

Luxembourg, 14 December 2023

Methodological note on labour market demand for ICT specialists in online job advertisements – experimental statistics

Introduction

Digitalisation is transforming the society and the economy. It facilitates global outreach for business, interaction with customers and business partners, it helps them streamline and optimise their operations. Consequently, by changing many occupations and tasks, digitalisation has impact on the labour market. More and more occupations are increasingly engaging digital technologies in their activities, therefore there is a growing need for qualified personnel able to deal with increasingly technology- and data-intensive working environments.

The statistics on the labour market demand for ICT specialists provide detailed and timely information on the need for ICT professionals on the labour market. The statistics include the demand represented by the share of online job advertisements (OJAs) for ICT specialists in the total number of OJAs, and a percentage change in the demand over time.

These data complement the [existing set of statistics on ICT specialists and digital skills](#), which include:

- the number of ICT specialists in employment,
- persons with ICT education by labour status,
- share of enterprises employing ICT specialists, providing ICT training to their staff, recruiting or trying to recruit ICT specialists, having difficulties to recruit ICT specialists,
- level of digital skills of citizens.

ICT specialists definition

Following OECD, Eurostat defines ICT specialists as ‘workers who have the ability to develop, operate and maintain ICT systems, and for whom ICT constitute the main part of their job’.

Operationalised in terms of International Standard Classification of Occupations (ISCO) codes, this definition converts into a statistical definition of ICT specialists. From 2011

onwards, correspondingly to the application of the [ISCO-08](#), Eurostat and OECD adopted a joint approach which considers the following occupations to be treated as ICT specialists¹:

I. ICT MANAGERS, PROFESSIONALS AND ASSOCIATE PROFESSIONALS			
	133	ICT Service managers	
25	Information and communications technology professionals		
	251	Software and applications developers and analysts	
		2511	Systems analysts
		2512	Software developers
		2513	Web and multimedia developers
		2514	Application programmers
		2519	Software and applications developers and analysts not elsewhere classified
	252	Database and network professionals	
		2521	Database designers and administrators
		2522	Systems administrators
		2523	Computer network professionals
2529		Database and network professionals not elsewhere classified	
35	Information and communications technicians		
	351	ICT operations and user support technicians	
		3511	ICT operations technicians
		3512	ICT user support technicians
		3513	Computer network and systems technicians
		3514	Web technicians
	352	Telecommunications and broadcasting technicians	
		3521	Broadcasting and audio-visual technicians
		3522	Telecommunications engineering technicians
	II. OTHER UNIT GROUPS THAT PRIMARILY INVOLVE THE PRODUCTION OF ICT GOODS AND SERVICES		
	2152	Electronic engineers	
	2153	Telecommunication engineers	
	2166	Graphic and multimedia designers	
	2356	Information technology trainers	
	2434	ICT sales professionals	
	3114	Electronics engineering technicians	
	742	Electronics and telecommunications installers and repairers	
		7421	Electronics mechanics and servicers
		7422	ICT installers and servicers

¹ [isoc_skslf_esms_an1.pdf \(europa.eu\)](#)

Data source

The indicators on the labour market demand for ICT specialists are based on information web scraped from the [Online Job Advertisements \(OJAs\)](#) posted on the internet, using natural language processing.

The source dataset of OJAs covers millions of ads posted in EU countries, collected from hundreds of web sources including job search engines and public employment services' websites. To the extent possible, automatic systems filter out multiple postings for the same vacancy to mitigate the risk of overestimation due to double-counting.

OJAs usually provide detailed information on the positions the employers are seeking to fill (occupation), and the skills sought for those jobs, together with some other characteristics of the job offered and the employer: location, economic activity, type of contract, etc. This information, only available as unstructured data (natural language text), is processed and classified according to main international classifications.

The source dataset has a large coverage in terms of job postings as web scraping collects all OJAs referenced by the web portals selected by the Web Intelligence Hub (WIH). However, as the coverage in terms of web portals scraped is not exhaustive (it does not cover all potential web portals posting job advertisements), the selection of web portals may have a significant impact on the quality of the output and comparability across time and countries. Moreover, it is important to stress that the OJAs data cover only the online job postings, not the entire job ads population.

Moreover, it is expected that the OJA source may be biased in terms of economic activities and occupations: certain positions are likely to be advertised online more than others, e.g. IT positions are more likely to be advertised on the web than jobs in small shops (butchers, bakeries, etc.) or retail trade sector. Another shortcoming is the possible multiple counting of the same advertisement in case it was posted in several web portals. However, algorithms are progressively improved to eliminate redundant OJAs.

Furthermore, since the data is built using natural language processing, based on information retrieved from the web, classified into several variables and classified based on some existing classifications, it is heavily dependent on the keywords selection as well as language and quality of the classifications' translation into national languages.

Therefore, some miss-classification issues may be encountered regarding the occupation (ISCO), skills (ESCO), geographical localisation (NUTS), economic activities (NACE), as well consistency issues between classification levels or data releases. However, there are continued efforts to progressively improve the algorithms. For that purpose, evaluation procedures of algorithms used to classify OJA are put in place, mainly for the occupation variable in OJA. They seek to combine human and machine intelligence to maximize accuracy, to assist human tasks with machine learning to increase classifiers efficiency.

Among strengths, OJAs provide very detailed information on the occupation and skills sought by employers. OJAs also frequently include additional information about the job for which the vacancy is advertised, such as location, education requirements, working conditions and characteristics of the employer. OJAs are particularly appropriate to measure skills demand because they are the exact labels used by the employers posting the job advertisement. The skills mentioned are assuredly relevant, and at a level of detail providing relevant statistics to serve policy makers. Furthermore, the timeliness of the OJA data is a big advantage of this data source.

Concepts

It is important to note that the data from OJAs should not be implicitly compared to the job vacancies statistics. Firstly, the source dataset of OJAs, used for producing indicators on labour market demand for ICT specialists in OJAs, is referring only to the online postings of job positions. Moreover, advertisements are not equivalent to vacancies. The two concepts are related, however there may be vacancies that are not advertised, and on the other hand, some employers post online job advertisements even when they don't intend to fill them either immediately or within a specific period of time.

Overview and definition of indicators

For deriving the indicators on the labour market demand for ICT specialists in online job advertisements, the number of OJA published during the reference period is used.

Two sets of quantitative indicators are derived, providing information on the employers' demand for ICT specialists and the change in the demand for ICT specialists on the labour market.

Labour market demand for ICT specialists in online job advertisements

The indicator provides information on the demand of employers for ICT specialists and is calculated as a percentage of the online job advertisements for ISCO-08 codes corresponding to occupations classified as ICT specialists according to the Eurostat-OECD definition. The indicator is published quarterly and refers to a period of the last 4 quarters (i.e. is calculated on four rolling quarters) to smooth seasonal effects.

$$\frac{\text{Number of OJAs referring to ICT specialists in } (Q_{i-3} \text{ to } Q_i)}{\text{Total number of OJAs in } (Q_{i-3} \text{ to } Q_i)} \cdot 100\%$$

where Q_i – the latest quarter available.

The data is available in the following breakdowns: by country, by [NUTS-2](#) region, by occupation sub-groups of the ICT specialists.

Percentage change in the labour market demand for ICT specialists in online job advertisements

The indicator provides information on the percentage change in the labour market demand for ICT specialists (ISCO-08 codes corresponding to occupations classified as ICT specialists according to the Eurostat-OECD definition) in a given quarter compared to the same quarter of the previous year.

$$\left(\frac{\text{Number of OJAs referring to ICT specialists in } Q_i}{\text{Number of OJAs referring to ICT specialists in } Q_{i-4}} - 1 \right) \cdot 100\%$$

The data is available in the following breakdowns: by country, by [NUTS-2](#) region.

Scope

Sectoral coverage

The data refers to all economic activities classified according to [NACE Rev.2](#) of enterprises that post job advertisements in the World Wide Web.

It needs to be noted that the economic activity according to NACE Rev.2 is attributed to a job advertisement in OJA dataset based on the description of the job or enterprise in the OJA, and therefore is not equivalent to the economic activity of enterprises in statistical business registers or survey-based data published by Eurostat, which is the indicated main economic activity of the enterprise.

Geographical coverage

The data covers all EU27 Member States, EFTA countries, the United Kingdom.

Time coverage

The data covers the period from year 2019 onwards.