Dynamic Mapping of the Information Economy Industries

Nesta techUK

A Nesta report by Mark Spilsbury for techUK. September 2015

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Foreword - techUK

The pace and growth of the UK tech industry over the last decade is a global success story, and this in turn has raised a number of questions from economists, industry and policy-makers alike in how that growth is defined and measured. Call it the Information and Communications Technology (ICT) sector, the information economy, the digital economy, or just tech – there are a number of terms used to measure and describe different parts of this phenomena. Many, including Sir Charlie Bean, former deputy governor of the Bank of England, have argued that the scale and pace of the internet revolution have rendered much of the approach to official statistics out of date. In the last two years, there have been a number of new approaches – including most notably from Accenture, Deloitte, Nesta, NIESR and Tech City UK. The result has been a welcome and growing community of interest in how we can complement and build on more traditional approaches to measuring the modern economy.

That is why techUK is pleased to have worked with Mark Spilsbury and Nesta on this research paper, a useful contribution to this growing collection of work. It applies a 'dynamic mapping' method, originally constructed to better capture creative industries through official statistics, to employment in the information economy industries. Our thanks goes to Google UK for their support on this report.

The digital technologies produced by the companies that techUK represents are having a transformative and positive economic contribution, and that cannot always be captured through traditional approaches to measurement. Policy-makers need evidence that keeps pace with a changing economy and techUK will continue to play an active role in informing that debate.

Charlotte Holloway
Head of Policy and Associate Director, techUK

Foreword - Nesta

The growing importance of the information economy and allied concepts like the ICT sector and digital economy has led policymakers to seek more rigorously constructed metrics than have been previously available. But policymakers' demands for metrics vary depending on their uses: in some cases, it is important to have timely data with industrial and occupational classifications which can identify cutting edge developments in the economy. In other cases, the metrics must be strictly consistent with the official classifications - to enable comparison with other sectors on a consistent basis - and make use of national accounts data sources.

This report, by consultant, Mark Spilsbury, applies to the information economy the Dynamic Mapping method that was first developed in 2013 by Nesta for the purposes of measuring the creative economy and which we then applied in 2015 to the high-tech economy. It is our belief that this approach is the preferred one in cases where consistency with official classifications and data is an important consideration (a significant reason why the method was adopted by the Department for Culture, Media and Sport in 2014). As such, it complements alternative 'big data' efforts - such as the National Institute of Economic and Social Research's work for Nesta - which rely on non-official classifications derived from big data.

As ever, we would welcome your comments.

Hasan Bakhshi, Director, Creative Economy, Nesta

Executive Summary

This report considers the classification of the **Information Economy Industries** by applying a Dynamic Mapping analysis. This is an examination of the distribution of employment in ICT-related occupations across industries, which we use to identify ICT intensive industries: Information Economy Industries. The Information Economy as a whole consists of employment in these industries and those employed outside them in ICT-related occupations.

The research has as its basis the occupations used in BIS's Information Economy analysis. In discussions across the sector, undertaken as part of this project, no clear additions to this list of occupations (as measured by Standard Occupational Classifications, SOCs) were suggested. However, the discussions did highlight that the current SOC classifications are not adequately capturing emerging job roles, particularly in the area of data analytics, in such roles as Data Developer, Data Administrators and Data Scientists.

Employment in these ICT-related occupations is just below 1.2 million, some four per cent of all employment in the economy (unless stated otherwise, figures here and elsewhere are an average of 2013-14 data). Employment in the ICT-related occupations has been increasing over recent years, at a faster rate than growth in overall employment. As a result, the proportion of employment accounted for by these occupations has grown from 3.3 per cent in 2004 to 3.9 per cent in 2012 and is forecast to continue to grow to 4.2 per cent by 2022.

Employment in these occupations is relatively finely spread across the economy. Whilst there are clearly two main clusters in what might be regarded as the 'core' ICT sectors of Computer consultancy activities (SIC 62.02) and Computer programming activities (SIC 62.01), after this no single industry accounts for more than three per cent of all ICT-related occupational employment.

The **Dynamic mapping analysis** uses an industry's employment proportion of ICT occupations in its workforce as a measure of whether or not it should be classified as an Information Economy Industry for our purposes. The ICT-intensity is calculated for all industries in the economy and then used to identify which industries are particularly intense employers of ICT occupations. Of the 606 4-digit industries that make up the UK economy, nearly half (48 per cent, 202 sectors) have a zero level of intensity, with a further third (35 per cent, 210 sectors) having a low-level intensity of below five per cent. The number of industries with high intensities are relatively few: 16 out of the 606 (2.6 per cent) have an ICT-intensity of 30 per cent and above.

An application of two filters - an ICT intensity threshold of 30% per cent - and an industry having a minimum employment size (to account for data reliability in small samples), gives us our baseline set of industries for inclusion as Information Economy Industries. A consideration of other potential industries which might be candidates for inclusion – on the basis of (i) size, (ii) proximity to the threshold and (iii) proximity within the standard industrial classification (SIC) codes suggests only minor modifications to this list and leads to a suggestion that the classification should include:

The individual industries in these codes are shown below:

Information Economy Industries based on Dynamic Mapping	
SIC code	**Industry name**
26.20	**Manufacture of computers & peripheral equipment**
58.2	**Software publishing, including:**
58.21	Publishing of computer games
58.29	Other software publishing
61	**Telecommunications, including:**
61.10	Wired telecomms activities
61.20	Wireless telecomms activities
61.30	Satellite telecomms activities
61.90	Other telecomms activities
62	**Computer programming, consultancy and related activities, including:**
62.01	Computer programming activities
62.02	Computer consultancy activities
62.03	Computer facilities management activities
62.09	Other IT & computer service activities
63.11	**Data processing, hosting & related activities**
95.11	**Repair of computers & peripheral equipment**

Based on this classification, the size of employment in the **Information Economy Industries** is 899,000. This is lower than the size under the Tech Partnership* classification (which is a broader classification) which has the highest employment level at 1,016,000 and higher than that suggested by the BIS classification (839,000).

This analysis suggests that the total size of the **Information Economy** workforce is 1,529,000, some five per cent of the UK economy. This is made up of the 899,000 workers within the Information Economy Industries (59 per cent) and 630,000 ICT-related occupational employment in non-ICT industries (41 per cent).

The reach of the Information Economy is constantly evolving and pushing into new areas, but the extent to which we can immediately identify its evolution in an analysis such as this is partly limited by the constraints of the current SIC and SOC classifications. This supports the efforts of bodies like Nesta and Tech City UK in exploring approaches to classifications using big data. This analysis should be seen as consolidating the current official classification – with the added reassurance that it has come from an in-depth consideration of the SOC classifications – which leaves the sector better placed to engage with the ONS when it reviews the SOC and SIC codes in the future.

*The original research was done under the e-skills brand which is now known as The Tech Partnership.

1. Background

The Information and Communications (ICT) sector (described by the Government as the 'Information Economy') has been classified for measurement purposes by BIS using a set of Standard Industrial Classification (SIC) codes[2] and Standard Occupational Classification (SOC) codes. Based on this classification Tech Partnership UK has produced estimates of the size of the sector[3]. Whilst this classification is pragmatic and clear, some believe it is too narrow and does not fully capture the production of ICT goods and services by firms outside of the traditionally-defined ICT industries.

Having the best possible definition, and one that has buy-in from newer as well as more established parts of the sector is important. It means that government will have a more consistent picture of the sector when formulating policy, not least if it means that emerging and fast growing sub-sectors can be more easily identified and supported. Because of this, members of the Information Economy Council and techUK are exploring possible classifications which consider a wider range of industries and occupations.

It should be noted that this analysis is, by design, totally located within the confines of the current official classification systems that the UK government (and others around the world) use to define industrial sectors (the SIC) and occupations (the SOC). This is essential insofar as policymakers need Information Economy estimates that are based on official data sources and are consistent with the treatment of other sectors in the national accounts. To the extent that these official classifications fail to describe and capture the activities of the ICT sector and ICT employees, however, the classification will not fully reflect the extent of activity in those areas. Some researchers, including Nesta, are exploring the use of alternative 'big data' classification systems, but these bring with them their own challenges when used for policy purposes (not least that they are typically based on proprietary algorithms making replicability impossible[4]).

We circulated an initial discussion paper in this process for comment which clarifies how the sector is currently classified (by BIS) and the occupational codes which are key to understanding this classification.

This subsequent paper:

1. Gathers those comments received to discuss the occupations which could and should be included in the classification of the Information Economy; and

2. Describes the **Dynamic Mapping** analysis which involves examining the industry distribution of employment of ICT-related occupations to identify ICT-intensive, or Information Economy Industries.

This paper is structured so that:

- **Section 2** discusses the boundaries of the Information Economy classifications;
- **Section 3** describes the list of occupations which are currently included in the Information Economy estimates and discusses possible additions to this list;
- **Section 4** looks at employment in these ICT-related occupations, including how it is distributed across industries;
- **Section 5** contains the Dynamic Mapping analysis, examining which industries employ a particularly high proportion of their workforce in ICT-related occupations (their ICT intensity) to identify information industries;
- **Section 6** considers other industries that might be meaningfully included as information industries[6];
- **Section 7** compares the structure of different classification of the Information Economy industries;
- **Section 8** estimates the employment levels in the wider Information Economy, that is employment in the Information Economy Industries, plus those ICT workers who are working in other industries; and
- **Section 9** discusses the findings.

2. Defining the boundaries of the Information Economy

Readers of the first discussion paper sought clarification about what (exactly) we are trying to draw the boundaries around and the language that is used to describe this. There is a perception that people may mean different things when talking about the Information Economy, ICT Industries, Digital Economy, and so on, and sometimes mean different things when adopting the same title.

In what follows we assume that:

The **Information Economy Industries** refers to ICT companies alone (as used by BIS and the Information Economy Council). A recent report by NIESR for Nesta uses the term 'Information Economy Industries' to be consistent with BIS and the Information Economy Council[7].

The **Information Economy** refers to the Information Economy Industries plus those ICT workers who are working in other industries across the economy.

The **Digital Economy** refers to what we might think of as ICT companies and companies which either provide digital content or who rely on digital technology to conduct their business. This lacks a classification based on official industrial codes[8].

In this exercise, we are working towards a classification of the first two – the Information Economy Industries and the wider Information Economy, but **not** the Digital Economy.

3. The list of SOC titles included

As a reminder, the occupations which are included in the current Information Economy classification are as follows:

Table 1: Occupations included in the Information Economy estimates

SOC Code	SOC Title
1136	IT and telecommunications directors
2133	IT specialist managers
2134	IT project and programme managers
2135	IT business analysts, architects & system designers
2136	Programmers & software development professionals
2137	Web design & development professionals
2139	IT & telecommunications professionals not elsewhere classified
3131	IT operations technicians
3132	IT user support technicians
5242	Telecommunications engineers
5245	IT engineers

Source: Information Economy: Economic Estimates 2013.

Through our consultation process and discussions with other parties, no clear additions to this list of SOCs have been suggested, with no apparent or obvious omissions identified either.

Perhaps this is not surprising – the list of ICT-related occupations has been the subject of some considerable thought by informed analysts over recent years and one would therefore not expect there to be immediately obvious additional SOC codes to be included from the SOC2010 classification. The Office for National Statistics (ONS) descriptions of job titles which underpin the 4-digit SOC codes have also gone some way to reassuring consultees that many of the jobs which they are concerned about have been adequately included in the SOC 2010 classification[9].

A number of points have been raised in discussions, however:

- Jobs related to **telecommunications:** there is some debate over whether the explicit inclusion of 'Telecommunications' is still appropriate in an Information Economy classification. With the increasing degree of integration and consolidation, telecommunications occupations are arguably more related to engineering than to ICT. Even if it were agreed, however, removing telecommunications workers completely from the current SOC definitions is simply not possible – mostly the SOC definitions combine IT and telecommunications occupations, as in SOC codes 1136 (IT and telecommunications directors) and 2139 (IT and telecommunications professionals nec[10]). The only explicit Telecommunications occupation which is identified separately from IT occupations, and which could therefore in practice be removed, is SOC 5242 (Telecommunications engineers).

- Jobs related to **data analytics:** a recent Tech Partnership report on 'Big data analytics'[11] suggests that whilst many data-related jobs are adequately included in the current SOC, some emerging job roles may not be captured accurately. The report assesses market demand for a number of job roles and from this we can match to a set of 4-digit SOC[12] codes, as shown below. Whilst some do match to a SOC code, the distinction in the SOC coding between 'data' and 'database' is nuanced and seems to describe different job roles. Because of this the job titles do not easily match to the SOC titles. Table 2 below sets out the relationship between job roles in this area and the current SOC classification. It is worth noting that:

  - The job role of **data developer** is probably not equivalent to a database developer which appears within the SOC. Database developers develop databases which address specific needs, whereas data developers arguably look across existing databases (and data) and find ways to develop new ways of using the data. The latter are roles which require more creative skills than a database developer per se;

  - Similarly, the job role of **data designer** is likely to be much wider in scope than **'database designer'** within the SOC. Arguably database design will emerge in the future as a subset of the skill set of data designers;

  - Data analyst job roles correspond in part to the non-ICT-related SOC code of 3539 (Business and related associate professionals nec). Other job titles linked to this SOC include Business systems analysts, Marine consultants, Planning assistant, Project administrator and Project coordinator, however;

  - There are particular challenges related to the job role of **'data scientist'.** This is clearly an emerging occupation – the Tech Partnership paper finds some jobs being advertised in this area (although they are very much a minority of identified 'big data' vacancies at two per cent of the 21,000 identified) and others note their emergence (including within Government). However, there is no consensus on what data scientists do, what training they have etc[13]. To include this as a job role when there is limited agreement on what the role is, is not at this stage feasible.

Table 2: Relationship between emerging job roles and the SOC

Job role	Nearest job role in ONS's matching tool	Equivalent SOC		In existing SOC list
Data developers	Database developer	2136	Programmers and software development professionals	No
Data architects	Data architects	2135	IT business analysts, architects and systems designers	Yes
Data analysts	Database analysts	2136	Programmers and software development professionals	Yes
	Data analysts	3539	Business and related associated professionals nec	No
Data administrators	Database administrators	3131	IT operations technicians	Yes
Data consultants	The term 'consultant is too generic for an accurate matching in the SOC – nearly all occupations can have the title 'consultant' applied			No
Project managers	IT project managers	2134	IT projects and programme managers	Yes
Data designers	Database designers	2135	IT business analysts, architects and systems designers	No
Data scientists	Whilst the term 'scientist' frequently appears across many job titles in the SOC, none are specifically attached to the word 'data' and there are no close matches.			No

- Jobs related to **data coding**: Other job titles have been suggested and identified as being potentially ICT-related but on investigation these are found to be included in wider occupational groups. For example, those involved in data coding are included in SOC 4131 (Records clerks and assistants who 'maintain and update electronic and/or hard copy documents, correspondence and other records and organise their storage'). This is a substantial occupation (it employs some 119,000 across the economy, of whom 31,500 work in a single sector - SIC 86.10, Hospital activities), but is it sufficient to include it as an ICT occupation?
- Jobs related to the **public sector:** other examples where the current list may not fully capture the full ICT-nature of work relate to the public sector. The current list does not have any public sector occupations, yet the public sector now has a key ICT role e.g. in facilitating open data. However, public sector occupations are only very broadly captured in the SOC codes with two generic codes being SOC 1115 (Chief executives and senior officials) and 3561 (Public services associate professionals). If a public/civil servant has a specific IT role and is titled as such then we presume that they will be coded appropriately in the data. Indeed the Labour Force Survey data suggests that there are substantial numbers who are identified as such, with, for example, 8,000 IT specialist managers (SOC 2133), 5,500 Programmers and software development professionals (SOC 2136) and 3,500 IT business analysts, architects and systems designers' (SOC 2135) being employed in the main public sector SIC code (SIC 84.11 General public administration activities).

A distinction needs to be drawn between those occupations which are heavily reliant on ICT but are not best described as ICT-occupations per se. The boundary between these two – fuzzy at best – may of course change over time: we may include an occupation that is heavily reliant on digital technology today, but which becomes commonplace in quite a short space of time.

The issue here is one of balance. There is no doubt that there will be some ICT-related job titles which are coded with a 4-digit SOC which is not regarded as an ICT-related occupation. However, the balance of job roles within that SOC occupation is such that we should not regard it, overall, as an ICT one. The opposite is also true: there may be some job roles within the occupations we have classified as being ICT which actually are not.

The issue is whether or not the balance of the job roles in the occupation is sufficiently ICT-related to warrant the inclusion (or not) of the 4-digit SOC as an ICT-related one. With the most disaggregated classifications we have – the 4-digit SOC – we do not have the ability to exclude non-digital jobs from within any selected occupational group. In this analysis we err on the side of caution and do not include any occupations which could be regarded as highly contested – it is important that the classifications in this study are not seen as artificially 'boosting' the estimated size of the sector.

4. Employment in ICT-related occupations

The UK Labour Force Survey suggests that there are just below 1.2 million people employed in ICT-related occupations, some 4 per cent of all employment in the economy[14]. The biggest single occupation is Programmers and software development professionals (SOC 2136) which accounts for 21 per cent of employment in ICT-related occupations (some 255,000), followed by ICT specialist managers (SIC 2133) with 15 per cent (181,000) and IT and telecommunications professionals nec (SOC 2139) at 14 per cent (166,000).

Table 3: Employment in ICT-related occupations

Occupation			
SOC Code	**SOC title**	**Employment Level**	**% of all ICT-related occupations employment**
ICT-related occupations			
1136	IT and telecommunications directors	67,000	6
2133	IT specialist managers	181,000	15
2134	IT project and programme managers	61,000	5
2135	IT business analysts, architects & systems designers	105,000	9
2136	Programmers and software development professionals	255,000	21
2137	Web design & development professionals	65,000	5
2139	IT & telecommunications professionals nec	166,000	14
3131	IT operations technicians	109,000	9
3132	IT user support technicians	93,000	8
5242	Telecommunications engineers	50,000	4
5245	IT engineers	37,000	3
Total ICT-related occupations		**1,189,000**	**100**
		(4%)	
Total all other occupations		**28,826,000**	
		(96%)	
Total (all economy)		**30,015,000**	
		(100%)	

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.

Note: all numbers rounded to nearest 1,000

The number of workers who work in these ICT-related occupations has been steadily increasing over the last decade, and are forecast to continue to do so, at a faster rate than overall employment in the economy. This means that the proportion that the ICT-related occupations will make up of overall employment will also increase, from 3.3 percent in 2004 to 3.9 per cent in 2012 and to a forecast of 4.2 percent in 2022[15].

Table 4: Change and forecast change of ICT-related occupational employment

	2004	2014	2022	Change 2014 - 2022	
				absolute	%
ICT-related employment	1,014,000	1,259,000	1,408,000	149,000	11.9
ICT-related intensity (%)	3.3	3.9	4.2		
Non-ICT employment	29,295,000	30,987,000	32,373,000	1,385,000	4.5
All employment	30,309,000	32,246,000	33,781,000	1,535,000	4.8

Source: Working Futures, 2012 – 2022, UK Commission for Employment and Skills.

These occupations are relatively thinly spread across the economy. Table 5 below identifies all the sectors in which at least one per cent of all ICT-related occupational employment is to be found. Whilst there are two main clusters in what we might regard as 'core' ICT sectors of Computer consultancy activities (SIC 62.02)[16] with employment of 214,000 (or 18 per cent of all ICT-related occupational employment) and Computer programming activities (SIC 62.01) with employment of 184,000 (15 per cent). After this, no single sector accounts for more than three per cent of all ICT-related occupational employment. 28 per cent of all ICT-related occupational employment is spread across sectors which do not, individually, account for more than half of one per cent of all ICT-related occupational employment.

Whilst (obviously) the Information and communication sectors are the main employers of ICT-related occupations (about 42 per cent of the total), the table below shows how other sectors are also significant employers including:

- The **public sector**, with 126,000 (or 11 per cent) across the various public sector service areas of defence, education and health, and including a substantial 35,000 within the core Civil Service (including Local Government);
- **Professional service** activities, including engineering consultancy, business and management consultancy and legal activities, which collectively employ 67,000 (six per cent); and
- **Financial services**, which collectively employ 63,000 (six per cent).

This does not necessarily mean that we should regard all these sectors as Information Economy Industries – for this we need to look at intensities (the proportion of their employment that is in information occupations).

Table 5: Industrial distribution of ICT-related occupational employment

Industry			
Code	**Name**	**Employment Level**	**%**
ICT-related		**498,000**	**42**
62.02	Computer consultancy activities	214,000	18
62.01	Computer programming activities	184,000	15
61.20	Wireless telecommunications activities	37,000	3
62.09	Other IT & computer service activities	23,000	2
61.10	Wired telecommunications activities	23,000	2
63.11	Data processing, hosting & related activities	9,000	1
61.90	Other telecommunications activities	8,000	1
Public sector		**126,000**	**11**
84.11	General public administration activities	35,000	3
85.42	Tertiary education	25,000	2
85.31	General secondary education	17,000	1
86.10	Hospital activities	13,000	1
88.99	Other social work activities without accommodation nec	11,000	1
84.12	Regulation of activities providing social services	11,000	1
84.22	Defence activities	8,000	1
85.59	Other education nec	6,000	1
Professional services		**67,000**	**6**
71.12	Engineering activities & related technical consultancy	26,000	2
70.22	Business & other management consultancy activities	25,000	2
72.19	R&D on natural sciences & engineering	8,000	1
69.10	Legal activities	8,000	1

Financial services		**63,000**	**6**
64.19	Other monetary intermediation	25,000	2
65.12	Non-life insurance	14,000	1
66.12	Security & commodity contracts brokerage	12,000	1
64.92	Other credit granting	6,000	1
66.19	Other activities auxiliary to financial services, except insurance & pension funds	6,000	1
Manufacturing			
26.20	Manufacture of computers & peripheral equipment	22,000	2
Retail		**15,000**	**2**
47.91	Retail sale via mail order houses or via the internet	8,000	1
47.41	Retail sale of PC equipment & accessories in specialised stores	7,000	1
Other services			
95.11	Repair of computers & peripheral equipment	21,000	2
All other sectors		**335,000**	**28**
Total ICT-related occupations		**1,189,000**	**100**

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.
Note: all numbers rounded to nearest 1,000

5. The Dynamic Mapping Analysis

To inform our discussion on the industry make-up of the Information Economy we use below an analytical technique called the Dynamic Mapping[17]. This uses an industry's proportion of employment of ICT occupations in its workforce as a measure of whether or not it should be classified as an Information Economy Industry for measurement purposes. It involves us calculating for each 4-digit SIC code an ICT intensity i.e. the proportion of employment in an industry that is in an ICT-related occupation[18]. Note that ICT intensity is computed in all industries in the economy – the identification of industries is therefore data-driven and is not predetermined.

The distribution of these intensities for the 606 4-digit industries that make up the UK economy are shown below. As can be seen:

- Around half (292 or 48 per cent of the total) of industries have a zero level of intensity i.e. the LFS does not report any ICT workers employed in that industry) or a low level below five per cent (210, 35 per cent);
- The number of industries with high intensities are relatively few: 25 (3.9 per cent of all industries) have an ICT intensity of 20 per cent and above, 17 (2.6 per cent) have an ICT-intensity of 30 per cent and above[19].

Table 6: Distribution of ICT Intensities

	Industries with that ICT intensity	
Level of ICT intensities (%)	**Number of industries**	**%**
Zero	292	48.2
0.1 to 4.9	210	34.7
5.0 to 9.9	51	8.4
10.0 to 14.9	20	3.3
15.0 to 19.9	8	1.3
20.0 to 24.9	3	0.5
25.0 to 29.9	5	0.8
30.0 to 34.9	1	0.2
35.0 to 39.9	4	0.7
40.0 to 44.9	1	0.2
45.0 to 49.9	2	0.3
50.0 to 54.9	3	0.5
55.0 to 59. 9	0	0.0
60.0 to 64. 9	0	0.0
65.0 to 69.9	1	0.2
70.0 to 74.9	2	0.3
75.0 to 79.9	2	0.3
80.0 to 84.9	0	0.0
85.0 to 89.9	0	0.0
90.0 to 94.9	0	0.0
95.0 to 95.9	0	0.0
100	1	0.2

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.

The highest level of ICT intensity is in SIC 95.11 (Repair of computers and peripheral equipment) at 78.7 per cent, followed by SIC 58.29 (Other software publishing) at 75.3 per cent, then a group of the 'core' ICT industries of SIC 62.09 (Other IT & computer service activities) at 73.9 per cent, SIC 62.02 (Computer consultancy activities) at 70.4 per cent, SIC 62.01 (Computer programming activities) at 69.2 per cent and SIC 62.03 (Computer facilities management activities) at 53.1 per cent, with SIC58.21 (Publishing of computer games) at 54.6 per cent.

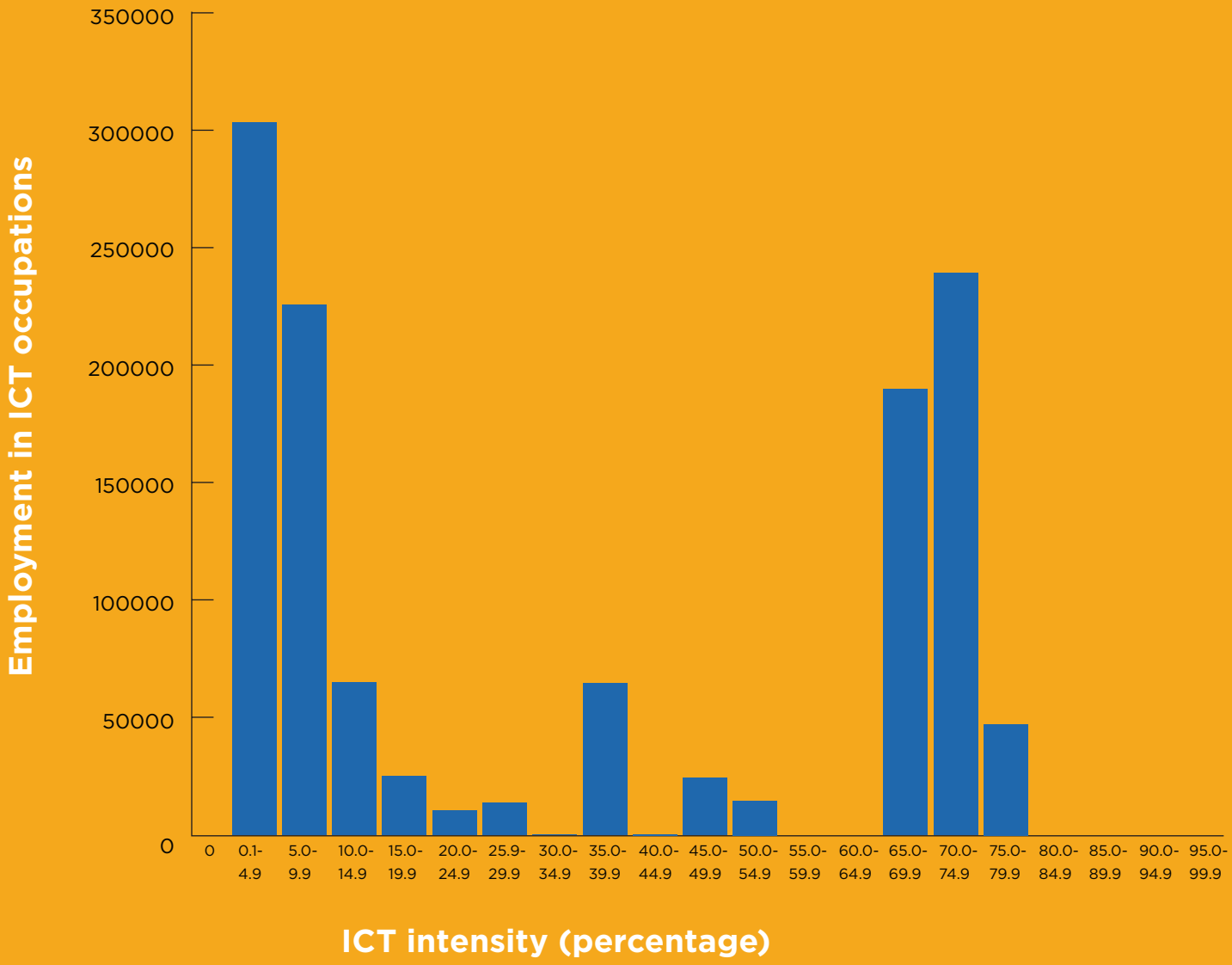
Table 7: Industries with an ICT intensity of more than 20 per cent

Industry				
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
95.11	Repair of computers & peripheral equipment	78.7	27,000	21,000
58.29	Other software publishing	75.3	16,000	12,000
62.09	Other IT & computer service activities	73.9	32,000	23,000
62.02	Computer consultancy activities	70.4	303,000	214,000
62.01	Computer programming activities	69.2	265,000	184,000
58.21	Publishing of computer games	54.6	3,000	2,000
62.03	Computer facilities management activities	53.1	8,000	4,000
63.11	Data processing, hosting & related activities	51.2	17,000	9,000
27.31	Manufacture of fibre optic cables	49.5	3,000	1,000
26.20	Manufacture computers & peripheral equipment	46.6	46,000	22,000
63.99	Other info service activities nec	40.3	2,000	1,000
61.20	Wireless telecommunications activities	39.7	93.000	37,000
61.10	Wired telecommunications activities	39.1	58,000	23,000
61.30	Satellite telecoms activities	37.9	4,000	1,000
18.20	Reproduction of recorded media	35.0	5,000	2,000
8.99	Other mining and quarrying nec.	32.7	1,000	*
61.90	Other telecommunications activities	29.3	26,000	8,000
46.14	Agents involved in the sale of industrial equipment, ships & aircraft	27.3	2,000	1,000
28.24	Manufacture of power-driven hand tools	27.6	2,000	1,000
09.90	Support activities other mining and quarrying	27.5	4,000	1,000
30.40	Manufacture of military fighting vehicles	27.0	1,000	*
58.12	Publication of directories & mailing lists	22.2	2,000	*
42.22	Construction of utility projects for electricity & telecommunications	20.7	17,000	3,000
26.30	Manufacture of communications equipment	20.4	22,000	5,000

*Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014. Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match. Where the industry is very small and the rounded numbers is less than 1,000 the data is shown as a *.*

A second way of looking at the distribution of ICT intensities is to consider the employment distribution across the industries which have different levels of ICT intensity. The diagram below shows that there are two clear peaks of high levels of employment – one in those industries which have a low level of ICT intensity (peaking at below 10 per cent levels of ICT intensity) and one in those with higher levels – at ICT intensity levels of between 65 and 75 per cent. This suggests that ICT occupations are pervasive across many industries at a low level: many companies will have a few ICT-related staff, but ICT is not the main activity of the business. The industries which have higher ICT intensities are those which have ICT as a main activity. Which suggests a clear difference between the ICT-related nature of the industries in the two respective clusters.

Figure 1: Distribution of ICT occupation employment by industries' ICT intensities



Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.

The next question is which of these should be included in our proposed Information Economy Industries?

We propose two filters:

- On a data reliability basis, that we only include those industries where **total employment is greater than 10,000.** Employment below this level may be scoring a high intensity because of small sample anomalies. The only exception to this is where a 4-digit SIC is part of a wider 2-or-3-digit sector where all the other codes have been included; and
- **An ICT intensity threshold of 30 per cent.** Our selection of 30 per cent has been informed by (i) the distributions shown in Figure 1 above where there appears to be a divide between lower and higher intensity industries which falls around this level and (ii) the nature of the industries which fall either side of the 30 per cent divide as seen in Table 7 above[20]. Above 30% ICT intensity there are arguably two groups of industries shown in Figure 1. Those with intensities in the range 35% - 55% and another group of industries with intensities in the range 55% plus. The majority of the ICT employment in the 35%-55% range is accounted for by three industries: Manufacture of computers & peripheral equipment 26.20, Wireless telecommunications activities 61.20 and Wired telecommunications activities 61.10. The two telecommunications industries fall with both the BIS and Tech Partnership information industries definition, while the Manufacture of computers and peripheral equipment falls within the Tech Partnership definition. A threshold of 55% would therefore have the main effect of excluding two large industries where there is a clear consensus that they are Information Economy Industries. This undermines the claim that a 55% threshold adequately captures Information Economy Industries, and we therefore consider that a threshold of 30% ICT intensity is appropriate.

However, it should be noted that these are only 'guideline' filters to allow us to develop a 'baseline' set of industries. Section 6 below considers the grounds for inclusion of other industries which would have been excluded on a strict application of this rule.

On this basis, the proposed list of industries for inclusion in the Information Economy Industries classification would be:

- SIC 26.20, the **manufacture of computers and peripheral equipment**. This industry employs 46,500, of whom 21,500 are in ICT-related occupations, giving an intensity of 46.6 per cent.
- The 3-digit SIC of 58.2, **software publishing**. On its own, one of the two 4-digit components (SIC 58.21) would be excluded because it is too small. However, adding these two as a single 3-digit SIC meets the size threshold (a total employment of 19,000) and has an intensity of 72 per cent;
- All of the two-digit SIC 61 **telecommunications** industries. Again, if examined on an individual 4-digit basis, we would exclude SIC 61.30 (Satellite telecommunications activities) on the grounds of size. Also SIC 61.90 would not be included as it falls just below the 30 per cent threshold. But if we group together all into a single 2-digit level, the resulting sector qualifies with a grouped employment level of 181,000 and an ICT intensity of 38 per cent.
- All of the 2-digit SIC 62 **computer programming, consultancy and related activities.** One of the component 4-digit SICs SIC 62.03, (Computer facilities management services) on its own would be omitted on the basis of size, but we would argue for its inclusion within this grouped 2-digit SIC with an overall employment of 608,000 and an ICT intensity of 69.8 per cent;
- SIC 63.11, **data processing, hosting and related activities** with an employment size of 17,000 and an ICT intensity of 51.2 per cent; and
- SIC 95.11, **repair of computers and peripheral equipment**, with an employment size of **27,000** and an ICT intensity of 78.7 per cent.

Table 8: Structure of the Information Economy Industries on the basis of the Dynamic Mapping

Industry			Employment	
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
26.20	Manufacture computers & peripheral equipment	46.6	47,000	22,000
58.2: Software publishing				
58.21	Publishing of computer games	54.6	3,000	2,000
58.29	Other software publishing	75.3	16,000	12,000
61: Telecommunications				
61.10	Wired telecommunications activities	39.1	58,000	23,000
61.20	Wireless telecommunications activities	39.7	93,000	37,000
61.30	Satellite telecommunications activities	37.9	4,000	1,000
61.90	Other telecommunications activities	29.3	26,000	8,000
62: Computer programming, consultancy and related activities				
62.01	Computer programming activities	69.2	265,000	184,000
62.02	Computer consultancy activities	70.4	303,000	214,000
62.03	Computer facilities management activities	53.1	8,000	4,000
62.09	Other IT & computer service activities	73.9	32,000	23,000
63.11	Data processing, hosting & related activities	51.2	17,000	9,000
95.11	Repair of computers & peripheral equipment	78.7	27,000	21,000

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.
Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match.

6. Considering other industries

Whilst this is our 'baseline' proposal for an Information Economy Industries classification, we need to consider possible other industries which may warrant inclusion. In this discussion we in turn look at:

- those industries which have passed the threshold of 30 per cent, but have been excluded on the basis of statistical robustness;
- those industries which just fell below the 30 per cent threshold, with an ICT intensity of between 20 and 30 per cent; and
- contiguous SIC codes: have we proposed taking parts of SIC codes and taken them out of their context when it may be more advisable to also include neighbouring codes?

6.1 Industries which are too small to include on the grounds of statistical robustness

In the first instance, industries excluded on the basis of size are listed below. In the main these are production and manufacturing industries. At this level of data we have to be careful that relatively high ICT intensities may reflect small sample noise and so on their own cannot be relied upon. With the exception of SIC 63.99 (Other information service activities nec), which we discuss further below, it not clear that these seem to merit inclusion.

Table 9: Industries with an ICT intensity of more than 20 per cent but with employment below 10,000

Industry			Employment	
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
08.99	Other mining and quarrying nec.	1,000	1,000	*
09.90	Support activities other mining & quarrying.	27.5	4,000	1.000
18.20	Reproduction of recorded media	35.0	5,000	2,000
27.31	Manufacture of fibre optic cables	49.5	3,000	1,000
28.24	Manufacture of power-driven hand tools	27.6	2,000	*
30.40	Manufacture of military fighting vehicles	27.0	1,000	*
46.16	Agents involved in the sale industrial equipment, ships & aircraft	27.3	2,000	1,000
63.99	Other information service activities nec.	40.3	2,000	1,000

*Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match. Where the industry is very small and the rounded numbers is less than 1,000 the data is shown as a *.*

6.2 Industries which fall just below the threshold

Industries which fall just below the 30 per cent threshold are shown below. These include SIC 61.90 (Other telecommunications activities) which falls just under the threshold at 30 per cent and which we have suggested should be included in the ICT industries.

Table 10: Industries which fall just below the 30 per cent threshold

Industry			Employment	
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
61.90	Other telecommunications activities	29.3	26,000	7,622
46.14	Agents involved in the sale of industrial equipment, ships & aircraft	27.3	2,000	1.000
28.24	Manufacture of power-driven hand tools	27.6	2,000	1,000
09.90	Support activities other mining & quarrying	27.5	4,000	1,000
30.40	Manufacture of military fighting vehicles	27.0	1,000	*
58.12	Publication of directories & mailing lists	22.2	2,000	*
42.22	Construction of utility projects for electricity & telecommunications.	20.7	17,000	3,000
26.30	Manufacture of communication equipment	20.4	22,000	5,000

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.
*Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match. Where the industry is very small and the rounded numbers is less than 1,000 the data is shown as a *.*

6.3 Contiguous SIC codes (considering industries that are close together in the SIC classifications)

As noted previously, the SIC codes have a nested structure, where the digits at the start of the code indicate which higher level grouping the industry sits within. In the baseline proposal above we have identified a number of 4-digit codes which might be considered to have been taken out of their wider context. In this discussion we look at their contiguous SIC codes.

26.20 sits within the 2-digit SIC 26 (Manufacture of computer, electronic and optical products). Also within this two-digit SIC code is SIC 26.30 (Manufacture of communication equipment). This has an ICT intensity of 20.4 per cent.

There appears to be nothing here to suggest that (i) the 2-digit SIC should be included as a whole or (ii) that other 3- or 4-digit SIC codes should be included over and above 26.20 (Manufacture of computers & peripheral equipment), which is highlighted **(in bold)** in Table 11 below.

Table 11: Manufacturing industries which are contiguous to Manufacture of computers

		Industry		
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
26.11	Manufacture of electronic components	11.6	39,000	4,000
26.12	Manufacture of loaded electronic boards	17.2	3,000	*
26.20	**Manufacture of computers & peripheral equipment**	**46.6**	**47,000**	**22,000**
26.30	Manufacture of communication equipment	20.4	22,000	5,000
26.40	Manufacture of consumer electronics	7.1	7,000	*
26.51	Manufacture instruments for measuring, testing & navigation	7.8	43,000	3,000
26.52	Manufacture of watches and clocks	0.0	3,000	0
26.60	Manufacture irradiation & electro medical equipment	3.2	10,000	*
26.70	Manufacture optical instruments & photo equipment	13.3	9,000	1,000
26.80	Manufacture magnetic and optical media	12.3	1.000	*
26	**Manufacture of computer, electrical and optical products**	**20.0**	**183,000**	**37,000**

*Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014. Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match. Where the industry is very small and the rounded numbers is less than 1,000 the data is shown as a *.*

There is a similar issue concerning the 2-digit SIC code 63 (Information service activities). We have included only 63.11 (Data processing, hosting and related activities). This excludes other sub-sectors, as shown in Table 12 below. It may seem strange that an industry such as SIC 63.12 (Web portals) would not be included as this would seem to be very ICT in nature, but it is very small and the LFS does not manage to identify any ICT-related occupational employment in this industry (at least for the year we are studying) – but at this level the data is very unreliable and this may be a quirk of the data due to the small sample. A case could be made for including these together as a single 3-digit SIC of 63.1 (Data processing, hosting and related activities and web portals).

The case for moving to a 2-digit SIC, moving to all Information Service activities, thus bringing in SIC 63.91 (News agency activities) and SIC 63.99 (Other info service activities nec) is perhaps less strong. Both industries are small, particularly that with the highest ICT intensity (SIC 63.99). Moreover, the activities of this SIC code – Computer-based telephone information services (this excludes call centres), information search services and news and press clipping services – do not, at least to us, obviously point to its inclusion as an Information Economy Industry.

Table 12: Information service activity industries

Industry			Employment	
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
63.11	**Data processing, hosting & related activities**	**51.2**	**17,000**	**9,000**
63.12	Web portals	0.0	2,000	0
63.91	News agency activities	9.4	10,000	1,000
63.99	Other information service activities nec	40.03	2,000	1,000
63	Information service activities	34.1	28,000	9,668

*Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014. Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match. Where the industry is very small and the rounded numbers is less than 1,000 the data is shown as a *.*

We have included SIC 95.11 (Repair of computers and peripheral equipment) in our baseline, but not included the other SIC code which makes up the 3-digit SIC of 95.1 (Repair of computers and communication equipment). Given that telecommunications are an integral part of our classification (at this stage at least) and we have included Repair of computers, we need to examine the case for the Repair of communications equipment. SIC 95.12 (Repair of communications equipment) is a small industry (8,000 in total), with an ICT intensity of 17.1 per cent. On that basis it does not qualify as an ICT industry in its own right. Combining the two Repair industries to form the entire 3-digit SIC 95.1 (Repair of computers and communication equipment) gives a sector with an ICT intensity of 64.9 per cent.

Table 13: Repair of computers and communication equipment industries

Industry			Employment	
Code	**Name**	**ICT intensity**	**Overall employment**	**ICT employment**
95.11	Repair of computers & peripheral equipment	78.7	27,000	21,000
95.12	Repair of communication equipment	17.1	8,000	1,000
95.1	Repair of computers and communication equipment	64.9	34,000	22,000

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014. Note: all numbers rounded to nearest 1,000 for public presentation to comply with ONS rules. The intensity figures are calculated on the exact (unrounded) numbers so the percentages and numbers shown in the table may not match.

7. Comparison to BIS Information Economy Estimates and Tech Partnership

It is useful and interesting to compare the suggestions for inclusion in the ICT industries with previous classifications, including (i) the BIS classification operationalised in the Information Economy Estimates (as discussed in Section 1 above) and (ii) the classification used previously by e-skills UK[21]. This is shown in Table 14 on the next page.

As can be seen, all classifications have the 'core' Information industries of SIC 61 (Telecommunications) and SIC 62 (Computer programming, consultancy and related activities), and the 3-digit SIC of Software publishing, including all of the 4-digit SIC codes contained within. It is the inclusion (or exclusion) of other activities in addition to these 'core' sectors where difference exists, in that:

- Our analysis suggests that there is a case to be made for including a single manufacturing SIC code – SIC 26.20 (the Manufacture of computers and peripheral equipment). The BIS classification excludes all manufacturing, Tech Partnership UK would include a much wider range of manufacturing SICs, including 18.20, 26.30 and 27.31;
- Our analysis does not support the inclusion of any wholesale or retail industries. This accords with the BIS classification which underpins the Information Economy Estimates, but not with the Tech Partnership UK classification which includes a range of these industries, including SIC 46.51 (Wholesale of computers, computer peripheral equipment & software), 46.52 (Wholesale of electronic & telecommunications equipment & parts), 47.41 (Retail sale of computers, computer peripheral equipment & software in specialised stores) and 47.42 (Retail sale of telecommunications equipment in specialised stores);
- Our analysis suggests that there is a case to be made for the inclusion of SIC 63.11 (Data processing and related activities[22]). The BIS classification includes this SIC code, and also the remainder of the SICs in 63, including 63.12 (Web portals), 63.91 (news agency activities) and 63.99 (Other information services nec). Tech Partnership UK recommends that only 63.11 and 63.12 are included, but does not recommend including SICS 63.91 or 63.99 in the classification;
- Our analysis suggests that there is a case to be made for the inclusion of SIC 95.11 (Repair of computers and peripheral equipment), which BIS do not include. Tech Partnership UK would also include SIC 95.12 (repair of communication equipment), which we do not think the data supports.

Table 14: Comparison of ICT-industry classifications

Information Economy Industries based on Dynamic Mapping		BIS Information Economy Estimates classification		Tech Partnership classification	
SIC code	**Industry name**	**SIC code**	**Industry name**	**SIC code**	**Industry name**
				18.20	Reproduction of recorded media
26.20	Manufacture computers & peripheral equipment			26.20	Manufacture computers & peripheral equipment
				26.30	Manufacture of communications equipment
				27.31	Manufacture of fibre optic cables
				46.51	Wholesale of computers, computer peripheral equipment & software
				46.52	Wholesale of electronic & telecomms equipment & parts
				47.41	Retail sale of computers, computer peripheral equipment & software in specialised stores
				47.42	Retail sale of telecomms equipment in specialised stores
58.2	Software publishing, including:	58.2	Software publishing, including:	58.2	Software publishing, including:
58.21	Publishing of computer games	58.21	Publishing of computer games	58.21	Publishing of computer games
58.29	Other software publishing	58.29	Other software publishing	58.29	Other software publishing
61	Telecommunications including:	61	Telecommunications including	61	Telecommunications, including:
61.10	Wired telecomms activities	61.10	Wired telecomms activities	61.10	Wired telecomms activities
61.20	Wireless telecomms activities	61.20	Wireless telecomms activities	61.20	Wireless telecomms activities
61.30	Satellite telecomms activities	61.30	Satellite telecomms activities	61.30	Satellite telecomms activities
61.90	Other telecomms activities	61.90	Other telecomms activities	61.90	Other telecomms activities
62	Computer programming, consultancy and related activities, including:	62	Computer programming, consultancy and related activities, including:	62	Computer programming, consultancy and related activities, including:
62.01	Computer programming activities	62.01	Computer programming activities	62.01	Computer programming activities

62.02	Computer consultancy activities	62.02	Computer consultancy activities	62.02	Computer consultancy activities
62.03	Computer facilities management activities	62.03	Computer facilities management activities	62.03	Computer facilities management activities
62.09	Other IT & computer service activities	62.09	Other IT & computer service activities	62.09	Other IT & computer service activities
63.11	Data processing, hosting & related activities	63.11	Data processing, hosting & related activities	63.11	Data processing, hosting & related activities
		63.12	Web portals	63.12	Web portals
		63.91	News agency activities		
		63.99	Other information services nec		
95.11	Repair of computers & peripheral equipment			95.11	Repair of computers & peripheral equipment
				95.12	Repair of communication equipment

Based on these different classifications we can estimate the size of the Information Economy Industries in employment terms using common data. The Tech Partnership UK classification, being the broadest, has the highest employment level at 1,016,000. The classification suggested by the Dynamic Mapping leads to an employment level of 899,000, which in turn is higher than that of the BIS classification (839,000). The difference between the BIS and Dynamic Mapping totals stems from Dynamic Mapping including SIC 26.20 (Manufacture of computers) and SIC 95.11 (Repair of communications equipment) which collectively employ 73,000 people, whilst the BIS classification does not include these industries, but does include the relatively small industries of SIC 63.12 (Web portals), 63.91 (News agency activities) and 63.99 (Other information services nec).

The Dynamic Mapping classification yields the highest level of overall ICT intensity at 62.2 per cent, compared with 61.7 per cent for the BIS classification and 55.5 per cent for the Tech Partnership UK classification.

Table 15: Differences in employment size and ICT intensities of different classifications

	Information Economy Industries based on Dynamic Mapping		**BIS Information Economy Estimates classification**		**The Tech Partnership classification**	
	Employment	**%**	**Employment**	**%**	**Employment**	**%**
ICT occupations	559,000	62.2	518,000	61.7	564,000	55.5
Other occupations	340,000	37.8	321,000	38.3	452,000	45.5
All	899,000	100	839,000	100	1,016,000	100

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.

8. Information Economy employment estimates

In Section 2 above we clarified our classification definitions. In the discussion above we have given employment estimates of the Information Economy Industries alone. In this section we also give employment estimates for the wider Information Economy, which is the Information Economy Industries plus those ICT workers who are working in other sectors across the economy. This is often called a 'trident' estimate of ICT employment, and is shown below in the shaded boxes.

This suggests that the total size of the Information Economy workforce is 1,529,000, some five per cent of the UK economy. This is made up of 899,000 workers within the Information Economy Industries (59 per cent) and 630,000 ICT-related occupational employment in non-ICT industries (41 per cent).

Table 16: The ICT industries trident

		ICT industry		
		Yes	**No**	**Total**
ICT-related Occupation	Yes	ICT occupation in ICT industry 559,000	ICT occupation in non-ICT industry 630,000	1,189,000
	No	Non-ICT occupation in ICT industry 340,000	Non-ICT occupation in non-ICT industry 28,486,000	28,826,000
	Total	899,000	29,116,000	30,015,000

Source: Office for National Statistics, Labour Force Survey four quarter averages Summer 2013 to Spring 2014.

9. Conclusions

The lack of an agreed methodology for identifying which industries should be classified as Information Economy Industries, and which industries should not, has meant that there has been some uncertainty over the economic size of the sector. In this report we have used a data-driven Dynamic Mapping approach to address this issue. This works by assessing the ICT intensities for all 4-digit SIC codes across the economy and proposing a threshold intensity, above which all industries are included.

We have examined the occupations which are currently within the classification of BIS's Information Economy Estimates, and feedback gathered during a consultation exercise suggests there are no obvious additional SOC codes which should be included. However, we have also learned that there are a number of emerging ICT-related job roles (particularly in relation to data collection and analysis) which do not appear to be accurately captured by the current SOC classification. Whilst outside the scope of this current study, this is information which should be useful when in the future ONS updates its SOC classification from SOC 2010 to SOC 2020.

The classification we propose for Information Economy Industries is different from that used by BIS, and which underpins the estimates in the Information Economy strategy, bringing in a Manufacturing industry and a Service industry, but having fewer Information Service activities. It is narrower than the Tech Partnership UK classification. However, in the main, the same industries lay at the core of the proposed sectors.

This is, in many senses, reassuring – ICT codes have been the subject of considerable thought and analysis in recent years and to have come up with a much different classification based on the official codes might perhaps have been surprising. Our analysis does not support the view that many other industries should be brought within it over and above those suggested by Tech Partnership UK and BIS.

Partly, this is a result of the analysis necessarily operating within the constraints of the current SIC and SOC classifications, which, until the classifications can be refined, may limit the extent to which we can immediately identify the evolution of the Information Economy.

This also supports the efforts of bodies like techUK, NIESR, Nesta and Tech City UK in exploring alternative big data classifications. This analysis should perhaps be seen as consolidating the current official classification – with the added reassurance that it has come from an in-depth consideration of the SOC classifications – and which leaves the sector better placed to engage with the ONS when it reviews the SOC and SIC codes in the future.

The reach of the Information Economy is constantly evolving and pushing into new areas – consistent with the view that ICTs are rare instances of what economists call General Purpose Technologies[23]. Consistent with this, the rate of employment growth in ICT-related occupations is over and above that of employment growth in the overall economy. This may mean that we should expect the number of industries becoming part of the Information Economy Industries classification to increase over time.

Footnotes

1. HM Government (2013), 'Information Economy Strategy'.
2. SICs and SOCS are the standard means by which the Office for National Statistics defines industries and jobs (occupations).
3 Tech Partnership UK, Intellect, BCS (2013), 'Information Economy - Economic Estimates 2013'.* 'http://www.e-skills.com/research/research-publications/information-economy- economic estimates/.
4. See, for example, Nathan, M., Rosso, A. and Bouet, F. (2014), 'Mapping 'information economy' businesses with Big Data: findings for the UK', Nesta working paper 14/10, http://www.nesta.org.uk/publications/mapping-information-economy-business-big- data-findings-uk and Tech City UK (2015), 'Tech Nation'.
5. Though note that the SOC2010 revisions to the occupational classifications made significant improvements to how ICT occupations are measured.
6. Bakhshi, H., Freeman, A. and Higgs, P. (2013), 'A Dynamic Mapping of the UK's Creative Industries' Nesta http://www.nesta.org.uk/publications/dynamic-mapping-uks-creative-industries. The name Dynamic Mapping reflects the fact that the intensities change over time so individual industries can in principle fall into or out of the Information Economy industry classification.
7. Nathan, M., Rosso, A. and Bouet, F. (2014) op. cit.
8. It is perhaps useful to note, as a point of information, that there does exist an ICT product-based definition (discussed in the OECD Guide to Measuring the Information Society http://dx.doi org/10.1787/9789264113541-en) which is that of (i) digital products and services: those that exist and are delivered solely online; (ii) digital products which have a physical equivalent: examples include newspapers, music, film products, etc. There may be some slight differences between the online and physical products, but the product/service is essentially the same; and (iii) products and services which are sold online but are delivered physically, which includes services (such as airline tickets, concerts, etc) and physical products. Those businesses that come in the last group are not generally considered part of the Information Economy – it is likely that they are consumers of the Information Economy rather than actually part of it. Separately, NIESR has done preliminary work on a Digital Economy classification based on big data http://niesr.ac.uk/press/digital-economy-40-cent-bigger- official-statistics-suggest-11498#.VNu-rhC6XSS.
9. The SOC codes have a nested structure, where the digits at the start of the code indicate which higher level grouping the occupation sits within. 4-digit SOC codes are as a result part of wider 3-digit SOC codes, which themselves are part of wider 2-digit codes.
10. Nec stands for 'not elsewhere classified'. At the unit group level, these nec groups contain a mix of occupations, each of which are not found in sufficient numbers to merit their own unit group.
11. Tech Partnership and SAS, 'Big data analytics: assessment of demand for labour and skills', 2013 – 2020, October 2014.
12. We have done this whilst omitting the term 'big data' because these job roles as specified may or may not relate to 'big' data.
13. Bakhshi, H., Mateos-Garcia, J. and Whitby A. (2014), 'Model Workers: how leading companies are recruiting and managing data talent', Nesta http://www.nesta.org.uk/publications/model-workers-how-leading-companies-are-recruiting-and-managing-data-talent.
14. The Information Economy: Economic Estimates 2013 suggest that in 2012 employment in these ICT-related occupations was 1,128,000.
15. Although the Working Futures forecasts also use the Labour Force Survey, slightly different treatment of the underlying data means that there are differences for 2014 to our main data in this report.
16. As this section includes analysis of industries at the 4 and 2 digit levels, for legibility the report writes the codes with a dot between the 2nd and 3rd code e.g. 6202 is written 62.02.

17. Bakhshi, H., Freeman, A. and Higgs, P. (2013), 'A Dynamic Mapping of the UK's Creative Industries' Nesta, http://www.nesta.org.uk/publications/dynamic-mapping-uks-creative-industries.

18. It also lends itself to the estimation of the Information Economy as well as Information Economy Industries (in the same way that the DCMS publishes Creative Economy as well as Creative Industries employment estimates), which consultees have generally supported (and indeed follows the approach used by Tech Partnership UK in its Information Economy Estimates).

19. There is a single industry (SIC 10.42, Manufacture of margarine and similar edible fats) which the LFS records as having a 100 per cent intensity. This is a small sample statistical anomaly reflecting the fact that it is a very small industry, employing only 155 workers, a fact reinforced by noting that it is not known for being particularly ICT-related. It is worth noting the error bounds on the LFS. Any number below 6,000 is not statistically significant; anything below 10,000 is not used by the ONS. It is therefore not included in the analysis.

20. Coincidentally – there is no a priori reason why this should be the case – 30 per cent is also the threshold that was chosen for the Creative Industries and is discussed in Bakhshi, H., Freeman, A. and Higgs, P. (2013), op cit.

21. https://www.e-skills.com/tools/login?ReturnUrl=%2fDocuments%2fResearch%2fGeneral%2fStrategicSkillsAssessmentfortheDigitalEconomy.pdf.

22. And possibly also 63.12, Web portals, which would mean including the 3 digit SIC of 63.1.

23. Rincon, Vecchi and Venturini (2013), 'ICT as a general purpose technology: spillovers, absorptive capacity and productivity performance', NIESR Discussion Paper No. 46, http://niesr.ac.uk/sites/default/files/publications/dp416_0.pdf.

*. The original research was done under the e-skills brand which is now known as The Tech Partnership.

techUK represents the companies and technologies that are defining today the world that we will live in tomorrow. More than 850 companies are members of techUK. Collectively they employ approximately 700,000 people, about half of all tech sector jobs in the UK. These companies range from leading FTSE 100 companies to new innovative start-ups. The majority of our members are small and medium sized businesses.

About the Author

Mark Spilsbury has worked in research and analysis for 25 years, mainly relating to the operation of labour markets, particularly employment, skills and training. Until recently, Mark was Chief Economist at the UK Commission for Employment and Skills. Since leaving the UKCES Mark has been responsible for a variety of projects relating to the creative industries, including a project on the classification and measurement of the Creative Industries and a consultation project on SIC and SOC codes and how they relate to the Creative Industries (and how they may need amending).