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SERISS (Synergies for Europe's Research Infrastructures in the Social Sciences) aims to exploit synergies, foster collaboration and develop shared standards between Europe's social science infrastructures in order to better equip these infrastructures to play a major role in addressing Europe's grand societal challenges and ensure that European policymaking is built on a solid base of the highest-quality socio-economic evidence.

The four year project (2015-19) is a collaboration between the three leading European Research Infrastructures in the social sciences – the European Social Survey (ESS ERIC), the Survey of Health Ageing and Retirement in Europe (SHARE ERIC) and the Consortium of European Social Science Data Archives (CESSDA AS) – and organisations representing the Generations and Gender Programme (GGP), European Values Study (EVS) and the WageIndicator Survey.

Work focuses on three key areas: Addressing key challenges for cross-national data collection, breaking down barriers between social science infrastructures and embracing the future of the social sciences.

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Executive summary

In analyses using the survey question “What is your occupation?”, it is assumed that the same occupational titles refer to the same work activities within and across countries. However, due to methodological limitations this assumption is hardly ever tested empirically. For this deliverable a TASKS DATABASE has been developed to measure work activities – called tasks - within occupations. The starting point for this database was the task descriptions provided by the ILO for occupations at the most detailed ISCO-08 4-digit occupational groups in its ISCO-08 coding index (2012). The database has been supplemented with task descriptions from national coding indexes and with translated task descriptions from the WageIndicator web survey on Salaries. All tasks have been checked for correspondence with the ILO list. If needed, translations have been added. The resulting database consists of 3,264 tasks for 427 ISCO-08 4-digit occupations in 16 languages: Albanian, Bosnian, Bulgarian, Czech, Dutch, Estonian, French, Indonesian, Norwegian, Russian, Spanish and Turkish, plus two language duplicates with minor differences, notably British and American English, and Portuguese for Portugal and for Brazil.

Section 3 in the paper describes how the WageIndicator web survey has measured tasks in 13 countries, using a previous version of the multilingual tasks database, and how the task descriptions are used in the so-called Jobs&Salary webpages in the national WageIndicator websites, with one page for each 4-digit occupational group.

Section 4 proposes a method to collect data about tasks in an ‘all occupations, many countries’ approach. In combination with a web survey and huge sample sizes, the tasks database allows to collect data on the homogeneity or heterogeneity of tasks within the 4-digit ISCO-08 occupations. It is also proposed to use the Jobs&Salary webpages to invite visitors to click how often they perform the tasks in their occupation.

The deliverable’s **accompanying database ISCO-08 TASKS DATABASE 20190615** consists of an excel file with two sheets. The sheet CODESET consists of the codes, master labels and translations of all tasks. The sheet STRUCTURE identifies the routing from the ISCO-08 4-digit occupational code to the related tasks. The sheet MAPPING includes the cross-over tables of the tasks to the 4-digit ISCO-08 codes. The sheet SURVEY_QUESTIONS has translations of the survey question “In your current job, how often do you carry out the following tasks?” and the answers on a five-point scale from never to daily. The database is downloadable from the website <http://surveycodings.org/>. Survey holders can use the database in two ways. For CAPI surveys, the database can be downloaded and then implemented in the CAPI software. For web surveys, the API of the database can be used. Details are available from <http://surveycodings.org/>.

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1. Introducing SERISS

Aims of SERISS Work Package 8

Synergies for Europe's Research Infrastructures in the Social Sciences ([SERISS](#)) is a four-year project that aims to strengthen and harmonise social science research across Europe (2015-'19). [Work Package 8](#) (WP8) of SERISS aims to provide cross-country harmonised, fast, high-quality and cost-effective coding of open-ended questions on respondents' occupations, industries and education into internationally standardized classification systems, and to develop a tool to collect standardized social network information, as described in SERISS Annex 1 (European Commission, 2015). Occupation, industry, employment status, educational attainment and field of education are core variables in many socio-economic and health surveys. In addition, the size and intensity of social networks are key variables in social surveys. However, their measurement, especially in a cross-cultural, cross-national and longitudinal context, is cumbersome, not sufficiently standardized and often expensive. This work package takes recent scientific and technological developments as an opportunity to improve this situation for the benefit of survey measurement quality and to provide cost-effective solutions to Research Infrastructures by developing a survey module with the related survey questions and the databases for answering these questions.

Outline of Task 8.2 of WP8

This report concerns Task 8.2 “Compile the API-database of occupations” of WP8.¹ The responsible partner is the University of Amsterdam (UvA); partners are SHARE ERIC (UNIVE) and SHARE ERIC (CentERdata). Task 8.2 aims to compile a multi-country and multilingual database of occupational titles, coded according to the International Standard Classifications of Occupations 2008, abbreviated as ISCO-08 (ILO, 2012).

Task 8.2 consists of five coherent deliverables, which are all downloadable from the website www.seriss.eu/resources/deliverables:

- D8.3: Tijdens KG (2019) Database of occupational titles, with explanatory note.
- D8.4: Tijdens KG, Kaandorp CS (2018) Validation of ISCO-08 codes + explanatory note.
- D8.5: Tijdens KG, Kaandorp CS (2019) Classifying job titles from job vacancies into ISCO-08 and related job features – the Netherlands.
- D8.6: Tijdens KG (2019) Measuring job tasks by ISCO-08 occupational group.
- D8.7: Tijdens KG (2018) Database of occupations for five languages + explanatory note.

Outline of deliverable D8.6 in Task 8.2

Deliverable D8.6 addresses a problem encountered in Deliverables D8.3, D8.4, and D8.7. The classification of the jobs of survey respondents is based on their occupational title only, as reported in the survey question “What is your occupation?”. It is assumed that the same occupational titles of respondents' jobs refer to the same work activities within and across countries, but hardly ever the survey question is followed by a test whether the work activities in the same occupational title are indeed homogeneous. In addition to the “what is your occupation?” question quite some surveys use an open text box, asking respondents to describe briefly the main activities in their job. The data from this question is primarily used to support the coders in case of coding ambiguity. This text data cannot be used to explore

¹ The technology of an API is explained in Martens M (2017) API for databases + explanatory note. Deliverable 8.1 of the SERISS project funded under the European Union's Horizon 2020 research and innovation programme GA No: 654221. Available at: www.seriss.eu/resources/deliverables

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the homogeneity of tasks within one occupational title because such an exploration requires a systematic rather than free text approach.

To explore whether the assumption of the same work activities, also called tasks, in the same occupation can be tested, section 2 of this paper details how tasks have been measured thus far. Section 3 describes how the WageIndicator web survey has measured tasks in 13 countries, using a multilingual tasks database. Section 4 advances a method to collect data about tasks in an ‘all occupations, many countries’ approach. Section 5 describes how survey holders can use the task_API in their web surveys.

2. Measuring tasks²

Tasks, jobs and occupations

Does an Italian carpenter engage in the same work activities as a carpenter from Spain, Finland or Romania? This is a relevant question for academia and for educational and human resources practices. The scientific relevance refers to the growing interest in occupations as a core concept in academic disciplines. Occupations have been studied for almost a hundred years in organisational psychology (Morgeson and Dierdorff, 2011), and for fifty years in the sociology of occupations (e.g. Larson, 1977). In labour economics, the studies on equal pay and gender segregation by occupation have been studied since WW2 (e.g. Reskin, 1984), whereas recently the task-based approach has been developed (Autor et al., 2003).

The business process model of any organisation identifies which work activities are to be performed and which not. Work activities consist of tasks, clustered into jobs, and a job’s task set determines what workers do in their workplaces and what wages they earn. Task sets or job profiles are to varying degrees formalized and described, ranging from formal descriptions made by job analysts to the domain of the supervisors’ knowledge or solely present in the head of the worker. Task sets can be dynamic over time. New technologies in workplaces may affect the division of work and change the task set. Changes in job tasks can also be on a worker’s own initiative.

Beyond organizations, the wording changes from jobs to occupations. Job titles are grouped into occupational titles. As SERISS Deliverable 8.4 has shown (Tijdens and Kaandorp, 2018), some coding indexes list thousands of job titles and classify them into occupational titles, following the ISCO-08 classification. Even though this implies a heterogeneous bundle of job titles and an even more heterogeneous bundle of tasks, the classification assumes that the job titles and tasks do not overlap with those classified in other occupational titles and that the boundaries between occupational titles are distinct.

In the 2000s the need for improving the measurement of skill requirements in occupations as well as the related work activities became more prominent. In 2008 EU’s New Skills for New Jobs initiative recommended the development of a common language between education/training and the world of work. In the 2010s the European Skills, Competences

² This section is in part based on author’s previous research concerning the measurement of tasks in occupations, see Tijdens, De Ruijter and De Ruijter (2012, 2014) and builds on the research undertaken for the EurOccupations project (EU-FP6 (028987, 2006-09).

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and Occupations taxonomy (ESCO) has been developed, aiming for a multilingual classification of occupations, skills, competences and qualifications.³

Simultaneously several research projects focussed on skill requirements, such as EUROFOUND's European Jobs Monitor to investigate the changes in employment levels and the composition of the workforce in so-called job-cells, ISCO-3 digit occupational groups and 2 digit industry groups clustered into these cells, thereby making a pseudo-panel of jobs.⁴ Another approach relates to the PIAAC survey that is used to address skill needs including 1-digit ISCO-08 controls (OECD, 2016). Cedefop (2018) has developed a pan-European employer survey on skill needs, based on ISCO 3-digit level groups. These approaches have definitely brought the research on understanding skills and skills requirements a huge step forward, but these studies have neither addressed ISCO-08 4-digit nor have they been able to measure variety within ISCO-08 4-digit occupations. The measurement of task implementation within ISCO-08 4-digit occupations may point to a way forward.

What do workers do? The measurement of tasks

The measurement of the homogeneity of occupations has to be based on a set of predefined tasks, derived from job descriptions. The O*NET® Database of Occupations in the United States of America for example comprises of empirically tested descriptions of the tasks performed in a range of occupations (Tippins and Hilton, 2010). These descriptions are tested for selected industries and occupations with regular time intervals. In Italy, the National Institute for the Analysis of Public Policies (INAPP)⁵ undertakes empirical testing of the job content of occupations, applying a methodology similar to O*NET, as for example is detailed in Cirillo et al (2019). Both approaches aim for a standardized description of the tasks in occupational titles, thus depicting the most frequent tasks.

In a cross-country approach, only a few studies compared task sets, for example a study of the tasks and skill requirements of bricklayers (Brockmann et al. 2010) and a study of unskilled workers' job content (Valenduc et al. 2008). Both studies however are based on anecdotal rather than systematic research. In the European Union hardly any cross-national studies have been undertaken to explore if occupational titles have the same meaning beyond semantic similarities and thus if they include the same work activities. Thus, to provide answers to the issue addressed in the beginning of this section – how does an Italian carpenter compare to his/her colleagues in Spain, Finland or Romania - an obvious need for a large-scale, systematic, and empirical investigating of occupations' task sets in Europe arises. Such an investigation requires the availability of descriptions of the task sets of occupations. Any labour market easily can have tens of thousands of different job titles. Taking into account that a labour force distribution is very skewed over these job titles, surveys that aim to measure the tasks in this large number of job titles require too huge samples. The solution is to cluster these job titles into occupational titles. The International Standard Classification of Occupations (ISCO–08) is a useful classification for this purpose.

The ISCO-08 coding index with task lists

The International Standard Classification of Occupations (ISCO–08) is maintained by the International Labour Organisation (ILO). ISCO-08 is increasingly being adopted worldwide.

³ See <https://ec.europa.eu/esco/portal/howtouse>, accessed 2019 JUN 05

⁴ See <https://www.eurofound.europa.eu/observatories/emcc/european-jobs-monitor/methodology>, accessed 2019 JUN 15

⁵ See <https://inapp.org/>, accessed 2019 JUN 7

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The Commission of the European Communities (2009) has agreed on ISCO-08 as its occupational classification, and the European statistical agency Eurostat has put efforts in supporting European countries in developing coding indexes to code the occupation data in their labour force surveys and similar. In recent years, the European labour force survey includes detailed occupational data, coded ISCO-08.

ISCO-08 defines a job as a bundle of tasks and duties performed by one person (ILO 2012). Jobs with the same set of main tasks and duties are aggregated into 436 occupation units at the 4-digit level of the classification. ISCO-08 is a hierarchical classification and the 436 units are classified into 130 minor groups at 3-digit level, 43 sub-major groups at 2-digit level, and 10 major groups at the highest level of the hierarchy. By 2012 the ILO published 'Volume 1, Structure, Group Definitions and Correspondence Tables of the International Standard Classification of Occupations ISCO-08'.⁶ This Volume 1 describes task sets for all 4-digit occupational units.

In contrast to the O*NET® descriptions, the task descriptions in Volume 1 are not based on empirical investigations. The ISCO classification is not to blame for this. While O*NET collects data in one country only, the ILO would have to do so in 193 member countries, which is a challenge beyond any budget and capacity. ISCO-08 also classifies occupations by skill level and an empirical underpinning would be great, but also beyond budget and capacities. However, such a measure might resolve concerns such as those of Dumont (2006). Based on wage regressions for four EU countries this researcher concludes that the ISCO-88 skill levels are not very reliable and vary across countries. An empirical underpinning of the required skill levels for all 4-digit ISCO-08 occupations may require European-wide analysis, similar to the one in the USA by Mow and Kalleberg (2010) on the role of occupations in explaining the increase in wage inequality.

ISCO's Volume 1 includes task lists for all occupational titles, apart from 3 titles in the group 'Armed forces' and five so-called 'not-elsewhere-classified' titles. Hence, the ILO publication provides lists of task sets for 427 occupational titles, varying between 2 and 14 tasks per title. In total 3,264 tasks are available, which is on average 7.6 tasks per occupational title. Almost all tasks are occupation-specific, and only a limited number of tasks are similar across more than one occupation. The screenshot presents an example of the task list for the child care workers (occupation no 5311).

⁶ See <https://www.ilo.org/public/english/bureau/stat/isco/docs/publication08.pdf>, accessed 2019 JUN 05

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Screenshot 1 Task list of child care workers

<p>Unit Group 5311 Child Care Workers</p> <p>Child care workers provide care and supervision for children in residential homes and in before-school, after-school, vacation and day care centres.</p> <p>Tasks include –</p> <ul style="list-style-type: none"> (a) assisting children to wash, dress and feed themselves; (b) taking children to and from school or outdoors for recreation; (c) playing games with children, or entertaining them by reading or storytelling; (d) assisting in the preparation of materials and equipment for children's education and recreational activities; (e) managing children's behaviour and guiding their social development; (f) disciplining children and recommending or initiating other measures to control behaviour, such as caring for own clothing and picking up toys and books; 	<ul style="list-style-type: none"> (g) observing and monitoring children's play activities; (h) keeping records on individual children, including daily observations and information about activities, meals served and medications administered. <p><i>Examples of the occupations classified here:</i></p> <ul style="list-style-type: none"> • Babysitter • Child care worker • Creche ayah • Family day care worker • Nanny • Out of school hours care worker <p><i>Some related occupations classified elsewhere:</i></p> <ul style="list-style-type: none"> • Early childhood educator – 2342
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Source: Page 253 from ILO (2012).

Volume 1 does not explain how the task lists have been compiled, but most likely the work would have been a mix of copying tasks from the ISCO-88 manual⁷ and tasks derived from Internet search where many task descriptions can be found, specifically if the occupation is associated with a professional organisation. In addition, ILO may have asked stakeholders to reflect on the task lists, for example for occupations in healthcare or in education. The ILO publication is in English and ILO has not provided translations.

The ISCO-08 lists of tasks per 4-digit occupation offer a great opportunity to investigate the homogeneity of tasks within an occupation across survey respondents, either in one country or in multiple countries. This assumes that each individual provides answers to survey questions concerning the tasks in his/her occupation. For two reasons a web survey seems to be the most suitable way to collect data on task implementation. First, in web surveys the respondents read the tasks, whereas in a face-to-face survey mode the interviewer reads the tasks out loud. It can be assumed that the reading of the tasks eases respondent's comprehension of the tasks compared to listening, specifically because the tasks will be familiar to respondents as they relate to his/her occupation. Second, the survey software needs to be able to facilitate that the task list of respondent's occupation is shown, and this needs to be selected from the pool of more than 3,000 tasks, which is more easy in the software for web surveys. Moreover, a tight fieldwork budget and other priorities might hamper the inclusion of rather difficult and complex items in a questionnaire. Additionally, large sample sizes are needed in order to collect data for a sufficient number of occupations, taken into account that any labour force is very skewed distributed over the occupational units. Against this background, it is not surprising that task data are rarely available. However, the ISCO-08 task lists and the advances in web survey technology have opened new possibilities, as will be explained in the next section.

⁷ See <https://www.ilo.org/public/english/bureau/stat/isco/isco88/major.htm>, accessed 2019 JUN 05

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3. The TASKS DATABASE

The WageIndicator tasks survey and database

In November 2013 WageIndicator Foundation copied the ISCO-08 tasks into a task database and for its Salary web survey, the WageIndicator team translated the ISCO-08 task sets for the 436 occupations from English into Indonesian, Brazilian Portuguese, French, Dutch, Russian, and Spanish, thereby creating the WageIndicator tasks database. The WageIndicator software programmers developed survey software to show the appropriate task list for respondents, based on their selected occupations. The data collection started in WageIndicator's Salary web survey about the tasks in 13 countries, namely Argentina, Australia, Belarus, Belgium, Brazil, Indonesia, Kazakhstan, Mexico, Netherlands, Russia, South Africa, Spain and the United Kingdom,. It is continuing today. The task list of their occupation is shown to respondents and they are asked to tick how frequent they perform each task using five categories: never, yearly, monthly, weekly and daily (screenshot 2). Several analyses have been performed on the collected data (Visintin et al., 2015; Tijdens and Visintin, 2016; Steinmetz et al., 2019).

Screenshot 2 WageIndicator task question for the specific occupation 'Bakers, pastry-cooks and confectionery makers' (ISCO-08, code 7512)

In your current job, how often do you carry out the following tasks?				
Making bread, cakes, biscuits, pastries, pies and other flour products	Never	Yearly	Monthly	Weekly
			Daily	Not applicable
Making handmade confectionery from mixtures of sugar, chocolate and other ingredients using hand tools and some machines	Never	Yearly	Monthly	Weekly
			Daily	Not applicable
Combining measured ingredients in bowls of mixing, blending, or cooking machinery	Never	Yearly	Monthly	Weekly
			Daily	Not applicable
Checking the quality of raw materials to ensure that standards and specifications are met	Never	Yearly	Monthly	Weekly
			Daily	Not applicable
Applying glazes, icings, or other toppings to baked goods, using spatulas or brushes	Never	Yearly	Monthly	Weekly
			Daily	Not applicable
Checking the cleanliness of equipment and operation of premises before production runs to ensure compliance with occupational health and safety regulations	Never	Yearly	Monthly	Weekly
			Daily	Not applicable

Source: WageIndicator survey – UK, accessed 14-JUN-2019

In addition to its Salary Survey, WageIndicator used the ISCO-08 task sets also to draft its so-called Jobs&Salary pages. Each national WageIndicator website has 436 web pages, one for each 4-digit occupational unit. Each web page acts as a landing page for search terms related to this occupational group, so that for thousands of occupations the search engines can identify these pages as relevant. On this landing page, visitors can find the task list of that occupation, they can click their occupation to enter the Salary Check or the Salary Survey (whereby the occupational title is prefilled), and they can navigate to the pages of related occupations.

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The task lists in national coding indexes

In the years following the publication of ISCO-08, Eurostat asked the National Statistical Offices (NSO) in EU member states and associated countries to translate the ISCO-08 classification, and to publish these as part of a national ISCO-08 coding index. The NSO's did so to varying degrees.

SERISS Deliverable D8.4 aimed to collect NSO's occupational coding indexes for 99 countries. These indexes could be found for only 34 countries. Five of these 34 used another classification than ISCO-08 (Canada, Iceland, India, Italy, Switzerland). Another two countries referred to other countries regarding their ISCO-08 coding indexes (Germany referred to the Austrian coding index and Montenegro stated that its index also applied to Serbia). For four countries we encountered technical difficulties, such as incomplete indexes (Greece) and right to left conversion problems for Hebrew (Israel). Of the remaining coding indexes, only eight provided task lists for the 4-digit occupations: Albania, Bulgaria, Czech Republic, Estonia, Montenegro, Norway, Portugal, and Turkey. Note: coding indexes are almost always in PDF format, and downloadable from the websites of the NSO's.

The TASKS DATABASE

For this SERISS deliverable, we extracted the tasks from the eight coding indexes. At first, we checked for each occupation whether the number of tasks in the foreign index was similar to that in the ISCO-08 index. This comparison revealed that none of the indexes were an exact translation of the initial index, but that some indexes only had not translated the tasks in a few occupations, whereas others had only partially overlapping tasks for quite a number of occupations, or had even many more tasks clustered in one occupation than present in the ICO-08 coding index.

Using Google translate we checked manually whether the tasks aligned with the tasks in ISCO-08. Table 1 shows an example of such a check, in this case for ISCO-08 occupation 1324 for Estonia. The comparison between the initial English ISCO-08 label and the Google translation reveals that Estonian labels are indeed similar to the initial labels, and therefore considered as satisfactory. The quality of the translations from Google translate are of sufficient quality to understand whether the content of the task in the foreign index and in ISCO-08 have the same meaning.

Table 1 The ISCO-08 code and ISCO-08 label from the ILO-ISCO-08 coding index for occupation 1324, the same occupational title in the Coding Index of Estonia and the Google translation from the Estonian tasks.

code	ISCO-08 label	ESTONIA coding index	Google translate
132401	Determining, implementing and monitoring purchasing, storage and distribution strategies, policies and plans	Ostude, ladustamise ja turustamise strateegiate, tegevussuundade ja kavade kindlaksmääramine, rakendamine ja jälgimine	Identifying, implementing and monitoring purchase, storage and marketing strategies, policies and plans
132402	Preparing and implementing plans to maintain required stock levels at minimum cost	Plaanide koostamine ja rakendamine nõutavate laovarude hoidmiseks võimalikult väikeste kuludega	Creating and implementing plans to maintain the required inventory at minimal cost
132403	Negotiating contracts with suppliers to meet quality, cost and delivery requirements	Kvaliteedi-, kulu- ja tarnenõuete täitmiseks tarnijatega lepingute sõlmimine	Concluding contracts with suppliers to meet quality, cost, and delivery requirements
132404	Monitoring and reviewing storage and inventory systems to meet supply requirements and control stock levels	Ladustamis- ja inventeerimissüsteemide jälgimine ja analüüs, et täita tarnenõudeid ja kontrollida laovarusid	Monitoring and analysis of storage and inventory systems to meet delivery requirements and inventory control

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code	ISCO-08 label	ESTONIA coding index	Google translate
132405	Overseeing the dispatch of road vehicles, trains, vessels or aircraft	Maanteesõidukite, rongide, veesõidukite või õhusõidukite väljasaatmise järele valvamine	Surveillance of the expulsion of road vehicles, trains, watercraft or aircraft
132406	Operating recording systems to track all movements of goods, and ensuring re-ordering and re-stocking at optimal times	Dokumenteerimissüsteemide kasutamine kõigi kaubaliikumiste jälgimiseks ning õigeaegselt kordustellimuste esitamiseks ja varude täiendamiseks	The use of documentation systems to monitor all goods movements and to timely place orders and replenish stocks
132407	Liaising with other departments and customers concerning requirements for outward goods and associated forwarding transportation	Teiste osakondade ja klientidega suhtlemine seoses väljaminevatele kaupadele kehtivate nõuete ja saatmiseks kasutatava transpordiga	Communicating with other departments and customers regarding outgoing commodity requirements and shipping used for shipping
132408	Overseeing the recording of purchase, storage and distribution transactions	Ostu-, ladustamis- ja turustamistehingute dokumenteerimise järele valvamine	Supervision of documentation of purchase, storage and distribution transactions
132409	Establishing and managing budgets, controlling expenditure and ensuring the efficient use of resources	Eelarvete kehtestamine ja juhtimine, kulude kontrollimine ja töhüsa ressursikasutuse tagamine	Budgeting and management, cost control and efficient resource use
132410	Establishing and directing operational and administrative procedures	Tegevus- ja halduskordade kehtestamine ja juhtimine	Establishment and management of operational and administrative procedures
132411	Planning and directing daily operations	Igapäevase töö kavandamine ja juhtimine	Planning and managing daily work
132412	Overseeing the selection, training and performance of staff	Töötajate valiku, väljaõppe ja töötulemuste järele valvamine	Monitor employee selection, training, and performance

Source: ISCO-08 TASKS DATABASE 20190615

In case occupations in the foreign index had more tasks than the same occupation in the ISCO-08 index, the translations were checked to determine which task could be dropped. In case occupations in the foreign index had less tasks, the translations were checked to determine which task in the index corresponded with which task in ISCO-08, and thus which tasks had to be sent to a translator. Table 2 shows an example of occupation 2512, the Software developers. ISCO-08 has eight tasks in this occupation, whereas Estonia this is only seven. Using the Google translations our check had to identify which task was not translated, which turned out to be task 251204.

Table 2 The ISCO-08 code and ISCO-08 label from the ILO-ISCO-08 coding index for occupation 2512, the same occupational title in the Coding Index of Estonia and the Google translation from the Estonian tasks.

code	ISCO-08 label	ESTONIA coding index	Google translate
251201	Researching, analyzing and evaluating requirements for software applications and operating systems	Tarkvararakendustele ja operatsioonisüsteemidele esitavate nõuete uurimine, analüüsimine ja hindamine	Research, analysis and evaluation of requirements for software applications and operating systems
251202	Researching, designing, and developing computer software systems	Arvutitarkvara süsteemide uurimine, kujundamine ja arendamine	Research, design and development of computer software systems
251203	Consulting with engineering staff to evaluate interfaces between hardware and software	Tehniliste töötajatega konsulteerimine riistvara ja tarkvara vaheliste liideste hindamiseks	Consultation of technical personnel to evaluate interfaces between hardware and software
251204	Developing and directing software testing and validation procedures		
251205	Modifying existing software to correct errors, to adapt it to	Tarkvara muutmine vigade parandamiseks, selle	Modifying software to correct errors, adapt it to new

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code	ISCO-08 label	ESTONIA coding index	Google translate
	new hardware or to upgrade interfaces and improve performance	kohandamiseks uue riistvaraga või liideste uuendamiseks ja töö parandamiseks	hardware, or upgrade interfaces and improve work
251206	Directing software programming and development of documentation	Tarkvara programmeerimise juhatamine ja dokumentatsiooni väljatöötamine	Software programming management and documentation development
251207	Assessing, developing, upgrading and documenting maintenance procedures for operating systems, communications environments and applications software	Operatsioonisüsteemide, suhtluskeskkondade ja rakenduste tarkvara hoolduskordade hindamine, väljatöötamine, uuendamine ja dokumenteerimine	Evaluating, developing, updating and documenting maintenance procedures for operating systems, communication environments, and applications software
251208	Consulting with customers concerning maintenance of software systems	Klientidega konsulteerimine seoses tarkvarasüsteemi hooldamisega	Consultation with customers regarding software system maintenance

Source: ISCO-08 TASKS DATABASE 20190615

Some tasks were only partially present in the foreign index, as is shown in Table 3 for the Norway coding index. In ISCO-08 occupational title 2221, the Nursing professionals, consists of ten tasks. The Norwegian index, however, lists only two tasks for this occupation, but even these two do not fully overlap. The Google translation exercise reveals that task 222104 does not fully overlap between the two indexes, and to some extent also task 222105 reveals a poor overlap.

Table 3 The ISCO-08 code and ISCO-08 label from the ILO-ISCO-08 coding index for occupation 2221, the same occupational title in the Coding Index of Norway and the Google translation from the Norwegian tasks.

code	ISCO-08 label	NORWAY coding index	Google translate
222104	Planning and providing personal care, treatments and therapies including administering medications, and monitoring responses to treatment or care plan	Planlegge og utføre personlig pleie, behandling og terapi inklusive medisiner	Plan and perform personal care, treatment and therapy including medication
222105	Cleaning wounds and applying surgical dressings and bandages	Rense sår og foreta sårforbinding	Cleanse wounds and make wound dressings

Source: ISCO-08 TASKS DATABASE 20190615

For the merger of the coding indexes, we decided whether to include a task in the task database. For the above two tasks of the nursing professional, we decided to do so, even when the translation was not perfect. Only tasks with very poor or non-overlapping texts were not included. Once the tasks from the coding indexes were correctly matched to the tasks in the ISCO-08 index, the tasks from the WageIndicator database were added. The resulting database consisted of 3,264 tasks for 427 occupations in 16 languages. Two languages were duplicates with minor differences, notably British and American English, and Portuguese for Portugal and for Brazil. Tasks that were not present in the foreign indexes were sent to the translation service of the University of Amsterdam and were added. Most indexes had between 20 and 100 missing tasks, with one exception. In the coding index from Norway 785 of 3,264 tasks were missing. Given the limited budget, the Norwegian tasks were not sent to a translator. For Bulgaria, we had 13 untranslated tasks.

For the 16 countries, Table 4 shows the source (Coding index versus WageIndicator), as well as the author's judgement about the quality of the tasks in the foreign coding index compared to the ISCO-08 index.

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Table 4 Languages in the ISCO-08 tasks database

locale	country	Source	Translation quality
ba_ID	Indonesia	WageIndicator team	good
bg_BG	Bulgaria	Coding index	good, 13 tasks not translated
bs_BA	Montenegro	Coding index	good
cs_CZ	Czech Republic	Coding index	good
de_AT	Austria	Coding index	good
en_GB	Great Britain	ILO Coding index	not applicable
en_US	USA	Adapted from ILO Coding index	not applicable
es_ES	Spain	Coding index	good
et_EE	Estonia	Coding index	good
fr_FR	France	WageIndicator team	good
nl_NL	Netherlands	WageIndicator team	good
no_NO	Norway	Coding index	moderate, 785 tasks not translated
pt_BR	Brazil	WageIndicator team	good
pt_PT	Portugal	Coding index	good
ru_RU	Russian Federation	WageIndicator team	good
tr_TR	Turkey	Coding index	good

Source: ISCO-08 TASKS DATABASE 20190615

Versioning of the ISCO-08 TASKS DATABASE

The versioning of the database will be done by adding the preparation date to its name. The first version is called **ISCO-08 TASKS DATABASE 20190615**. This versioning practice allows to identify quickly the most recent version, as well as the dates that the versions have been prepared. By indicating the year before the month and month before the day, sorting of the most recent version is easy.

4. Empirical research about job profiles

The tasks database opens up perspectives to investigate the task implementation in occupations at the ISCO-08 4-digit level. For a long time, job content has been investigated only for selected occupations, now the database allows to do so for the labour force at large. The multilingual database opens up possibilities to do so in multiple countries.

This new opportunity raises the question how to collect data from jobholders in the labour force? As said in section 2, face-to-face questioning increases the respondent burden compared to printed questions, either on paper or on the Internet, although face-to-face has the advantage of being able to collect data from (partially) illiterate respondents. The web-mode is best suited for the technically complex routing of presenting the proper task list for the respondent's occupation, although some CAPI software will definitely also be able to handle the database. Before the end of SERISS the database will be available as an API or web surveys with one excel sheet for the coded labels – master label plus translations – and one excel sheet detailing the routing.

In combination with micro-data from jobholders the routinization index of Mihaylov and Tijdens (2019) opens perspectives to explore the dynamics in the labour market in greater detail than for occupations only. It will allow explorations of individual characteristics in combination with the occupation occupied.

How can data be collected from job holders? First, the task database will be included in the WageIndicator web survey of salaries, thereby enlarging the country coverage from 13

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countries to 107 countries. This salary survey is a volunteer survey and response across countries varies largely, ranging from 1 to 10,000 completed questionnaires per year. Given the skewed distribution of the labour force over the 4-digit occupations, even with 10,000 completed questionnaires sufficient data will be collected for approximately 250 occupations. In case data from countries with low data intake is needed, extra efforts will be put into promotion of the survey in these countries.

Second, to collect data about the task implementation in occupations, a survey is not necessarily needed. The tasks are listed in the Jobs&Salary pages in the WageIndicator websites, as detailed in section 3. These webpages can also be used to ask the visitors of these pages to tick how often they perform the tasks. This would require few adaptations in the software of these pages. To elicit visitors to click the tasks, for each page a graph could be generated about the distribution of tasks based on previous visitors, compared to the task implementation of that visitor.

Third, surveys with representative samples could be invited to add the task questions to their survey. Preferably, the data collected in these three different modes could be pooled to get sufficient observations of the occupations with relatively few job holders.

Activating this program of activities is beyond the SERISS project, but the author will definitely continue activating this program. In a next step a research program needs to be developed in order to analyse the data collected in the above described methods. However, with such a research program, a final language check needs to be done for the languages currently present in the database; the Norwegian tasks need to be completed and checked, and translations have to be provided for languages currently not present in the database. If the data collection should cover all countries of the European Union, translations would be needed for Swedish, Finnish, Polish, Lithuanian, Latvian, Romanian, Italian, Greek, Slovenian and Slovakian.

5. How can survey holders use the TASKS DATABASE ?

The deliverable's **accompanying database ISCO-08 TASKS DATABASE 20190615** consists of an excel file with four sheets. The sheet CODESET consists of the codes, master labels and translations of all tasks. The sheet STRUCTURE identifies the routing from the ISCO-08 4-digit occupational code to the related tasks. The sheet MAPPING includes the cross-over tables of the tasks to the 4-digit ISCO-08 codes. The sheet SURVEY_QUESTIONS has translations of the survey question "In your current job, how often do you carry out the following tasks?" and the answers on a five-point scale from never to daily. The database is downloadable from the website <http://surveycodings.org/>.

Survey holders can use the database in two ways. For CAPI surveys, the database can be downloaded and then implemented in the CAPI software. For web surveys, the API of the database can be used. Details are available from <http://surveycodings.org/>.

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