Office for National Statistics

Article

Redefining investment in digital infrastructure in the UK

Estimates of investment in an expanded definition of digital infrastructure in the UK, to include selected intellectual property products and permits for the use of radio spectrum as a type of infrastructure asset. These are official statistics in development.

Contact:
Intangible Assets and Infrastructure branch
nfa-development@ons.gov.uk
+44 1633 455612

Release date:
31 July 2024

Next release:
To be announced

Table of contents

1. Main points

2. Current definition

3. Expanding our definition

4. Government sector digital infrastructure investment and expenditure

5. Expanding measurement of market sector digital infrastructure investment

6. Impact on digital infrastructure investment estimates

7. Summary of our proposal to expand the definition of digital infrastructure and its results on our estimates

8. Proportions of infrastructure investment in each asset class

9. Glossary

10. Data sources and quality

11. Future developments

12. Related links

13. Cite this article

1 . Main points

- Market sector investment in digital infrastructure was £9.2 billion in 2022, compared with investment estimates of £1.2 billion calculated under our current, narrower methodology.
- Government capital grants funded 3.3% (£304 million) of all market sector investment in digital infrastructure in 2022.
- 66.8% of total market sector digital infrastructure investment between 1997 and 2022 was in software and databases, and telecoms equipment.

These are not official statistics and should not be used for policy- or decision-making. They are published as research into an alternative method for producing investment in infrastructure statistics. This research will not affect the main national accounts statistics. We advise caution when using the data.

2 . Current definition

The Office for National Statistics (ONS) has been publishing estimates of investment and net stocks of infrastructure in the UK economy in our Infrastructure in the UK, investment and net stocks statistical bulletin since 2017. The 2017 infrastructure investment bulletin in this series discussed the methodology and definitions we have consistently used, including in our July 2024 infrastructure investment bulletin.

Through consultation with our stakeholders, we have identified digital infrastructure as an area where our definitions and methodology can be revisited and expanded, in line with recent international discussion.

Infrastructure is not currently explicitly defined within the national accounts, and is therefore not covered within statistical manuals such as the System of National Accounts (SNA) 2008 (PDF, 9.3MB) or the European System of Accounts (ESA) 2010 (PDF, 6.6MB). As such, the proposed changes we discuss in this article will not lead to the revision of the main national accounts statistics, such as gross fixed capital formation, the national balance sheet, or business investment.

Our estimates of infrastructure are currently produced using a functional definition, where infrastructure is recognised as the "basic physical structures and assets needed for the operation of our society and economy, and for the maintenance of energy, transport, water, communications, sewerage and flood defence systems". The categories referred to here are considered economic infrastructure, and align with those used by the National Infrastructure Commission (NIC) (PDF, 15.1MB) and HM Treasury in the Green Book (PDF, 627KB), as well as by other national statistical institutes around the world.

Under our current definition, digital infrastructure broadly refers to the fixed, physical assets needed to maintain broadband communications systems and allow the flow of communication data: specific assets include fibre-optic networks, coaxial and copper cables, and communication towers. Digital infrastructure can also be referred to as telecommunications infrastructure or network infrastructure.

However, our methodology for estimating market sector and government investment in infrastructure, which is primarily tailored towards "traditional" infrastructure (such as water and electricity), currently omits some of the assets needed to maintain communications systems. Moreover, definitions of digital infrastructure used by other economic and statistical bodies, such as the United States' Bureau of Economic Affairs (BEA) (PDF, 3.5MB) and the Organisation for Economic Co-operation and Development (OECD) (PDF, 456KB) consider a broader spectrum of assets necessary for the function of communications systems, which our narrow scope has not included.

3 . Expanding our definition

In this article, we explore alternative definitions of digital infrastructure, and evaluate the limitations of our current methodology for estimating digital infrastructure investment. We will also present revised estimates of government and market sector investment, which capture the value of a wider suite of assets.

The most comprehensive statistical definition of infrastructure comes from the Organisation for Economic Co-operation and Development's (OECD's), Strategic Policies for Sustainable Infrastructure Horizontal Project. The definition integrates the approaches taken by the four OECD members who currently produce statistics on infrastructure: the UK, the United States, Canada and the Netherlands:

"Infrastructure is the set of fundamental facilities and systems that support the provision of goods and services essential to enable, sustain, or enhance societal living conditions and maintain the surrounding environment. The set of fundamental facilities and systems are composed of public and private physical structures as well as intellectual property products supporting the effective operation of these structures. The following functions are considered to be provided by economic infrastructure: transport; utilities (provision of energy, water, and sanitation and waste management); flood protection and water management; and IT and communications."

Based on this definition, they identify the following assets as digital infrastructure:

- communications buildings, including cell-towers and data centres
- network base stations
- broadband access and internet connectivity systems
- software to run IT and communications related networks
- permits for the use of radio spectra
- cables and lines - coaxial, copper, aluminium, etc., optical fibre
- other communication construction

A useful clarification in the OECD's definition is that relevant intellectual property products ("intangible assets") should be included in the value of associated infrastructure assets.

Prior to the 2000s, water, energy and transport were considered the main types of economic infrastructure. As such, functional definitions of infrastructure, which attempted classification based on the characteristics common to these systems, focused primarily on physical assets, rather than intellectual property products (IPPs), which are necessary to maintaining digital infrastructure systems.

While definitions have been evolving in recent years, government bodies from Canada, Australia and the EU (among others) all define infrastructure as strictly physical. Statistics Canada's infrastructure definition notably specifies that assets must be tangible, to fit within the "infrastructure" boundary.

However, many nations, especially those whose definitions are predicated on economic rather than physical characteristics, include intangible assets. The Bureau of Economic Activity (PDF, 3.5MB), which produces the most comprehensive figures on digital infrastructure investment, notes the importance of software to the function of broadband systems, and the potential for associated uncapitalised intangible assets to be considered part of infrastructure systems in the future.

Permits for the use of radio spectrum, while not classed as an intangible as they are non-produced, also play a critical role in the function of communications networks and are rarely captured in most definitions of digital infrastructure. The Office for National Statistics (ONS) publishes data on net acquisitions of non-produced, non-financial assets such as K2 (spectrum) within the Maastricht supplementary tables.

4 . Government sector digital infrastructure investment and expenditure

We currently measure government sector investment in infrastructure using Office for National Statistics (ONS) tables detailing general government (GG) expenditure on public services. From these, we extract estimates of gross fixed capital formation (GFCF), for relevant Classification of the Functions of Government (COFOG) codes (PDF, 605KB): digital infrastructure is proxied using the communications function (04.06), which includes postal, telephone, telegraph, wireless and satellite communications systems.

Figure 1: General government investment in communications infrastructure was less than £5 million every year from 2009 to 2021

Government investment (GFCF) in communications infrastructure, UK, 1995 to 2022, current prices

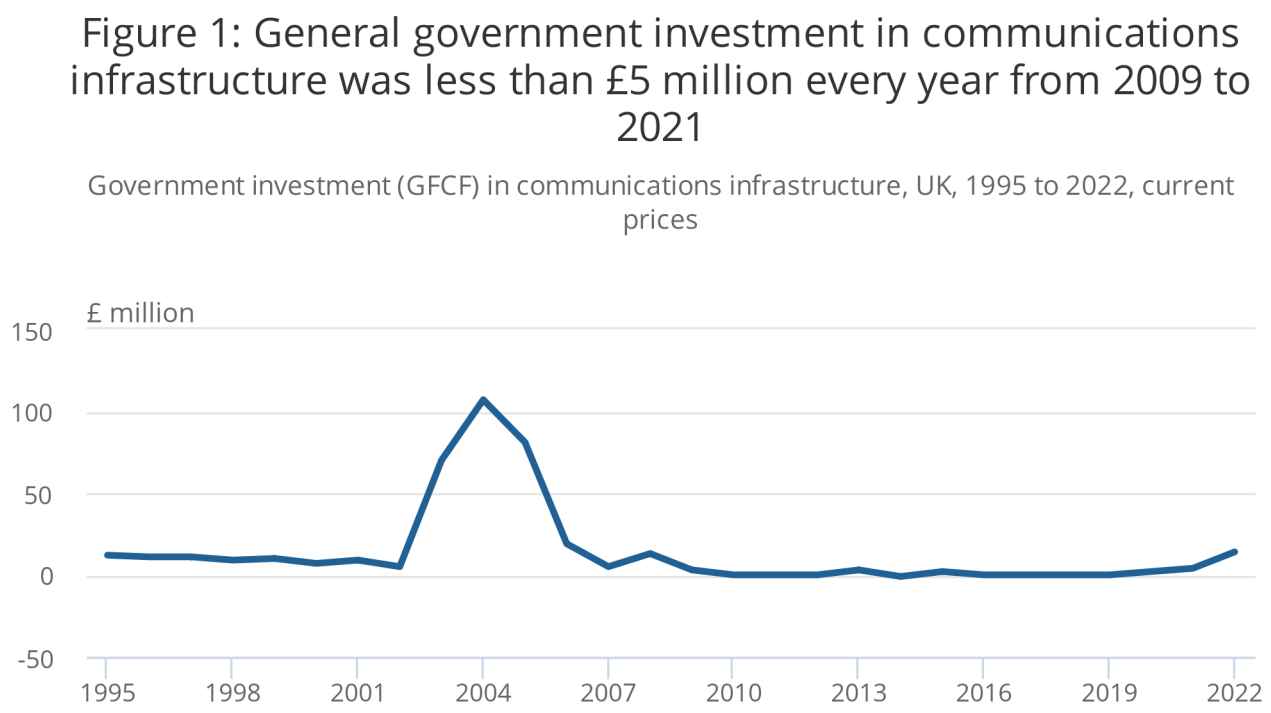


Figure 1 shows our existing estimates of the investment made by government into communications infrastructure over the period 1995 to 2022. The most significant period of investment was between 2003 and 2006, where government invested £277 million. This funding was used to help set up the Office of Communications (Ofcom) , the regulator for UK communications services, as well as to support the 2004 e-Government initiatives (PDF, 5.8 MB). However, outside this period, there has been limited government investment in communications, with less than £5 million invested per year between 2009 and 2021.

This approach captures the value of infrastructure assets owned by the public sector and is therefore effective for the likes of the transport industry, where most government expenditure is used to purchase assets, of which government is the economic owner.

However, in the case of digital infrastructure, the structure of the market makes this methodology inappropriate. Rather than purchasing or constructing assets directly, government expenditure for digital infrastructure is normally passed to private sector entities, to incentivise them to provide telecommunications services in areas where it would elsewise not be profitable to do so. While the government partially or fully funds the construction of this infrastructure, they are not the final economic owner: as such, government GFCF figures would not capture this expenditure. We can estimate the value of government funding given to private telecommunications firms by considering expenditure on investment grants for communications.

According to the System of National Accounts (SNA) 2008 manual (PDF, 9.3MB):

"Investment grants consist of capital transfers made by governments to other resident or non-resident institutional units to finance all or part of the costs of their acquiring fixed assets."

This metric would capture all government funding given to businesses for the purpose of investment in telecommunications services assets. It is worth highlighting that this does not represent government investment in a European System of Accounts, or SNA consistent use of the term, because the government does not own the asset. However, these figures are useful as they highlight the role of public financing in the creation of digital infrastructure assets in the UK.

Figure 2: Government provided investment grants worth £304 million in 2022 for telecommunications

Government investment grants provided for telecommunications compared with existing investment (GFCF) in communications infrastructure, UK, 1995 to 2022, current prices

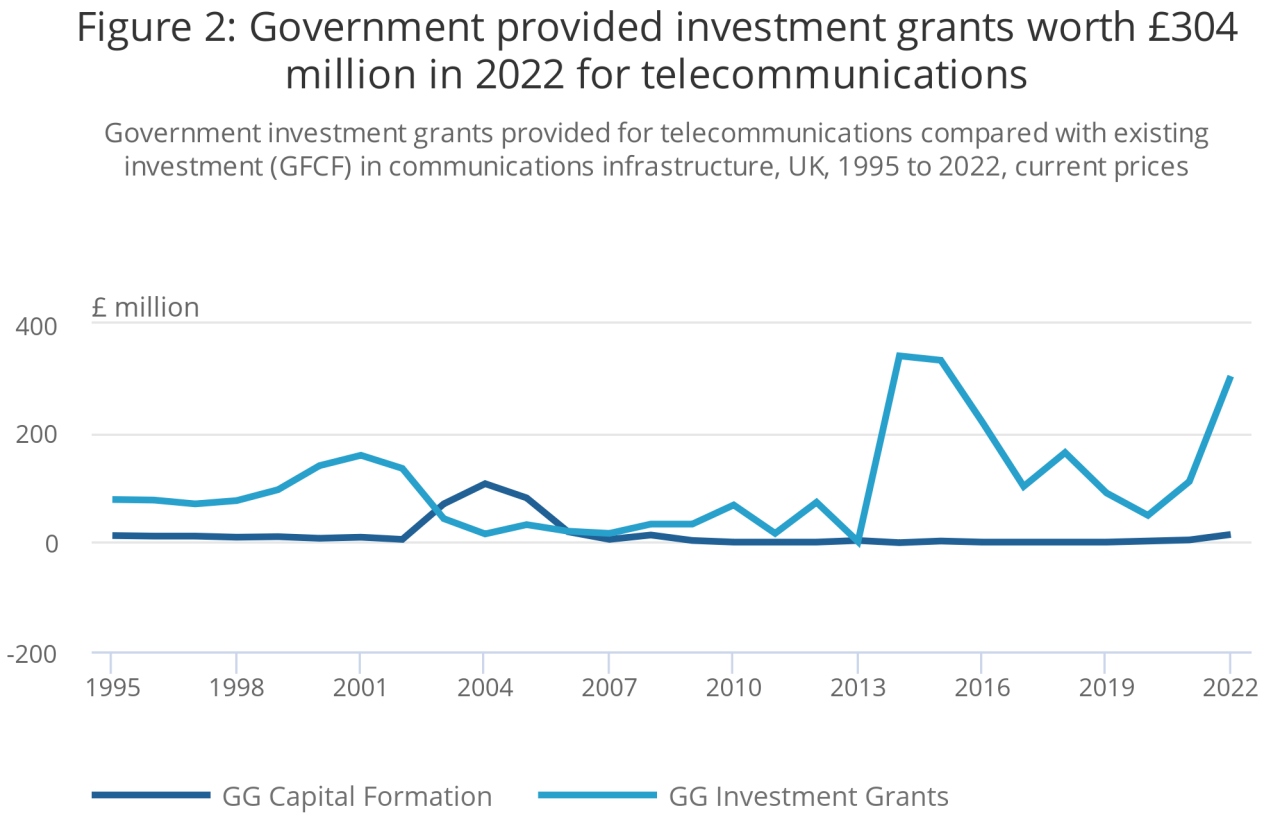


Figure 2 shows the value of investment grants made to telecommunications companies to support in the construction of digital infrastructure assets. Between 1995 and 2022, a total of £2.9 billion of public funding was used for this purpose: in contrast, the total value of government investment in communications assets, as shown in GG capital formation, over the same period was £0.4 billion.

Based on the investment grants data, government funding was greatest between 2014 and 2018, when £1.2 billion was allocated. This coincides with the delivery of the Superfast Broadband Programme (PDF, 1.6MB), a government initiative to ensure access to adequate broadband speeds in areas which otherwise would not have seen sufficient commercial investment.

The next major digital infrastructure programme, Project Gigabit, recently began. A total of £1.2 billion of public funding has been committed for 2020 to 2025, to help deliver gigabit-capable broadband to 85% of the UK by 2025, and 100% by 2030. £434 million has been spent up to 2022, with a further £736 million planned from 2023 to 2025.

These figures detailing government funding used to produce digital infrastructure will be captured within our total investment estimates of market sector digital infrastructure investment, presented in Table 1. Therefore, users should not combine our expanded government funding estimates with market sector investment to produce a wider economy estimate of digital infrastructure investment as this would lead to double counting.

Table 1: Funding and ownership of investment in digital infrastructure assets by market and government sectors, 2022

		Asset Funding		
		Government	**Market Sector**	**Total**
Asset Ownership	**Government**	£14m	n/a	£14m
	Market Sector	£304m	£8,872m	£9,176m
	Total	£318m	£8,872m	£9,190m

Source: Office for National Statistics

Notes

1. Data are presented in current prices.

Table 1 shows which sector funded investment in digital infrastructure and who owns the produced digital infrastructure assets in 2022. Detail on how market sector investment in digital infrastructure was calculated is available in Section 5: Expanding measurement of market sector digital infrastructure investment.

Capital formation by the government sector was £14 million, while the value of investment grants given to the market sector was £304 million. As such, the government sector “owns” £14 million of the infrastructure produced in 2022, while funding total investment of £318 million. Inversely, the market sector, having received £304 million from the government, invested a total of £9.2 billion of infrastructure in total in 2022, of which £8.9 billion they funded themselves.

5 . Expanding measurement of market sector digital infrastructure investment

The market sector is defined as the whole economy, excluding government and the non-profit institutions serving households (NPISH) sectors. Market sector infrastructure investment is estimated using gross fixed capital formation (GFCF) data, taking estimates of annual expenditure in the "other structures" asset class, for a range of relevant industries.

To estimate communications investment, which is essentially synonymous with digital infrastructure, we consider investment figures from industry division 61 - Telecommunications, of the UK Standard Industrial Classification (SIC) 2007.

The "other structures" asset class is defined in System of National Accounts (SNA 2008) (PDF, 9.3KB) as "structures other than buildings, including the cost of the streets, sewer, etc... such as highways, streets, roads, railways and airfield runways; bridges, elevated highways, tunnels and subways; waterways, harbours, dams and other waterworks; long-distance pipelines, communication and power lines; local pipelines and cables, ancillary works; constructions for mining and manufacture; and constructions for sport and recreation."

Several of the assets classified as digital infrastructure by the Organisation for Economic Co-operation and Development (OECD) (PDF, 456KB) are therefore included under this category. However, it notably omits data centres and the equipment within them, software, and permits for the usage of radio spectra.

Digital infrastructure assets and where they are located within the national accounts

Cell towers

- Currently included in estimates: Yes
- Where asset is located in the national accounts: GFCF "other structures"

Network base stations

- Currently included in estimates: Yes
- Where asset is located in the national accounts: GFCF "other structures"

Cables and lines

- Currently included in estimates: Yes
- Where asset is located in the national accounts: GFCF "other structures"

Other communication construction

- Currently included in estimates: Mostly yes
- Where asset is located in the national accounts: GFCF "other structures"

Data centres

- Currently included in estimates: No
- Where asset is located in the national accounts: GFCF "other buildings"

Equipment within data centres

- Currently included in estimates: No
- Where asset is located in the national accounts: GFCF "hardware and telecoms"

Broadband access and internet connectivity systems

- Currently included in estimates: No
- Where asset is located in the national accounts: GFCF "software and databases"

Software to run IT and communications networks

- Currently included in estimates: No
- Where asset is located in the national accounts: GFCF "software and databases"

Radio spectra permits

- Currently included in estimates: No
- Where asset is located in the national accounts: non-produced non-financial assets

However, it is worth noting that not all the GFCF in these categories counts as digital infrastructure investment. For example, while the value of investment into data centres by the telecommunications industry is counted under the "other buildings" asset class, so will investment into offices and shopfronts: these assets are not used for the maintenance of communications systems, and thus should not be considered digital infrastructure investment. Similar problems arise for the "hardware", "telecoms" and "software" asset classes.

The approach taken by the Canadian and Dutch statistical authorities in valuing digital infrastructure investment only includes the "other structures" asset class (called "Civil Engineering" assets in the Netherlands). However, the United States' Bureau of Economic Affairs (BEA) (PDF, 3.5MB), who produce statistics on United States investment in infrastructure, consider all "private communications structures..., computers, communications equipment and software" for a range of digitally intensive industries, North American Industry Classification System (NAICS 2017) codes 515, 517, 518, 519.

The BEA further notes that their methodology would neglect the value of the structures component of data centres, as it would be difficult to separate from the value of offices and other commercial buildings owned by companies in the previous categories. As such, data centres are not included in their methodology.

Therefore, we will estimate the total value of GFCF in "other structures", and a proportion of GFCF in "other buildings", "information and communications technology (ICT) equipment" and "software" for the relevant industries (which are detailed in the following list). It is difficult to know exactly what proportion of the assets owned by companies who provide telecommunications services are considered infrastructure: we have provided the following analysis, based on proportions of relevant asset classes we have determined through consultation with stakeholders, but will continue to revise and revisit these estimates in the future. The proportions we have chosen are detailed in Section 8: Proportions of infrastructure investment in each asset class.

NAICS digital infrastructure codes and industries and their Standard Industrial Classification (SIC) 2007 equivalents

515: Broadcasting

- Closest SIC 2007 code equivalent: 60
- Closest SIC 2007 industry equivalent: Radio and TV broadcasting and programming

517: Telecommunications

- Closest SIC 2007 code equivalent: 61
- Closest SIC 2007 industry equivalent: Telecommunications

518: Data processing and hosting and related services

- Closest SIC 2007 code equivalent: 63.1
- Closest SIC 2007 industry equivalent: Data processing, hosting, and related activities; web portals

519: Other information services

- Closest SIC 2007 code equivalent: 58, 63
- Closest SIC 2007 industry equivalent: Publishing activities, information service activity

The NAICS categories used by the BEA to estimate digital infrastructure investment cover a broader range of industries than the Office for National Statistics (ONS) currently uses, which is only the telecommunications industry.

If we were to follow the American approach, we would extract data from the publishing, radio and TV broadcasting, telecommunications and information service activities industries. However, given the definition of digital infrastructure we are using, and the assets we are considering under that definition, there is no reason to include the broadcasting or publishing industries: while these industries produce the information which is distributed via digital infrastructure, we are only interested in the systems necessary to enable that distribution.

However, we believe, since data centre management and ownership falls under industry 63.1 - Data processing, hosting and related activities; web portals, this industry plays an important role in supporting communications systems, and should be included alongside industry 61 as part of the group of industries involved in digital infrastructure investment.

Users should note that industry 63.1 - Data processing, hosting and related activities; web portals, is currently used in the estimation of investment in "Other" industries in our Infrastructure in the UK, investment and net stocks bulletin, and therefore would see a reduction in investment if this expanded definition was implemented.

6 . Impact on digital infrastructure investment estimates

Figure 3: Digital infrastructure investment reached £9.2 billion in 2022 using an expanded methodology

Market sector investment in digital infrastructure, UK, 1997 to 2022, current prices

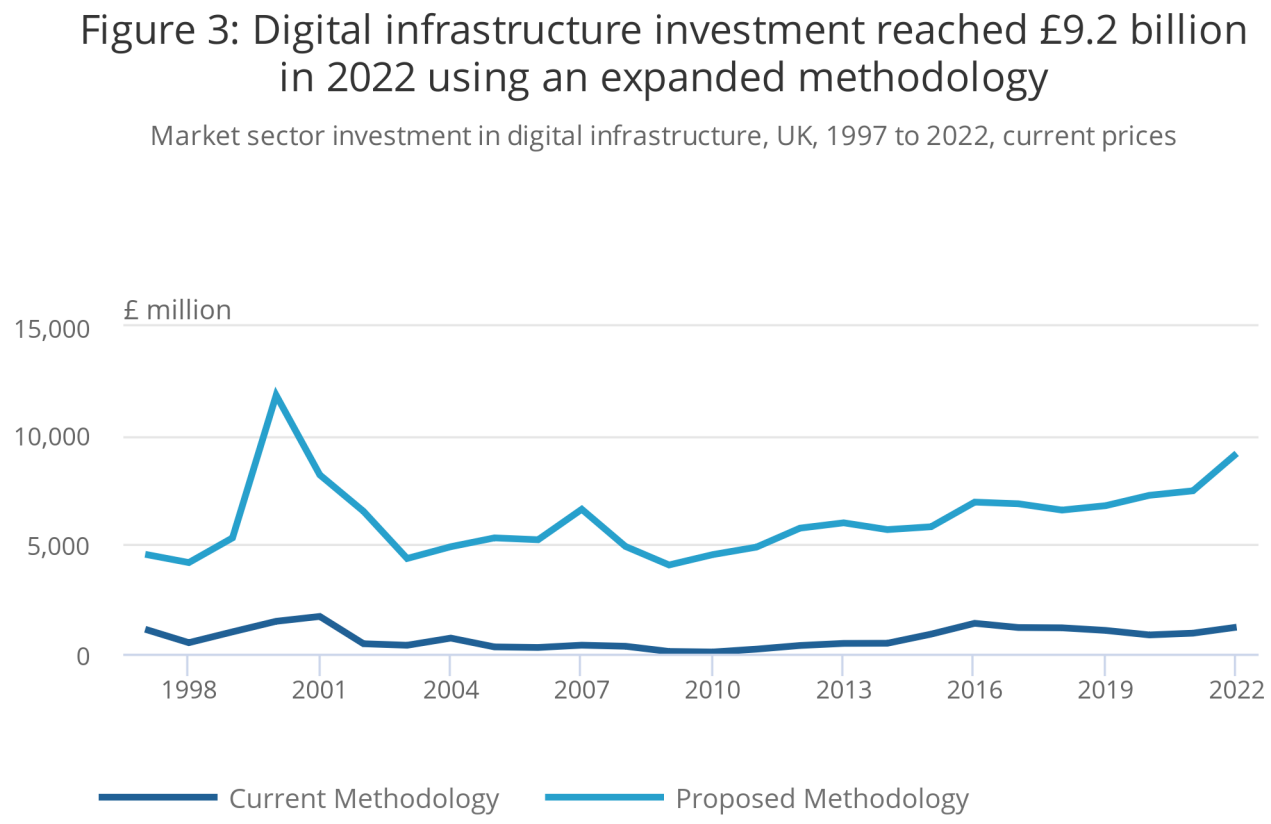


Figure 3 shows market sector investment by industries 61 – Telecommunications, and 63.1 – Data processing, hosting and related activities; web portals in digital infrastructure assets, over the period 1997 to 2022, compared with estimates calculated via our existing methodology.

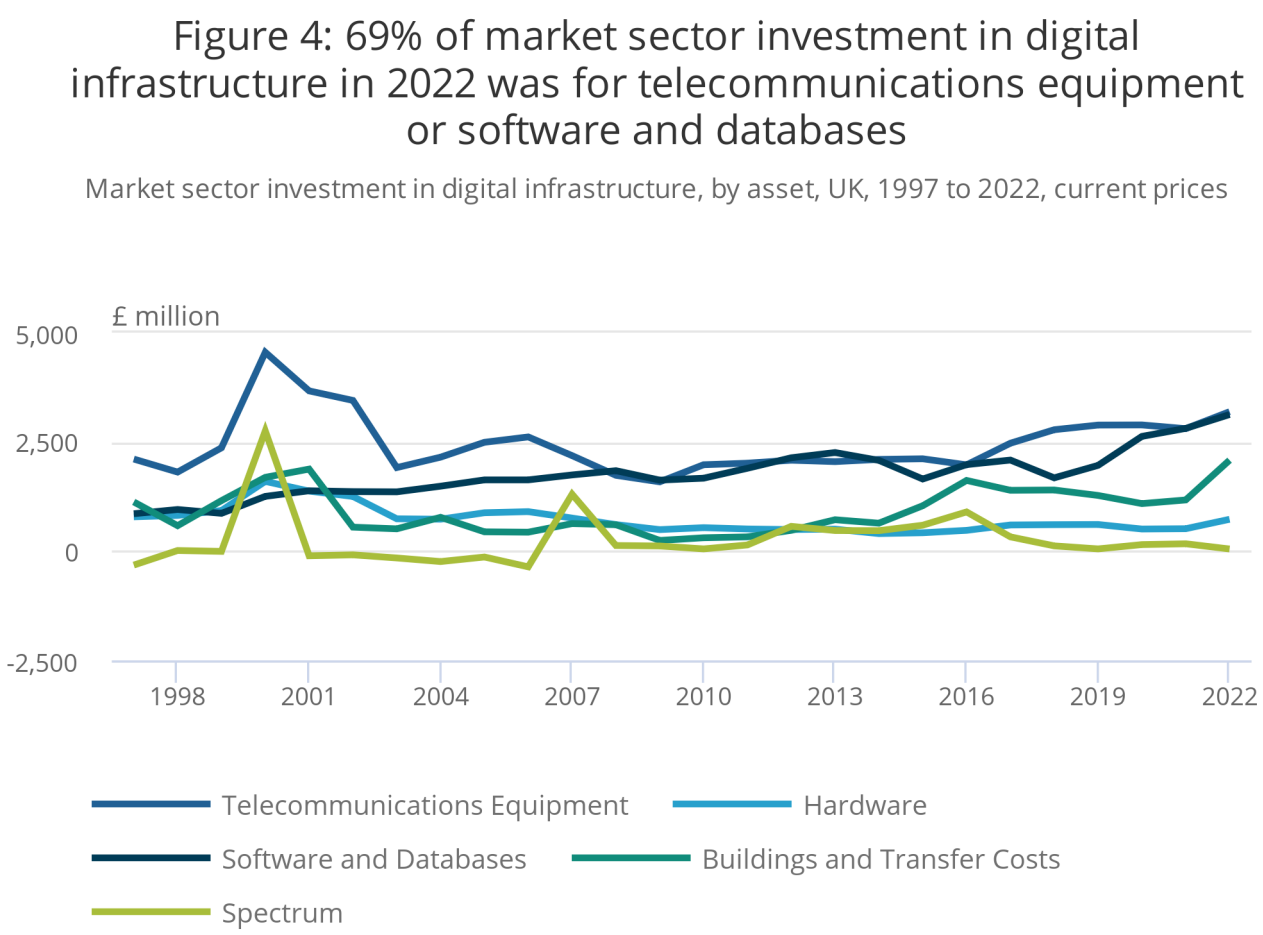
Based on our expanded definition, annual digital infrastructure investment in 2022 reached £9.2 billion, a 22.9% increase relative to 2021 and the highest level of investment since 2000. The £1.7 billion increase is the largest absolute change since 2001 and the largest percentage change since 2008. In contrast, our existing estimates suggest that digital infrastructure investment would have been £1.2 billion in 2022, roughly 13% of our new figures.

Investment grew by 123.2% in 2000 to reach £11.8 billion at the height of the telecoms bubble. However, following the telecoms crash in 2001, investment in digital infrastructure fell sharply, with investment in 2003 just over a third of what it had been three years previously. Since then, investment has had a continuous upward trend for the most part, with peaks in 2007 and 2016 (£6.6 billion and £6.9 billion, respectively), and a slight decline between 2007 and 2009.

Notably investment has remained resilient and even grown during the coronavirus (COVID-19) pandemic and post-pandemic period, with investment higher year-on-year between 2019 and 2022, increasing by 35.3% over this period. In contrast total business investment across the same years increased by only 7.5%.

Figure 4: 69% of market sector investment in digital infrastructure in 2022 was for telecommunications equipment or software and databases

Market sector investment in digital infrastructure, by asset, UK, 1997 to 2022, current prices



Decomposing expanded estimates of digital infrastructure investment into its constituent assets show most of the investment over the period 1997 to 2022 has been in telecoms equipment and software. In 23 of the 26 years for which we have data, these assets have accounted for more than 60% of investment. Both assets have been on a broadly upward trend in recent years, with software investment in 2022 the highest across the time series, and telecoms investment the highest since 2002.

In contrast, investment in hardware has been gradually decreasing since the telecoms crash. Investment in software and hardware in 2002 was broadly similar, at £1.4 billion and £1.3 billion, respectively: however, in the following 20 years, investment in software increased by 129.5%, while investment in hardware has fallen by 41.8%. This may be indicative of changes in the efficiency of different types of capital in maintaining communications systems.

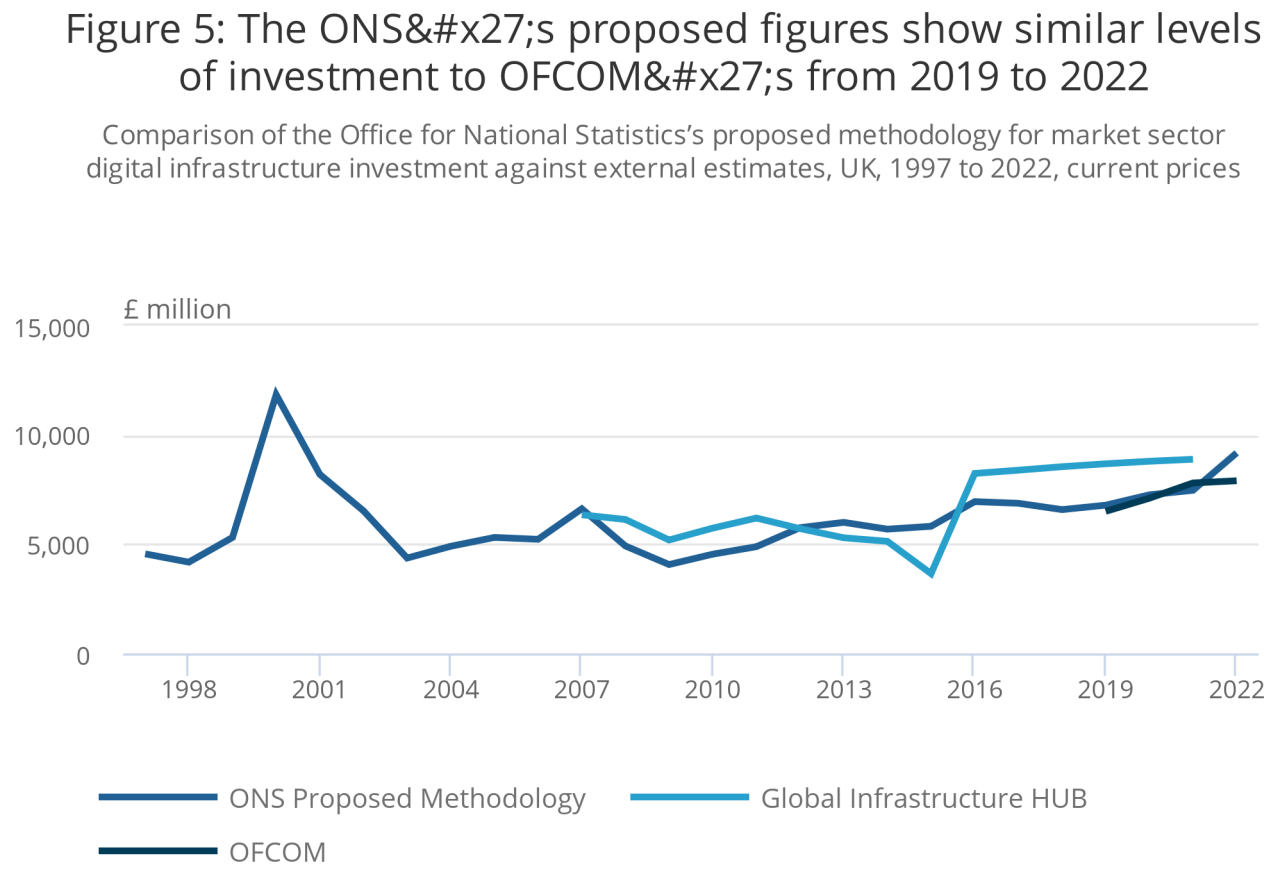
The buildings and transfer costs asset class, which includes "other structures" such as fibre optic cables and base stations, and "other buildings" such as data centres, saw the largest percentage increase in investment of all assets in 2022, of 77.7%. At £2.1 billion, investment in buildings in 2022 was the highest of all years, slightly greater than the £1.9 billion invested in this asset class in 2001. Since 2015, investment in buildings and transfer costs has been greater than £1 billion per year.

There were only three periods where there was significant investment into radio spectra permits: 2000 (£2.8 billion), 2007 (£1.3 billion) and 2012 to 2017 (£3.3 billion), which coincides with the dates of significant spectrum auctions for 3G, fixed and mobile services (such as mobile TV, digital radio and smart meters) and 4G, respectively.

When considering total investment in digital infrastructure assets excluding spectrum, one can see investment increases year-on-year approaching the dates of spectrum auctions: positive growth rates in all years between 1999 and 2000, 2004 and 2006 and 2010 and 2013. This is to be expected, as firms construct the infrastructure necessary to use spectrum won in auctions. The investments in 5G spectrum made in 2018 will be accrued in our data over the next 20 years.

Figure 5: The ONS's proposed figures show similar levels of investment to OFCOM's from 2019 to 2022

Comparison of the Office for National Statistics's proposed methodology for market sector digital infrastructure investment against external estimates, UK, 1997 to 2022, current prices



Source: Office for National Statistics, OFCOM, Global Infrastructure Hub

Figure 5 shows a comparison of our proposed estimates of market sector digital infrastructure investment, against estimates produced by other bodies. The Office of Communications (Ofcom) uses a survey-based method to estimate market sector investment in network infrastructure (which is synonymous with digital infrastructure).

The survey is sent out to approximately 30 of the largest communications providers in the UK and captures data on capital expenditure for fixed and mobile access networks, backhaul networks and intangible assets needed to support connectivity (including software). Ofcom also ask respondents to detail funding received via grants.

The Global Infrastructure HUB (GI HUB) estimate investment in digital infrastructure using a variety of sources, including research institutes such as EDHECInfra and ratings agencies such as Moody's. More detail on GI HUB's methodology can be found in their Infrastructure Monitor 2022 paper (PDF, 36.1MB).

While GI Hub's estimates do differ to an extent, it is reassuring that our numbers are now comparable in scale and show similar trends to theirs.

7 . Summary of our proposal to expand the definition of digital infrastructure and its results on our estimates

This article expands the UK's definition of "infrastructure" beyond our current asset boundary, in line with a growing body of international material on the subject.

Currently, this has been restricted to physical infrastructure assets. For digital infrastructure this meant expanding our definition beyond just considering structures such as fibre cables and cell towers, to include data centres, mobile base stations, intellectual property products (IPPs) and permits that support the operation of these structures. By expanding our definition of digital infrastructure, and valuing a more complete list of assets, we have been able to understand the extent to which we may currently underestimate investment into this vital part of the economy.

Our research has found that, under an expanded definition of digital infrastructure, market sector investment in 2022 was £9.2 billion, significantly higher than the £1.2 billion suggested by our existing approach.

Further, by considering how government funding for digital infrastructure is distributed, rather than just looking into the communications assets owned by the government, we have found that, since 1995, the government has given the market sector £2.9 billion to fund the creation of digital infrastructure assets. The value of these assets is captured within these current price market sector estimates.

8 . Proportions of infrastructure investment in each asset class

As discussed in the market sector investment section, following sensitivity analysis in conjunction with stakeholders, we have arrived at the following proportions of investment in each asset class, which we consider infrastructure investment:

- telecoms: 80% of all investment by industries 61 and 63.1
- software: 60% of all investment by industries 61 and 63.1
- hardware: 60% of all investment by industries 61 and 63.1
- buildings and transfer costs: 75% of all investment by industries 61 and 63.1
- spectrum: 100% of spectrum sold by the government, which most likely was purchased by telecommunications companies

9 . Glossary

Infrastructure assets

Infrastructure assets are considered fixed capital assets, which have an economic life of at least one year. The asset stock is determined by the investments made in the current and previous periods.

General government

In paragraph 2.111 of the European System of Accounts (ESA) 2010 framework, the general government (GG) sector (S.13) is defined as consisting "of institutional units which are non-market producers whose output is intended for individual and collective consumption and are financed by compulsory payments made by units belonging to other sectors, and institutional units principally engaged in the redistribution of national income and wealth".

Market sector

The market sector is defined as the whole economy, excluding all government and the non-profit institutions serving households (NPISH) sectors. In relation to digital infrastructure, it covers industries 61 - Telecommunications, and 63.1 - Data processing, hosting and related activities; web portals. For more details on the industries used to estimate total market sector investment in all types of infrastructure, see the Glossary of Infrastructure in the UK, investment and net stocks: July 2024.

10 . Data sources and quality

Investment (gross fixed capital formation) and capital stocks -- definition by "asset (other structures) and industries".

Government-- definition by "Classification of the Functions of Government" (COFOG).

Official statistics in development

These statistics are labelled as "official statistics in development". Until September 2023, these were called "experimental statistics". Read more about the change in the guide to official statistics in development (opens in a new tab).

We are developing how we collect and produce the data to improve the quality of these statistics. Once the developments are complete, we will review the statistics with the Statistics Head of Profession. We will decide whether the statistics are of sufficient quality and value to be published as official statistics, or whether further development is needed. Production may be stopped if they are not of sufficient quality or value. Users will be informed of the outcome and any changes.

We value your feedback on these statistics. Contact us at nfa-development@ons.gov.uk.

11 . Future developments

We intend to include figures consistent with the expanded definition of digital infrastructure in future editions of our Infrastructure in the UK, investment and net stocks articles.

We will also consider the Organisation for Economic Co-operation and Development (OECD)'s proposal for the description of infrastructure assets (PDF, 644KB) as a "set of fundamental facilities and systems composed of public and private physical structures as well as intellectual property products supporting the effective operation of these structures" in redefining other UK infrastructure functions.

As such, we welcome all feedback from stakeholders on these proposed changes to our methodology, particularly regarding the asset classes we have included within our expanded definition, and the proportions of each asset class we intend to capture.

12 . Related links

Infrastructure in the UK, investment and net stocks: July 2024
Article | Released 22 July 2024
Update of existing estimates of investment and net stocks of infrastructure in the UK economy.

Developing new statistics of infrastructure: August 2018
Article | Released 21 August 2018
The second in a series of articles on infrastructure statistics, updating measures of infrastructure investment and introducing measures of infrastructure stocks.

Developing new measures of infrastructure investment: July 2017
Article | Released 5 July 2017
The first in a series of articles on infrastructure statistics, focusing on definitional and data challenges in measuring infrastructure investment.

13 . Cite this article

Office for National Statistics (ONS), released 31 July 2024, ONS website, article, Redefining investment in digital infrastructure in the UK