



Technequality

Understanding the relation between technological innovations and social inequality

Deliverable D1.1

Database with country-specific automation risk assessments for occupations

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TECHNEQUALITY partners

ROA Universiteit Maastricht

TiU Stichting Katholieke Universiteit Brabant

UOXF The Chancelor, Masters and Scholars of the University of Oxford

CE Cambridge Econometrics Ltd.

SOFI Stockholms University

WZB Wissenschaftszentrum Berlin für Sozialforschung GGmbH

EUI European University Institute

TU Tallinn University

Description of deliverable (100 words)

In Autumn 2019, we conducted a survey among experts who are knowledgeable about the tasks that are performed in occupations. The aim of this survey was to assess experts' opinion of the future importance of tasks in these occupations given the current state of technology. The survey covers the occupations in the 2008 International Standard Classification of Occupations (ISCO) in eight countries. The data gathered through this survey can be used to generate country-specific automation risk assessments for occupations at the 2-digit level of ISCO. The automation risk indicators can be used to assess the impact of technological developments on labour markets in Europe.

1. Survey on automation risk

In Autumn 2019, we fielded a questionnaire among experts to gather data on country-specific automation risk assessments for occupations at the 2-digit level of the International Standard Classification of Occupations (ISCO) 2008.¹ The data from the survey can be used to derive automation risk indicators that could help quantify the impact of technological developments on labour markets in Europe.

A number of studies have predicted the extent to which jobs are susceptible to automation (see, e.g., Frey & Osborne, 2017²; Nedelkoska & Quintini, 2018³). The estimates produced by previous studies rely on an expert assessment of the type of tasks that are (still) difficult to automate given the current state of technology. Based on the task composition of jobs, such so-called engineering bottlenecks are used to determine the automation risk in occupations. However, the fact that certain job tasks are automatable does not automatically imply that jobs will actually be automated. This is because many factors (e.g., price and access to technology, legislation, availability of training data and also managerial practices and culture) constrain the adoption and diffusion of technologies (Levels et al., 2019⁴).

Professionals who are experts on tasks that are performed in specific occupational groups have been requested to give their opinion on their expectation with respect to the time that workers in occupations spend on tasks that characterize their occupation. Respondents have been explicitly asked to take into account factors that influence the actual adoption of technologies when giving their assessment. The advantage of this is that automation risk indicators that can be derived from the data are not purely based on the automation *potential* of tasks. Another advantage of our data is that it reflects experts' view for a variety of EU countries.

2. Survey design

2.1 Target population

The target population for the survey comprised professionals who are knowledgeable about the tasks that are performed within specific (or a variety of) occupational groups according to the ISCO classification. The target population included owners or directors of companies and HR professionals. The sample was restricted to respondents who are at least 30 years old to ensure that they would have enough work experience to develop a sound judgement about how automation affects the time that workers spend on performing occupation-specific tasks.

¹ A complete description of the ISCO 2008 can be found on the following website:

<https://www.ilo.org/public/english/bureau/stat/isco/isco08/>

² Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation? *Technological forecasting and social change*, 114, 254-280.

³ Nedelkoska, L., & Quintini, G. (2018). *Automation, skills use and training*. OECD Social, Employment and Migration Working Papers, No. 202. OECD Publishing, Paris.

⁴ Levels, M., Fregin, M.C. & Somers, M. (2019). The implications of technological change for the workforce: A scenario study. *Technequality Working Paper*.

Professionals in all sectors and company sizes could participate in the survey. In view of the relatively small base per country, random samples were drawn. The survey was rolled out in 8 European countries:

- Czech Republic
- Germany
- Great Britain
- Spain
- France
- Norway
- Estonia
- The Netherlands

The country selection was made as follows. As will be described in Section 2.2, the country specific translations of the largest part of the survey were developed as part of the H2020 SERISS (Synergies for Europe's Research Infrastructures in the Social Sciences) project. We restricted ourselves to the countries for which translations of occupation-specific tasks were readily available, due to budgetary restrictions. Among the countries for which translations were available⁵, we selected the countries such that those with the largest economies were included. Hence, the adoption and implementation of technologies is likely to have the largest EU-wide impact when implemented in these countries. We also ensured that we include countries of different European regions (Northern Europe, Southern Europe, Western Europe and Central Europe) that differ in their geographical location, culture, and socio-economic and institutional structure.

2.2. Approach target population

The survey was designed by us (Section 2.3) and disseminated by Kantar Public. For the fieldwork in the Netherlands, Kantar used the Kantar NIPObase Business panel. This panel includes professionals in the commercial and non-profit sector who are in decision-making positions. Respondents are recruited by drawing random samples from the population and asked about their responsibilities in their organisation, given that they are employed. Individuals who are in a position to influence or make decisions on HR related issues, or who are owner or director of a firm are included in the panels. Members of the panel have indicated that they are willing to participate in business-to-business research. The approach for the local panels in the other countries is similar.

In all countries, the data collection took place via the Internet (computer-assisted web interviewing, CAWI). In the Netherlands, a target sample was drawn and subsequently invited via e-mail. The way in which respondents were approached in other countries differs across the local panels. In some panels, a broad sample of respondents was invited. In other panels,

⁵ Translations were also available for Bulgaria and Luxemburg.

surveys are accessible in a portal, where respondents can log in and fill in questionnaires that are suitable for them. In all panels, quotas were used. As soon as the minimum response target was reached, the questionnaire could no longer be accessed. The minimum target was n=100 respondents per country. Respondents received a small remuneration for their participation.

2.3 Questionnaire

The questionnaire mainly included close-ended questions. The complete survey can be found in the Appendix. In the questionnaire, respondents were asked to select occupations for which they are knowledgeable based on the ISCO classification and to report about their expectation with changes in the time that workers spend on occupation-specific tasks in the next five years given the most recent technological developments.

Before respondents provided their assessment on the importance of tasks, they were asked to select a set of occupations they are knowledgeable about and for which they would like to give their opinion. To guide respondents in the selection of occupations, a stepwise approach was used based on the ISCO-2008 classification. In total, the ISCO-2008 classification consists of 433 occupations (at the 4-digit level). Respondents were first asked to select one major occupational group (there are 9 major groups at the 1-digit level), and subsequently, one of the underlying sub-major groups (there are 40 sub-major groups at the 2-digit level). Within the selected sub-major group, respondents were allowed to select multiple unit groups (there are 433 unit groups at the 4-digit level). After assessing the changes in tasks for a specific occupation, respondents were offered the opportunity to assess another occupation. For costs reasons, we maximised this possibility such that respondents did not exceed a maximum survey time of 15 minutes.

To ensure a realistic assessment by experts, we refer them to the most detailed level of tasks at the 4-digit ISCO level. The tasks are taken from the ISCO handbook. For each of these occupation-specific tasks we asked respondents to provide their opinion on the future change in time that workers spend on the tasks in the next five years.⁶ The following question was used:

“Based on the most recent technological developments (e.g., in the fields of robotics, computerization, machine learning), could you indicate how much time workers will spend on the following tasks for the occupation of [selected occupation] in the next five years?”

Please take into account factors that influence the actual adoption of technologies when providing your answer (i.e., the price of technologies; the design of the organisation, production processes and supply chains; legal constraints; and cultural expectations).”

⁶ On average, a unit occupational group contains 8 tasks in the ISCO description.

Respondents indicated the future importance of each task by selecting one of the following answer categories: 1) workers will not perform this task any longer, 2) workers will spend less time on this task, 3) workers will spend the same amount of time on this task, 4) workers will spend more time on this task, or 5) I don't know.

Once respondents provided their opinion for the selected occupations, respondents were asked whether they wanted to assess additional occupations. If they indicated that they wanted to do so, they could make a selection from the remaining occupations. The maximum amount of occupations for which respondents could provide their assessment was five.

The questionnaire included questions on respondents' occupation, gender and age. The final part of the questionnaire included two questions that reflect respondents' view on technological innovations.⁷

“Due to the use of robots and artificial intelligence, more jobs will disappear than new jobs will be created.”

“Robots are necessary as they can do jobs that are too hard or too dangerous for people.”

Respondents were asked to indicate to what extent they agree or disagree with the statements by selecting one of the following answer categories: 1) totally agree, 2) tend to agree, 3) tend to disagree, 4) totally disagree, or 5) I don't know.

The questionnaire included routings such that the respondents are only provided with the relevant questions. The questionnaire was developed by the Research Centre for Education and the Labour Market (ROA) and programmed by Kantar Public. The translation of tasks at the ISCO 4-digit was provided to us by Prof. Kea Tijdens and were developed as part of the H2020 SERISS (Synergies for Europe's Research Infrastructures in the Social Sciences) project. Kantar Public provided the country specific translations of the invitation text, and other survey questions.

3. Fieldwork and response

The fieldwork took place between October 15th and 27th, 2019. Table 1 shows the timing of the fieldwork and the response in each country. The table only includes respondents who selected a unit occupation and provided their assessment on the future importance of at least one occupation-specific task (“I don't know” answers included). In total, 964 individuals started the survey. Out of these 964 individuals, 894 respondents selected one or more unit occupations and provided their assessment for at least one occupation-specific task. In the overall sample

⁷ The questions are retrieved from the Special Eurobarometer 460, a survey conducted by TNS opinion & social at the request of the European Commission.

of 894 respondents, the average duration for completing the survey was 6.7 minutes. On average, these 894 respondents participated in 2.7 survey rounds.

Table 1: Net response by country and field work period

Country	Net response	Starting date	End date	Average duration survey	Average number of rounds
Czech Republic	105	16-10-2019	23-10-2019	415 sec	2.9
Germany	90	15-10-2019	17-10-2019	349 sec	2.6
Great Britain	95	15-10-2019	18-10-2019	294 sec	2.6
Spain	164	15-10-2019	17-10-2019	407 sec	3.2
France	129	15-10-2019	17-10-2019	381 sec	2.5
Norway	93	15-10-2019	21-10-2019	388 sec	2.7
Estonia	93	17-10-2019	22-10-2019	460 sec	2.2
The Netherlands	125	21-10-2019	27-10-2019	482 sec	2.5
Total	894				

Note: The table reports the unique number of respondents by country. The table excludes respondents who did not select at least one unit occupation or who never provided their assessment of the future importance of tasks associated with the selected unit occupation.

Table 2 depicts the job functions of our respondents. The largest share of respondents (33.6%) are firm owners, followed by managers (28.3%). In total, 5.1% of the respondents are an HR professional.

Table 2: Characteristics respondents

Characteristics respondents	
Occupation	
HR professional %	5.1
Firm owner %	33.6
Manager %	28.3
Other %	32.9

Note: The descriptive statistics in the table are based on a sample that is restricted to respondents who have selected at least one unit occupation and provided their assessment for at least one occupation-specific task (N=868). Respondents who only answered “I don’t know” when asked about the future importance of tasks are excluded from the sample.

Table 3 shows the number of respondents by country and 2-digit sub-major occupational group. Compared to Table 1, Table 3 also excludes respondents who always answered “I don’t know” when asked about the future importance of tasks. In 65 survey rounds, respondents only answered “I don’t know” in their assessment of the future importance of tasks. Table 3 is based on 868 unique respondents who participated in 2,328 survey rounds in total. The highest response is observed for the major group “Managers” (ISCO codes 11 – 14). The lowest response is observed for the major groups “Skilled Agricultural, Forestry and Fishery Workers” (ISCO codes 61-63) and “Plant and Machine Operators and Assemblers” (ISCO codes 81-83).

4. Data availability

The data will be made publicly available after completion of the project, i.e. December 2021 on the project website: <https://technequality-project.eu/>

Table 3: Occupational coverage by country

	Czech Republic	Germany	Great Britain	Spain	France	Norway	Estonia	Netherlands	Total
11. Chief Executives, Senior Officials and Legislators	11	25	30	35	25	16	10	11	163
12. Administrative and Commercial Managers	33	28	30	43	23	23	13	32	225
13. Production and Specialized Services Managers	15	28	19	50	35	24	27	27	225
14. Hospitality, Retail and Other Services Managers	17	6	11	15	10	13	14	12	98
21. Science and Engineering Professionals	7	5	13	10	10	10	5	3	63
22. Health Professionals	1	6	6	22	14	19	4	16	88
23. Teaching Professionals	4	6	8	14	10	19	1	15	77
24. Business and Administration Professionals	6	11	14	22	13	5	8	10	89
25. Information and Communications Technology Professionals	11	4	10	19	9	1	4	9	67
26. Legal, Social and Cultural Professionals	8	9	9	30	5	4	4	7	76
31. Science and Engineering Associate Professionals	17	2	4	9	12	3	7	7	61
32. Health Associate Professionals	0	4	5	12	5	4	1	6	37
33. Business and Administration Associate Professionals	5	1	4	11	8	4	6	1	40
34. Legal, Social, Cultural and Related Associate Professionals	3	2	0	7	2	1	0	1	16
35. Information and Communications Technicians	7	7	3	9	4	3	4	9	46
41. General and Keyboard Clerks	16	10	7	16	16	13	5	27	110
42. Customer Services Clerks	4	5	4	30	7	8	6	6	70
43. Numerical and Material Recording Clerks	4	7	4	11	13	7	5	7	58
44. Other Clerical Support Workers	10	2	2	15	8	1	2	11	51
51. Personal Services Workers	22	7	5	8	11	3	4	6	66
52. Sales Workers	19	9	9	23	13	14	20	24	131
53. Personal Care Workers	8	11	6	9	10	3	2	10	59
54. Protective Services Workers	1	0	1	5	0	2	1	4	14

Table 3: Continued

	Czech Republic	Germany	Great Britain	Spain	France	Norway	Estonia	Netherlands	Total
61. Market-oriented Skilled Agricultural Workers	2	1	2	15	5	0	5	6	36
62. Market-oriented Skilled Forestry, Fishery and Hunting Workers	3	1	2	4	0	2	1	1	14
63. Subsistence Farmers, Fishers, Hunters and Gatherers	2	3	1	4	5	0	1	4	20
71. Building and Related Trades Workers (excluding Electricians)	11	0	3	5	8	7	4	12	50
72. Metal, Machinery and Related Trades Workers	7	2	1	6	0	2	7	1	26
73. Handicraft and Printing Workers	7	2	2	7	3	1	0	1	23
74. Electrical and Electronic Trades Workers	5	0	0	5	4	2	4	4	24
75. Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	4	4	1	8	0	1	5	3	26
81. Stationary Plant and Machine Operators	3	1	4	8	1	4	2	6	29
82. Assemblers	6	0	4	0	2	3	1	3	19
83. Drivers and Mobile Plant Operators	2	1	1	6	2	3	0	5	20
91. Cleaners and Helpers	3	4	3	10	3	6	8	4	41
92. Agricultural, Forestry and Fishery Labourers	1	0	2	0	0	2	1	0	6
93. Labourers in Mining, Construction, Manufacturing and Transport	5	2	2	1	1	2	5	0	18
94. Food Preparation Assistants	3	1	1	9	2	1	2	1	20
95. Street and Related Sales and Services Workers	1	4	1	5	1	1	0	0	13
96. Refuse Workers and Other Elementary Workers	3	2	0	0	2	4	1	1	13
	297	223	234	518	302	241	200	313	2,328

Note: The number of respondents in the table are based on a sample that is restricted to respondents who have selected at least one unit occupation and provided their assessment for at least one occupation-specific task (N=868). Respondents who only answered "I don't know" when asked about the future importance of tasks are excluded from the sample.

Appendix – Overview of the survey

Q007 - VBJ: DUMMY: Country		Single coded
Not back Dummy		
Normal		
1	Czech Republic	
2	Germany	
3	Great Britain	
4	Spain	
5	France	
6	Netherlands	
7	Norway	
8	Estonia	

Q012 - VBP:	Text
Not back	
<p>Welcome to this survey.</p> <p>In this survey, we would like to hear your opinion on the extent to which the tasks that people perform in their occupations change due to recent technological innovations. We would like your opinion for 5 occupations you are most familiar with. This will take about 15 minutes of your time.</p>	

Ask only if NOT Q007 - VBJ,6	
B004 - BBF: Screener block	Begin block

Q011 - VBN: Occupation		Single coded
Not back		
<p>What is your occupation?</p>		
Normal		
1	HR professional	
2	Firm owner	

3 Manager

4 Other

 GO TO SCREEN OUT

Q010 - VBM: Gender

Single coded

Not back

Are you ...?

Please select the answer that applies

Normal

1 Male

2 Female

Q009 - VBL: Age

Numeric

Not back | Min = 18 | Max = 99

What is your age?

B004 - BBF: Screener block

End block

B001 - BBB: Occupation selection

Begin block

Q001 - VBB: Major occupation

Single coded

Below, we ask you to select for which occupations you would like to provide your opinion. In total, there are 433 occupations. To guide you in this selection, we will first show you the overarching major (9) and underlying sub-major (40) occupational groups. You will then be able to choose specific occupations. You will be given the opportunity to give your opinion for multiple occupations.

Please indicate for which **major** occupational group you would like to give your opinion.

Normal

1 Managers

Managers plan, direct, coordinate and evaluate the overall activities of enterprises, governments and other organizations, or of organizational units within them, and formulate and review their policies, laws, rules and regulations.

2 Professionals

Professionals increase the existing stock of knowledge; apply scientific or artistic concepts and theories; teach about the foregoing in a systematic manner; or engage in any combination of these activities.

3 Technicians and Associate Professionals

Technicians and associate professionals perform technical and related tasks connected with research and the application of scientific or artistic concepts and operational methods, and government or business regulations.

4 Clerical Support Workers

Clerical support workers record, organize, store, compute and retrieve information, and perform a number of clerical duties in connection with money-handling operations, travel arrangements, requests for information, and appointments.

5 Services and Sales Workers

Services and sales workers provide personal and protective services related to travel, housekeeping, catering, personal care, protection against fire and unlawful acts; or demonstrate and sell goods in wholesale or retail shops and similar establishments, as well as at stalls and on markets.

6 Skilled Agricultural, Forestry and Fishery Workers

Skilled agricultural, forestry and fishery workers grow and harvest field or tree and shrub crops; gather wild fruits and plants; breed, tend or hunt animals; produce a variety of animal husbandry products; cultivate, conserve and exploit forests; breed or catch fish; and cultivate or gather other forms of aquatic life in order to provide food, shelter and income for themselves and their households.

7 Craft and Related Trades Workers

Craft and related trades workers apply specific technical and practical knowledge and skills to construct and maintain buildings; form metal; erect metal structures; set machine tools or make, fit, maintain and repair machinery, equipment or tools; carry out printing work; and produce or process foodstuffs, textiles, wooden, metal and other articles, including handicraft goods.

8 Plant and Machine Operators and Assemblers

Plant and machine operators and assemblers operate and monitor industrial and agricultural machinery and equipment on the spot or by remote control; drive and operate trains, motor vehicles and mobile machinery and equipment; or assemble products from component parts according to strict specifications and procedures.

9 Elementary Occupations

Elementary occupations involve the performance of simple and routine tasks which may require the use of hand-held tools and considerable physical effort.

10 I do not want to provide my opinion for any other occupational group(s)

Q002 - VBC: sub-major occupation

Single coded

Please indicate for which **sub-major** occupational group you would like to give your opinion.

Random

- 11 Chief Executives, Senior Officials and Legislators
- 12 Administrative and Commercial Managers
- 13 Production and Specialized Services Managers
- 14 Hospitality, Retail and Other Services Managers
- 21 Science and Engineering Professionals
- 22 Health Professionals
- 23 Teaching Professionals
- 24 Business and Administration Professionals
- 25 Information and Communications Technology Professionals
- 26 Legal, Social and Cultural Professionals
- 31 Science and Engineering Associate Professionals
- 32 Health Associate Professionals
- 33 Business and Administration Associate Professionals
- 34 Legal, Social, Cultural and Related Associate Professionals
- 35 Information and Communications Technicians
- 41 General and Keyboard Clerks

42	Customer Services Clerks
43	Numerical and Material Recording Clerks
44	Other Clerical Support Workers
51	Personal Services Workers
52	Sales Workers
53	Personal Care Workers
54	Protective Services Workers
61	Market-oriented Skilled Agricultural Workers
62	Market-oriented Skilled Forestry, Fishery and Hunting Workers
63	Subsistence Farmers, Fishers, Hunters and Gatherers
71	Building and Related Trades Workers (excluding Electricians)
72	Metal, Machinery and Related Trades Workers
73	Handicraft and Printing Workers
74	Electrical and Electronic Trades Workers
75	Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers
81	Stationary Plant and Machine Operators
82	Assemblers
83	Drivers and Mobile Plant Operators
91	Cleaners and Helpers
92	Agricultural, Forestry and Fishery Labourers
93	Labourers in Mining, Construction, Manufacturing and Transport
94	Food Preparation Assistants
95	Street and Related Sales and Services Workers
96	Refuse Workers and Other Elementary Workers

Q003 - VBD: Occupation selection

Multi coded

Min = 1 | Max = 5

Please indicate for which occupation(s) you would like to give your opinion.

You can select multiple occupational groups.

Random

- 1111 Legislators
- 1112 Senior Government Officials
- 1113 Traditional Chiefs and Heads of Villages
- 1114 Senior Officials of Special-interest Organizations
- 1120 Managing Directors and Chief Executives
- 1211 Finance Managers
- 1212 Human Resource Managers
- 1213 Policy and Planning Managers
- 1219 Business Services and Administration Managers Not Elsewhere Classified
- 1221 Sales and Marketing Managers
- 1222 Advertising and Public Relations Managers
- 1223 Research and Development Managers
- 1311 Agricultural and Forestry Production Managers
- 1312 Aquaculture and Fisheries Production Managers
- 1321 Manufacturing Managers
- 1322 Mining Managers
- 1323 Construction Managers
- 1324 Supply, Distribution and Related Managers
- 1330 Information and Communications Technology Services Managers
- 1341 Child Care Services Managers
- 1342 Health Services Managers

- 1343 Aged Care Services Managers
- 1344 Social Welfare Managers
- 1345 Education Managers
- 1346 Financial and Insurance Services Branch Managers
- 1349 Professional Services Managers Not Elsewhere Classified
- 1411 Hotel Managers
- 1412 Restaurant Managers
- 1420 Retail and Wholesale Trade Managers
- 1431 Sports, Recreation and Cultural Centre Managers
- 1439 Services Managers Not Elsewhere Classified
- 2111 Physicists and Astronomers
- 2112 Meteorologists
- 2113 Chemists
- 2114 Geologists and Geophysicists
- 2120 Mathematicians, Actuaries and Statisticians
- 2131 Biologists, Botanists, Zoologists and Related Professionals
- 2132 Farming, Forestry and Fisheries Advisers
- 2133 Environmental Protection Professionals
- 2141 Industrial and Production Engineers
- 2142 Civil Engineers
- 2143 Environmental Engineers
- 2144 Mechanical Engineers
- 2145 Chemical Engineers
- 2146 Mining Engineers, Metallurgists and Related Professionals
- 2149 Engineering Professionals Not Elsewhere Classified

2151	Electrical Engineers
2152	Electronic Engineers
2153	Telecommunications Engineers
2161	Building Architects
2162	Landscape Architects
2163	Product and Garment Designers
2164	Town and Traffic Planners
2165	Cartographers and Surveyors
2166	Graphic and Multimedia Designers
2211	Generalist Medical Practitioners
2212	Specialist Medical Practitioners
2221	Nursing Professionals
2222	Midwifery Professionals
2230	Traditional and Complementary Medicine Professionals
2240	Paramedical Practitioners
2250	Veterinarians
2261	Dentists
2262	Pharmacists
2263	Environmental and Occupational Health and Hygiene Professionals
2264	Physiotherapists
2265	Dieticians and Nutritionists
2266	Audiologists and Speech Therapists
2267	Optometrists and Ophthalmic Opticians
2269	Health Professionals Not Elsewhere Classified
2310	University and Higher Education Teachers

- 2320 Vocational Education Teachers
- 2330 Secondary Education Teachers
- 2341 Primary School Teachers
- 2342 Early Childhood Educators
- 2351 Education Methods specialists
- 2352 Special Needs Teachers
- 2353 Other Language Teachers
- 2354 Other Music Teachers
- 2355 Other Arts Teachers
- 2356 Information Technology Trainers
- 2359 Teaching Professionals Not Elsewhere Classified
- 2411 Accountants
- 2412 Financial and Investment Advisers
- 2413 Financial Analysts
- 2421 Management and Organization Analysts
- 2422 Policy Administration Professionals
- 2423 Personnel and Careers Professionals
- 2424 Training and Staff Development Professionals
- 2431 Advertising and Marketing Professionals
- 2432 Public Relations Professionals
- 2433 Technical and Medical Sales Professionals (excluding ICT)
- 2434 Information and Communications Technology Sales Professionals
- 2511 Systems Analysts
- 2512 Software Developers
- 2513 Web and Multimedia Developers

- 2514 Applications Programmers
- 2519 Software and Applications Developers and Analysts Not Elsewhere Classified
- 2521 Database Designers and Administrators
- 2522 Systems Administrators
- 2523 Computer Network Professionals
- 2529 Database and Network Professionals Not Elsewhere Classified
- 2611 Lawyers
- 2612 Judges
- 2619 Legal Professionals Not Elsewhere Classified
- 2621 Archivists and Curators
- 2622 Librarians and Related Information Professionals
- 2631 Economists
- 2632 Sociologists, Anthropologists and Related Professionals
- 2633 Philosophers, Historians and Political Scientists
- 2634 Psychologists
- 2635 Social Work and Counselling Professionals
- 2636 Religious Professionals
- 2641 Authors and Related Writers
- 2642 Journalists
- 2643 Translators, Interpreters and Other Linguists
- 2651 Visual Artists
- 2652 Musicians, Singers and Composers
- 2653 Dancers and Choreographers
- 2654 Film, Stage and Related Directors and Producers
- 2655 Actors

2656 Announcers on Radio, Television and Other Media

2659 Creative and Performing Artists Not Elsewhere Classified

3111 Chemical and Physical Science Technicians

3112 Civil Engineering Technicians

3113 Electrical Engineering Technicians

3114 Electronic Engineering Technicians

3115 Mechanical Engineering Technicians

3116 Chemical Engineering Technicians

3117 Mining and Metallurgical Technicians

3118 Draughtspersons

3119 Physical and Engineering Science Technicians Not Elsewhere Classified

3121 Mining Supervisors

3122 Manufacturing Supervisors

3123 Construction Supervisors

3131 Power Production Plant Operators

3132 Incinerator and Water Treatment Plant Operators

3133 Chemical Processing Plant Controllers

3134 Petroleum and Natural Gas Refining Plant Operators

3135 Metal Production Process Controllers

3139 Process Control Technicians Not Elsewhere Classified

3141 Life Science Technicians (excluding Medical)

3142 Agricultural Technicians

3143 Forestry Technicians

3151 Ships' Engineers

3152 Ships' Deck Officers and Pilots

- 3153 Aircraft Pilots and Related Associate Professionals
- 3154 Air Traffic Controllers
- 3155 Air Traffic Safety Electronic Technicians
- 3211 Medical Imaging and Therapeutic Equipment Technicians
- 3212 Medical and Pathology Laboratory Technicians
- 3213 Pharmaceutical Technicians and Assistants
- 3214 Medical and Dental Prosthetic Technicians
- 3221 Nursing Associate Professionals
- 3222 Midwifery Associate Professionals
- 3230 Traditional and Complementary Medicine Associate Professionals
- 3240 Veterinary Technicians and Assistants
- 3251 Dental Assistants and Therapists
- 3252 Medical Records and Health Information Technicians
- 3253 Community Health Workers
- 3254 Dispensing Opticians
- 3255 Physiotherapy Technicians and Assistants
- 3256 Medical Assistants
- 3257 Environmental and Occupational Health Inspectors and Associates
- 3258 Ambulance Workers
- 3259 Health Associate Professionals Not Elsewhere Classified
- 3311 Securities and Finance Dealers and Brokers
- 3312 Credit and Loans Officers
- 3313 Accounting Associate Professionals
- 3314 Statistical, Mathematical and Related Associate Professionals
- 3315 Valuers and Loss Assessors

- 3321 Insurance Representatives
- 3322 Commercial Sales Representatives
- 3323 Buyers
- 3324 Trade Brokers
- 3331 Clearing and Forwarding Agents
- 3332 Conference and Event Planners
- 3333 Employment Agents and Contractors
- 3334 Real Estate Agents and Property Managers
- 3339 Business Services Agents Not Elsewhere Classified
- 3341 Office Supervisors
- 3342 Legal Secretaries
- 3343 Administrative and Executive Secretaries
- 3344 Medical Secretaries
- 3351 Customs and Border Inspectors
- 3352 Government Tax and Excise Officials
- 3353 Government Social Benefits Officials
- 3354 Government Licensing Officials
- 3355 Police Inspectors and Detectives
- 3359 Government Regulatory Associate Professionals Not Elsewhere Classified
- 3411 Legal and Related Associate Professionals
- 3412 Social Work Associate Professionals
- 3413 Religious Associate Professionals
- 3421 Athletes and Sports Players
- 3422 Sports Coaches, Instructors and Officials
- 3423 Fitness and Recreation Instructors and Programme Leaders

- 3431 Photographers
- 3432 Interior Designers and Decorators
- 3433 Gallery, Museum and Library Technicians
- 3434 Chefs
- 3435 Other Artistic and Cultural Associate Professionals
- 3511 Information and Communications Technology Operations Technicians
- 3512 Information and Communications Technology User Support Technicians
- 3513 Computer Network and Systems Technicians
- 3514 Web Technicians
- 3521 Broadcasting and Audiovisual Technicians
- 3522 Telecommunications Engineering Technicians
- 4110 General Office Clerks
- 4120 Secretaries (general)
- 4131 Typists and Word Processing Operators
- 4132 Data Entry Clerks
- 4211 Bank Tellers and Related Clerks
- 4212 Bookmakers, Croupiers and Related Gaming Workers
- 4213 Pawnbrokers and Money-lenders
- 4214 Debt Collectors and Related Workers
- 4221 Travel Consultants and Clerks
- 4222 Contact Centre Information Clerks
- 4223 Telephone Switchboard Operators
- 4224 Hotel Receptionists
- 4225 Inquiry Clerks
- 4226 Receptionists (general)

4227 Survey and Market Research Interviewers

4229 Client Information Workers Not Elsewhere Classified

4311 Accounting and Bookkeeping Clerks

4312 Statistical, Finance and Insurance Clerks

4313 Payroll Clerks

4321 Stock Clerks

4322 Production Clerks

4323 Transport Clerks

4411 Library Clerks

4412 Mail Carriers and Sorting Clerks

4413 Coding, Proofreading and Related Clerks

4414 Scribes and Related Workers

4415 Filing and Copying Clerks

4416 Personnel Clerks

4419 Clerical Support Workers Not Elsewhere Classified

5111 Travel Attendants and Travel Stewards

5112 Transport Conductors

5113 Travel Guides

5120 Cooks

5131 Waiters

5132 Bartenders

5141 Hairdressers

5142 Beauticians and Related Workers

5151 Cleaning and Housekeeping Supervisors in Offices, Hotels and Other Establishments

5152 Domestic Housekeepers

5153 Building Caretakers

5161 Astrologers, Fortune-tellers and Related Workers

5162 Companions and Valets

5163 Undertakers and Embalmers

5164 Pet Groomers and Animal Care Workers

5165 Driving Instructors

5169 Personal Services Workers Not Elsewhere Classified

5211 Stall and Market Salespersons

5212 Street Food Salespersons

5221 Shopkeepers

5222 Shop Supervisors

5223 Shop Sales Assistants

5230 Cashiers and Ticket Clerks

5241 Fashion and Other Models

5242 Sales Demonstrators

5243 Door-to-door Salespersons

5244 Contact Centre Salespersons

5245 Service Station Attendants

5246 Food Service Counter Attendants

5249 Sales Workers Not Elsewhere Classified

5311 Child Care Workers

5312 Teachers' Aides

5321 Health Care Assistants

5322 Home-based Personal Care Workers

5329 Personal Care Workers in Health Services Not Elsewhere Classified

5411 Firefighters

5412 Police Officers

5413 Prison Guards

5414 Security Guards

5419 Protective Services Workers Not Elsewhere Classified

6111 Field Crop and Vegetable Growers

6112 Tree and Shrub Crop Growers

6113 Gardeners; Horticultural and Nursery Growers

6114 Mixed Crop Growers

6121 Livestock and Dairy Producers

6122 Poultry Producers

6123 Apiarists and Sericulturists

6129 Animal Producers Not Elsewhere Classified

6130 Mixed Crop and Animal Producers

6210 Forestry and Related Workers

6221 Aquaculture Workers

6222 Inland and Coastal Waters Fishery Workers

6223 Deep-sea Fishery Workers

6224 Hunters and Trappers

6310 Subsistence Crop Farmers

6320 Subsistence Livestock Farmers

6330 Subsistence Mixed Crop and Livestock Farmers

6340 Subsistence Fishers, Hunters, Trappers and Gatherers

7111 House Builders

7112 Bricklayers and Related Workers

- 7113 Stonemasons, Stone Cutters, Splitters and Carvers
- 7114 Concrete Placers, Concrete Finishers and Related Workers
- 7115 Carpenters and Joiners
- 7119 Building Frame and Related Trades Workers Not Elsewhere Classified
- 7121 Roofers
- 7122 Floor Layers and Tile Setters
- 7123 Plasterers
- 7124 Insulation Workers
- 7125 Glaziers
- 7126 Plumbers and Pipe Fitters
- 7127 Air Conditioning and Refrigeration Mechanics
- 7131 Painters and Related Workers
- 7132 Spray Painters and Varnishers
- 7133 Building Structure Cleaners
- 7211 Metal Moulders and Coremakers
- 7212 Welders and Flame Cutters
- 7213 Sheet Metal Workers
- 7214 Structural Metal Preparers and Erectors
- 7215 Riggers and Cable Splicers
- 7221 Blacksmiths, Hammersmiths and Forging Press Workers
- 7222 Toolmakers and Related Workers
- 7223 Metal Working Machine Tool Setters and Operators
- 7224 Metal Polishers, Wheel Grinders and Tool Sharpeners
- 7231 Motor Vehicle Mechanics and Repairers
- 7232 Aircraft Engine Mechanics and Repairers

7233 Agricultural and Industrial Machinery Mechanics and Repairers

7234 Bicycle and Related Repairers

7311 Precision-instrument Makers and Repairers

7312 Musical Instrument Makers and Tuners

7313 Jewellery and Precious Metal Workers

7314 Potters and Related Workers

7315 Glass Makers, Cutters, Grinders and Finishers

7316 Signwriters, Decorative Painters, Engravers and Etchers

7317 Handicraft Workers in Wood, Basketry and Related Materials

7318 Handicraft Workers in Textile, Leather and Related Materials

7319 Handicraft Workers Not Elsewhere Classified

7321 Pre-press Technicians

7322 Printers

7323 Print Finishing and Binding Workers

7411 Building and Related Electricians

7412 Electrical Mechanics and Fitters

7413 Electrical Line Installers and Repairers

7421 Electronic Mechanics and Servicers

7422 Information and Communications Technology Installers and Servicers

7511 Butchers, Fishmongers and Related Food Preparers

7512 Bakers, Pastry-cooks and Confectionery Makers

7513 Dairy Products Makers

7514 Fruit, Vegetable and Related Preservers

7515 Food and Beverage Tasters and Graders

7516 Tobacco Preparers and Tobacco Products Makers

7521 Wood Treaters

7522 Cabinet-makers and Related Workers

7523 Woodworking Machine Tool Setters and Operators

7531 Tailors, Dressmakers, Furriers and Hatters

7532 Garment and Related Patternmakers and Cutters

7533 Sewing, Embroidery and Related Workers

7534 Upholsterers and Related Workers

7535 Pelt Dressers, Tanners and Fellmongers

7536 Shoemakers and Related Workers

7541 Underwater Divers

7542 Shotfirers and Blasters

7543 Product Graders and Testers (excluding Foods and Beverages)

7544 Fumigators and Other Pest and Weed Controllers

7549 Craft and Related Workers Not Elsewhere Classified

8111 Miners and Quarriers

8112 Mineral and Stone Processing Plant Operators

8113 Well Drillers and Borers and Related Workers

8114 Cement, Stone and Other Mineral Products Machine Operators

8121 Metal Processing Plant Operators

8122 Metal Finishing, Plating and Coating Machine Operators

8131 Chemical Products Plant and Machine Operators

8132 Photographic Products Machine Operators

8141 Rubber Products Machine Operators

8142 Plastic Products Machine Operators

8143 Paper Products Machine Operators

- 8151 Fibre Preparing, Spinning and Winding Machine Operators
- 8152 Weaving and Knitting Machine Operators
- 8153 Sewing Machine Operators
- 8154 Bleaching, Dyeing and Fabric Cleaning Machine Operators
- 8155 Fur and Leather Preparing Machine Operators
- 8156 Shoemaking and Related Machine Operators
- 8157 Laundry Machine Operators
- 8159 Textile, Fur and Leather Products Machine Operators Not Elsewhere Classified
- 8160 Food and Related Products Machine Operators
- 8171 Pulp and Papermaking Plant Operators
- 8172 Wood Processing Plant Operators
- 8181 Glass and Ceramics Plant Operators
- 8182 Steam Engine and Boiler Operators
- 8183 Packing, Bottling and Labelling Machine Operators
- 8189 Stationary Plant and Machine Operators Not Elsewhere Classified
- 8211 Mechanical Machinery Assemblers
- 8212 Electrical and Electronic Equipment Assemblers
- 8219 Assemblers Not Elsewhere Classified
- 8311 Locomotive Engine Drivers
- 8312 Railway Brake, Signal and Switch Operators
- 8321 Motorcycle Drivers
- 8322 Car, Taxi and Van Drivers
- 8331 Bus and Tram Drivers
- 8332 Heavy Truck and Lorry Drivers
- 8341 Mobile Farm and Forestry Plant Operators

8342	Earthmoving and Related Plant Operators
8343	Crane, Hoist and Related Plant Operators
8344	Lifting Truck Operators
8350	Ships' Deck Crews and Related Workers
9111	Domestic Cleaners and Helpers
9112	Cleaners and Helpers in Offices, Hotels and Other Establishments
9121	Hand Launderers and Pressers
9122	Vehicle Cleaners
9123	Window Cleaners
9129	Other Cleaning Workers
9211	Crop Farm Labourers
9212	Livestock Farm Labourers
9213	Mixed Crop and Livestock Farm Labourers
9214	Garden and Horticultural Labourers
9215	Forestry Labourers
9216	Fishery and Aquaculture Labourers
9311	Mining and Quarrying Labourers
9312	Civil Engineering Labourers
9313	Building Construction Labourers
9321	Hand Packers
9329	Manufacturing Labourers Not Elsewhere Classified
9331	Hand and Pedal Vehicle Drivers
9332	Drivers of Animal-drawn Vehicles and Machinery
9333	Freight Handlers
9334	Shelf Fillers

- 9411 Fast Food Preparers
- 9412 Kitchen Helpers
- 9510 Street and Related Services Workers
- 9520 Street Vendors (excluding Food)
- 9611 Garbage and Recycling Collectors
- 9612 Refuse Sorters
- 9613 Sweepers and Related Labourers
- 9621 Messengers, Package Deliverers and Luggage Porters
- 9622 Odd-job Persons
- 9623 Meter Readers and Vending-machine Collectors
- 9624 Water and Firewood Collectors
- 9629 Elementary Workers Not Elsewhere Classified

Q004 - VBF: Task matrix

Matrix

Not back | Number of rows: 1 | Number of columns: 5

Based on the most recent technological developments (e.g., in the fields of robotics, computerization, machine learning), could you indicate how much time workers will spend on the following tasks for the occupation of [INSERT ANSWER Q003] in the next five years?

Please take into account factors that influence the actual adoption of technologies when providing your answer (i.e., the price of technologies; the design of the organisation, production processes and supply chains; legal constraints; and cultural expectations).

Rows: Random | Columns: Normal

Rendered as Dynamic Grid

	Workers will not perform this task any longer	Workers will spend less time on this task	Workers will spend the same amount of time on this task	Workers will spend more time on this task	I don't know
[INSERT FROM EXCEL]	?	?	?	?	?

B001 - BBB: Occupation selection End block

B003 - BBD: Robot/ AI statements Begin block

Q006 - VBH: Robot/AI statements

Matrix

Not back | Number of rows: 2 | Number of columns: 5

To what extent do you agree or disagree with each of the following statements?

Rows: Random | Columns: Normal

Rendered as Dynamic Grid

	Totally agree	Tend to agree	Tend to disagree	Totally disagree	I don't know
Due to the use of robots and artificial intelligence, more jobs will disappear than new jobs will be created	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Robots are necessary as they can do jobs that are too hard or too dangerous for people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

B003 - BBD: Robot/ AI statements End block