTSE Russell Industry Classification Benchmark sectors, in each case further segmented by Geospatial Intelligence (GI) and Ubiquitous Connectivity (UC). The analysis identifies key customer segments, use cases, addressable markets, existing penetration levels, key export markets, barriers to entry, U.K. centres of academic excellence, and potential areas for effective Catapult intervention. Additionally, the analysis affords insights into key sectors, themes, and market barriers and opportunities.

The study combines qualitative and quantitative analysis. Qualitative elements include space and satellite company technology offerings, capabilities, existing commercial adoption, and cross-sector opportunities. Quantitative elements include revenues, capital and operational expenditure, export markets, and market growth rates. The data has been drawn from company reports and published data, the Satellite Industry Association State of the Satellite Industry report, the GSA GNSS Market Reports, the Catapult's own Route to Market reports, and Bryce data sets, as well as numerous respected economic and financial data sources, such as the OECD and the Financial Stability Board.

Bryce identified significant opportunities for increased penetration of downstream satellite services in large ICB benchmark sectors such as Automobiles and Parts; Electronic and Electrical Equipment; and Software and Computer Services, as well as sectors closely associated to these.

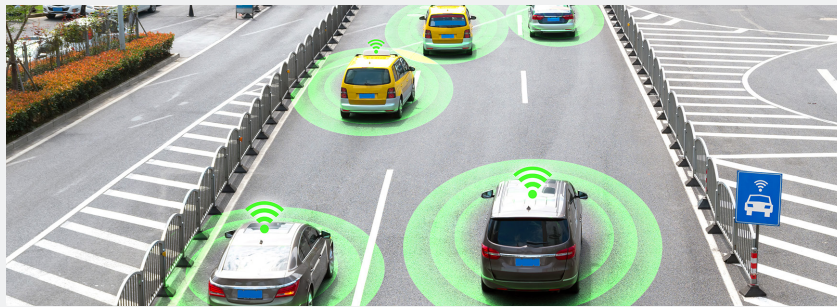
A number of universal themes emerged from the analysis, primarily related to sustainability and digitalisation, as well as niche themes related to the continued proliferation of recreational GNSS and location based services; fleet management and asset tracking; and customer and passenger connectivity.

The study attempts to provide a general purpose supplemental resource to those asking questions about the future growth of the UK downstream satellite product and service offering, with the goal of signposting potential paths forward to increased economic success.

Macro Trends Across Sectors

The study considered three macro trends affecting most sectors throughout the global economy: connected future and autonomy; Internet of Things (*IoT*) and digitisation; and big data analytics.

Connected Future and Autonomy



Mobility is driving demand to close connectivity gaps while concurrently spurring demand for higher, seamless connectivity as consumers and businesses roam between motorways, rail, home, and work. Cellular bandwidth and Wi-Fi hot spots are unlikely to bridge demand both geographically and for the capacity required, particularly in rural areas and for high bandwidth applications such as streaming that roam between environments. The need for connectivity is primarily driven by:

1. real-time redundancy for architecture;
2. demand for high speed data;
3. external connectivity for safety and other applications;
4. autonomous driving quality and safety;
5. and increasing use of reduced number of components, and managed via cloud;
6. efficient communication and data transfer that requires mass-distribution.

Key sub-trends in this area include less human capital needing to be deployed, leading to enhanced productivity; reducing human capital in remote monitoring and “ground truthing” of assets; and increased safety for workers in remote (*dangerous*) environments.

Examples of the relevance of this broad trend for satellite services are seamless ubiquitous connectivity beyond line-of-sight/out of reach of terrestrial alternatives, and reliability/security of service.

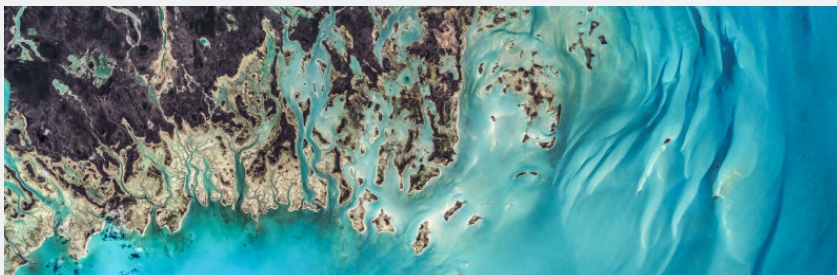
IoT and Digitisation



Digitalisation is being used to reduce maintenance costs, enhance efficiency, and deploy predictive maintenance analytics, though in a limited manner at present. Enhanced connectivity can improve the quantity and quality of maintenance schedules, with some energy providers already reporting almost 40% improvement in service reliability utilising enhanced analytics. Digital technology is being employed in analytics for obtaining sensory data through low-cost sensors in equipment, machine-to-machine (M2M), geological modelling and predictive maintenance. This technology is also being used in human-machine interaction i.e., sensors are being used to transmit key data to managers on performance and safety. Finally, digital technology is being used in the area of artificial intelligence (AI): tele-remote and assisted-control equipment are becoming common, and deployment of fully autonomous equipment is occurring in haulage, drilling, and other mining processes.

Examples of the relevance of IoT and digitalisation for satellite services include the need for connectivity in remote areas (*satcomms*) and enabling the digital grid via remote connectivity.

Big Data Analytics



The exponential growth in data from sensors is leading to increased need for analytics to derive insights and value from underlying data. The digital grid of the future, for example, includes an increasing proportion of renewable and distributed energy resources, with this increasing the demand for accurate, real-time analytics and big data. Industrial process automation technologies are being implemented to transform daily operations, optimise returns on mining assets. Big data analytics is expected to drive demand for increased bandwidth and connectivity in many geographic locations.

Examples of the relevance of this trend for satellite services are demand for increased bandwidth and growth in geospatial data.



Satellite and Space Trends



The study considered space and satellite trends that are broadly shaping space-related markets and opportunities.

There has been a significant increase in venture investment in start-up space companies, the majority of which has occurred in the last few years. This has led to many downstream application and analytics companies, particularly ones related to geospatial insights applications, this is partly driven by the expanding data points from increasing number of sensor types (SAR, Optical, Infrared), leading to a strong need for improved analytics.

Another noticeable trend is the significant reduction in GEO satellite manufacturing orders, which has decreased in comparison to historic trends of around twenty orders per year. There were only eight orders in 2016; and while there have been more orders recently, the overall rate is lower than in the past. This is due primarily to uncertainty related to demand needed to fully utilise on-orbit high throughput capacity. The significant amount of high-throughput satellite capacity launched recently has led to a drop-in transponder pricing, which has led to margin erosion. Additional uncertainty has also been created by anticipated LEO smallsat constellations e.g., OneWeb, SES m-power, SpaceX Starlink, though specific competitive dynamics with GEO are not yet clear.

Other highlights include the significant investment in commercial human spaceflight, which has been driven by advocacy for the transformative power of space, rather than specific market incentives. Finally, billionaire investors and other trends have created interest in space in non-space financial communities.

Satellite Services Opportunities: General Themes and Key Sector Highlights

Based on the sector-by-sector analysis of revenues, market trends, growth rates, and technology, two cross-cutting themes strongly associated with market opportunities for satellite connectivity and geospatial capabilities were identified. These themes are sustainability and digitalization.

Universal Theme: Sustainability

Sustainability is a critical issue across most sectors, which is creating an opportunity to cement roles for satellite data and technology in best practice methodologies in globally significant industries. This theme is impacting investment practices, operating models, risk assessment, and regulatory compliance. The ICB super-sectors most affected by this theme include Financials, Basic Resources, Energy, Industrials, and Utilities.

Universal Theme: Digitalisation

There is a universal focus on industrial process automation and digitalization, with IoT being at the centre of many initiatives. Autonomy, M2M sensor and Earth Observation technologies are being looked to for productivity gains. The ICB super-sectors most affected by this theme include Oil & Gas, Basic Resources, Industrial Goods & Services, Utilities, Consumer Services, and Financials.

Additionally, the study team also identified three niche themes: Recreational GNSS & Location Based Services (*LBS*), Fleet Management & Asset Tracking, and Customer / Passenger Connectivity.

Niche Theme: Recreational GNSS & Location Based Services (*LBS*)

Otherwise known as Position, Navigation and Timing (*PNT*), this is a high growth, mass retail market theme. Its applications range from connected vehicles, recreational marine, and LBS smartphone apps. The ICB super-sectors most affected by this theme include Consumer Goods, Software, Travel & Leisure, and Automobiles & Parts.

Niche Theme: Fleet Management & Asset Tracking

This niche theme can be classified as a subcategory of digitalization and is a recurring feature of both process optimization and operational risk management. The ICB super-sectors most affected by this theme include Industrial Transportation, Aerospace, Oil & Gas, Utilities, and Travel & Leisure.

Niche Theme: Customer / Passenger Connectivity

With continuous connectivity set to come expected as standard, connectivity creates platforms for customer and environment-specific services. The ICB super-sectors most affected by this theme include Travel & Tourism, Recreational Services, Airlines, “Software”.

Satellite Services: UK-Specific Opportunities

The study considered UK specific opportunities in the context of the UK's general strengths, such as its diplomatic and soft power, strengthened by programmes like the International Partnerships Programme (*IPP*), and its strong financial and services environment.

The UK is a world leader in small-sat manufacturing and constitutes a sizable portion of the global small-sat market. Furthermore, the UK has a strong R&D focus with the emphasis around satellite applications creating a positive environment for space and satellite start-ups to thrive and deliver value across sectors.

The study identified UK-specific opportunities in each sector. *Table 1*, below, highlights the six sectors with unaddressed UK market opportunities (*either GI or UC*) in excess of £500m. These sectors have the highest difference between UK addressable market and current penetration.



Sector	Key UK GI Opportunities	Key UC Opportunities
2710 Aerospace & Defence	Security and autonomy for improved crew safety and quicker response times, Increased safety and efficiency due to more automation (Driverless vehicles and drones for security checks). Quicker emergency response and better forewarning and preparedness for emergencies.	Defence communications (e.g. beyond line-of-sight UAV connectivity) and air traffic control and IoT (maintenance) – improved awareness of situations. Greater quantity of data about aircraft etc. to increase maintenance awareness and identify malfunctions quicker.
3740 Leisure Goods	Supply chain tracking and tracing, asset management. Package Tracking – Increase efficiency through improved inventory and packaging tracking/monitoring.	Remote communications - high capacity store-and-forward data backhaul. Efficient communication and data transfer that requires mass-distribution.
3350 Automobiles & Parts	Large addressable market as focus on increasing vehicle autonomy foundationally reliant on enhanced GNSS, sensor technology, and connectivity.	Automobiles: Vehicle to Vehicle (V2V) applications: communications, Over the Air (OTA) software updates, emergency response, automobile and air traffic control. Auto parts: IoT, M2M communications.
3570 Food Producers	Immediate opportunity for UK firms without a well-established customer base to provide differentiated product or micro services to the established, large platform companies who serve US farmers and agricultural market (with a suite of services ranging from EO data and crop maintenance to payroll and taxes applications).	Remote sensing, digital content to cell phones, Real time sensor to handheld, UAV navigation and control, IoT, virtual fencing, animal tracking, asset tracking.
0570 Oil Equipment, Services & Distribution	Oil discovery and assessment (e.g. improved, quicker identification of Oil/gas sources with more data). Pollution monitoring (e.g. monitoring of oil well sites after decommissioning for leaks, etc.).	UAV navigation & control – improved maintenance and crew safety on offshore sites (using them to inspect the oil rig).
1770 Mining	Predictive analytics, IoT, smart products and smart mining, exponential(s)/artificial intelligence, and insights gathering using machine learning to derive potential mine sites.	Supply chain management, high capacity store-and-forward data backhaul, plant communications, track and manage IoT across system assets, integration of equipment/systems, optimisation of value chain gaps, need for unified view of activities, trend towards centralised operations.

Table 1: UK-Specific Satellite Services Opportunities

Biggest Barriers and Most Effective Potential Interventions

Most Common Barriers

The most common barriers to market success identified in the study were regulatory requirements, competition and market structure, lack of customer, high cost of entry, partner relationships, and cost issues (especially compared to terrestrial alternatives). Table 2, below, is a characterisation of the most common barriers to entry, and other relevant barriers where catapult intervention could be most impactful. This provides a snapshot of the key barriers identified and possible Catapult interventions that cut across sectors.

Key Barriers	Possible Catapult Interventions
Most common	
<ul style="list-style-type: none"> Regulatory requirements <i>(must meet certain requirements and/or standards)</i> Competition and market structure Lack of customer High cost of entry Partner relationships Cost issues <i>(especially compared to terrestrial alternatives)</i> 	<p>Relevant intervention:</p> <ol style="list-style-type: none"> Market analysis, promotion and marketing, networking, negotiation support, partnerships, bilateral/multilateral agreements with relevant organisations in target market regions, direct financial resources, negotiating support, infrastructure support, partnerships. Catapult could become the conduit for successful identification of key contacts within the sector and navigation through their internal processes, as well as connect businesses to the economic decision maker with the ability to sign contracts. Promotion, marketing, education and outreach. Encourage communication and action to overcome perception that future provision of consistent EO data cannot be relied upon. Sustainability and Socially Responsible Investment are key priorities as corporate bodies. A window of opportunity exists to cement satellite data and technology at the heart of these efforts. <p>Outcome expected:</p> <p>Improved insight and awareness by customers into the value of satellite products and services, better provider access to customer, provider better equipped to provide products and services relevant to customer. Improved links between industry sectors. Higher value relationships and engagement with the GI community; wider technology adoption.</p>
Other relevant barriers worth highlighting	
<ul style="list-style-type: none"> Fragmented market in Europe: many small players, implies low barrier to entry. US market dominated by large platform / farm management companies e.g., Climate Corporation, Farm Command Some aspects of GI-related precision farming still high cost for smaller farms Skills base of end users National security issues imply a medium barrier to entry due to defence implications 	<p>Relevant intervention: Market analysis, networking and partnerships:</p> <ul style="list-style-type: none"> Catapult could become the conduit for successful identification of key contacts within the larger equipment manufacturers and US farm platform companies and help to develop partnerships with small UK companies, such that they can provide niche / component services to an existing customer base Given the growing market for agricultural insurance, consider initiatives that combine efforts to foster awareness, relationship building, and adoption in both the Insurance and Food Producer sectors. Help UK companies access and successfully engage with companies in Asian markets where food traceability / provenance assurance is a key issue. <p>Promotion, marketing, education and outreach:</p> <ul style="list-style-type: none"> Foster collaboration between private sector and academia to try to address the issue of the high minimum viable farm size for technology adoption – which is a major issue for most countries other than the United States. Aggregate and help coordinate the research output of high quality but fragmented research centres and agricultural colleges. <p>Outcome expected:</p> <ul style="list-style-type: none"> Higher value relationships and engagement between industry and the GI and UC community; wider technology adoption; a larger addressable market as costs are reduced and new export markets are penetrated.

Table 2: Biggest Barriers and Most Effective Potential Interventions

Key Barriers by Sector

The study identified interventions through which an entity such as the Catapult could improve market access or UK market penetration. The sectors that could potentially see the most benefit from interventions included Leisure Goods, Media, and Technology & Hardware Equipment. Table 3 highlights the market areas where interventions could be of most benefit/impact. The short-list is based on sectors meeting the following criteria: ‘High’ values for ‘Barriers to Entry’; ‘High’ and ‘Medium’ values for ‘Utility of Intervention’; further filtered based on either unaddressed GI or UC values being greater than £1bn.

During discussions, it was also identified that there is a potential role for an entity such as the Catapult in establishing some standardised documents or transaction templates to help enable engagement between satellite companies and industry.

Sector	Key UK GI Opportunities	Key UC Opportunities
3740 Leisure Goods	Competition and market structure, lack of customer, partner relationships, cost issues (<i>especially compared to terrestrial alternatives</i>)	<p>Relevant intervention:</p> <p>Market analysis, promotion and marketing, networking, negotiation support, partnerships, bilateral/multilateral agreements with relevant organisations in target market regions, direct financial resources, negotiating support, infrastructure support, partnerships.</p> <p>Outcome expected:</p> <p>Improved insight and awareness by customers into the value of satellite products and services, better provider access to customer, provider better equipped to provide products and services relevant to customer.</p>
5550 Media	Competition and market structure, regulatory requirements and lack of customer relationships	<p>Relevant intervention:</p> <p>Market analysis, promotion and marketing, networking, partnerships, bilateral/multilateral agreements with relevant organisations in target market regions, education and outreach.</p> <p>Outcome expected:</p> <p>Could lead to better customer understanding and access, larger addressable market, new UK capabilities.</p>
9570 Technology Hardware & Equipment	Competition and market structure, high costs of entry, economies of scale implications	<p>Relevant intervention:</p> <p>Market analysis, promotion and marketing, networking, negotiation support, partnerships, bilateral/multilateral agreements with relevant organisations in target market regions, direct financial resources, negotiating support, infrastructure support, partnerships.</p> <p>Outcome expected:</p> <p>Improved insight and awareness by customers into the value of satellite products and services, better provider access to customer, provider better equipped to provide products and services relevant to customer.</p>

Table 3: Biggest Barriers and Most Effective Potential Interventions

Candidates for Additional Research

The study identified candidates for additional research, including deep dive analysis of specific sectors or markets, study of selected long-term markets, and cross-sector analysis to understand the types of opportunities available.

Deep Dives

The sectors that were identified as candidates for further deep dive analysis, based on the largest unaddressed market for UK-specific space opportunities, are Aerospace & Defence, Leisure Goods, and Automobiles & Parts. The supersectors most affected by global trends of autonomy, digitalization, and data analytics were identified as being Oil & Gas, Industrials, and Utilities. Another potential area for deep dive analysis is to assess the evolution of Synthetic Aperture Radar (SAR) services. This would involve analysing possible new ranges of applications and markets as a result of improvements in temporal and spatial resolution of SAR capability.

Long-Term Markets

One area with strong long-term potential is Unmanned Aerial Vehicles (UAVs), High Altitude Pseudo Satellites (HAPS), and other autonomous commercial vehicles. An assessment of the future scenario of exponential growth / ubiquity of commercial usage of drones and the impact on data generation, communications requirements, and EO data analytics could shed light on new applications and services. Another long-term market identified for further exploration is the launch and satellite manufacture market. This would involve examining future capabilities created by new types of satellite manufacture and launch capability, considered in the context of business case realities.

Cross-Sector Analysis

Cross-sector themes worthy of further exploration include the space sustainability market, pension, and sovereign wealth funds (SWF).

Analysis of space sustainability which would involve examining either space as a contributor to sustainability across all economic sectors and the role of the industry in sustainable practices and sustainability monitoring across the whole economy, or the sustainability of the space sector itself.

Another cross-sector analysis area identified is the unique investment roles of pension and sovereign wealth funds. This would involve analysis of sources of overseas UK-inbound direct and portfolio investment for the space and satellite industries, market segments and technology of interest, and trends and forecasts. Furthermore, it would be necessary to analyse the role of pension funds and SWFs play as investors and influencers of corporate strategy and practices and what this means for the space and satellite industry.

Key Opportunities Factsheet

The key opportunities factsheet (Table 4) is a distillation of the top opportunities identified from this study per sector, along with a few key facts related to the sector growth rate and global unaddressed market size.

Sector	Sector Growth Rate	Global Unad-dressed (Gt £M)	Global Unad-dressed (Lc £M)	Key Opportunity Geospatial Intelligence	Key Opportunity Ubiquitous Connectivity
0530 Oil & Gas Producers	19%	£80	£312	IoT - maintenance & safety	Autonomy - safety
0570 Oil Equipment, Services & Distribution	5%	£80	£312	Pollution monitoring - decommissioning	UAV nav & control - maintenance & safety
0580 Alternative Energy	-12%	£50	£220	Power grid synchronization - improved energy efficiency	IoT - maintenance of offshore wind farms
1350 Chemicals	-1%	£0	£13	Predictive analytic, Internet of things	Plant communications
1730 Forestry & Paper	-1%	£159	£228	Active monitoring systems	Remote communications/management
1750 Industrial Metals & Mining	3%	£53	£312	IoT - Operations optimisation	High capacity store-and-forward
1770 Mining	7%	£53	£312	Mine surveillance, mapping	Plant communications
2350 Construction & Materials	-2%	£796	£106	Land use classification and monitoring	Asset management
2710 Aerospace & Defence	-12%	£1,356	£806	Security & autonomy	Communications & IoT
2720 General Industrials	-8%	£0	£13	Package tracking	IoT & plant communications
2730 Electronic & Electrical Equipment	5%	£9,864	£398	Package tracking	IoT & plant communications
2750 Industrial Engineering	-1%	£1,037	£37	Autonomy	Fleet comms & IoT
2770 Industrial Transportation	-4%	£3,945	£845	Asset management	Fleet comms & IoT
2790 Support Services	-6%	£40	£0	Pollution monitoring	Comms & IoT
3350 Automobiles & Parts	-1%	£15,542	£154	Automobile navigation, autonomous operation	Vehicle to Vehicle (V2V) applications: communications, software updates, emergency response
3530 Beverages	-4%	£0	£37	Asset surveillance and monitoring/Asset tracking	Manufacturing plant communications
3570 Food Producers	-7%	£472	£375	Differentiated product or analytics	Real time sensor to handheld, UAV navigation and control, IoT
3720 Household Goods & Home Construction	-7%	£0	£0	Risk assessment (flooding, etc.), asset tracking, construction, cadastral surveying	Remote communications, manufacturing plant communications
3740 Leisure Goods	9%	£347	£3,466	Supply chain tracking and tracing, asset tracking	Remote communications - high capacity store-and-forward data backhaul
3760 Personal Goods	0%	£0	£0	Supply chain tracking and tracing, asset tracking	Manufacturing plant communications
3780 Tobacco	4%	£20	£131	Yield monitoring, farm machinery guidance, autonomy	Remote communications
4530 Health Care Equipment & Services	-3%	£0	£37	Preventative monitoring / early warning	Telemedicine, IoT sensors to monitor health
4570 Pharmaceuticals & Biotechnology	0%	£0	£37	Asset & process optimisation	Telemedicine, Surveillance and monitoring
5330 Food & Drug Retailers	-3%	£25	£33	Supply chain tracking and tracing	IoT sensors to monitor health
5370 General Retailers	-10%	£25	£33	Wireless payments, supply chain tracking and tracing	Remote communications
5550 Media	-4%	£0	£1,309	Asset monitoring/tracking	Broadcast and cable television distribution, IoT/M2M asset comms
5750 Travel & Leisure	3%	£57	£1,003	Air navigation	Air traffic control, in-flight Wi-Fi
6530 Fixed Line Telecommunications	-6%	£54	£63	Asset monitoring/tracking, timing and synchronisation	Satellite backhaul
6570 Mobile Telecommunications	2%	£424	£6	Asset monitoring/tracking, timing and synchronisation	Broadband for rural areas, mobile cellular backhaul
7530 Electricity	-1%	£32	£111	Infrastructure, resource monitoring, asset management of overhead lines	Smart meters, smart grids, energy demand response (Supervisory Control and Data Acquisition - SCADA)
7570 Gas, Water & Multiutilities	-7%	£30	£111	Infrastructure, resource monitoring, leak monitoring	Remote communications and IoT
8350 Banks	1%	£36	£37	Quantum key encryption technology	Secure data and payment processing
8530 Nonlife Insurance	1%	£3,508	£0	Shared risk & exposure data platform	Maritime, other asset tracking
8570 Life Insurance	-3%	£0	£0	Air quality monitoring, claims management	IoT enabled health and wellness monitoring
8630 Real Estate Investment & Services	8%	£812	£0	Surveying, land use, risk analysis, water monitoring	IoT
8670 Real Estate Investment Trusts	5%	£140	£0	IoT and sensor-driven digitalised building monitoring services	IoT
8770 Financial Services	2%	£22	£37	Alternative data / machine learning	Secure communication / fraud risk mitigation, payment security
8980 Equity Investment Instruments	-53%	£0	£0	Asset tracking, surveillance, monitoring	Secure communication / fraud risk mitigation
8990 Non-equity Investment Instruments	-36%	£0	£0	Asset tracking, surveillance, monitoring	Secure communication / fraud risk mitigation
9530 Software & Computer Services	1%	£4,757	£24	Imagery and video, cyber security and encryption	Differential navigation, automobile navigation
9570 Technology Hardware & Equipment	6%	£0	£2,651	Manufacture of satellites, satellite component suppliers, chipset manufacturers	Manufacturing plant communications