

# Database with country-specific automation risk assessments for occupations

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# Technequality

Understanding the relation between technological innovations and social inequality

Deliverable D1.1

Database with country-specific automation risk assessments for occupations

Version 1.0

17-12-2019



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#### TECHNEQUALITY partners

ROA Universiteit Maastricht

TiU Stichting Katholieke Universiteit Brabant

UOXF The Chancellor, 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.<sup>1</sup> 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, 2017<sup>2</sup>; Nedelkoska & Quintini, 2018<sup>3</sup>). 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., 2019<sup>4</sup>).

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.

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<sup>1</sup> A complete description of the ISCO 2008 can be found on the following website:

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

<sup>2</sup> 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.

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

<sup>4</sup> 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.

Due to budgetary restrictions, the survey was rolled out in 8 European countries that vary in their socio-economic and institutional structure:

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

## *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. The database includes information on the precise responsibilities of individuals in the panel and about their organisation. Members of the panel have indicated that they are willing to participate in business-to-business research. The data collection took place via the Internet (computer-assisted web interviewing, CAWI). Respondents received a small remuneration for their participation. A target sample was drawn and subsequently invited via e-mail.

For the fieldwork outside the Netherlands, various local panels were used in each country. The data collection in the other countries also took place via the Internet (CAWI). The way in which respondents were approached differs across the local panels. In some panels, a broad sample of respondents was invited. In other panels, 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.

## *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.<sup>5</sup> 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).”*

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.

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<sup>5</sup> On average, a unit occupational group contains 8 tasks in the ISCO description.

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.<sup>6</sup>

*“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 15<sup>th</sup> and 27<sup>th</sup>, 2019. The average duration for completing the survey was 8 minutes. Table 1 shows the timing of the field work and the response in each country.

**Table 1: Net response by country and field work period**

Country	Net response	Starting date	End date	Average duration survey
Germany	104	15-10-2019	17-10-2019	6
Estonia	101	17-10-2019	22-10-2019	10
France	139	15-10-2019	17-10-2019	7
Great-Britain	100	15-10-2019	18-10-2019	7
The Netherlands	132	21-10-2019	27-10-2019	8
Norway	107	15-10-2019	21-10-2019	7
Spain	170	15-10-2019	17-10-2019	8
Czech Republic	111	16-10-2019	23-10-2019	8
Total	964	15-10-2019	27-10-2019	8

<sup>6</sup> The questions are retrieved from the Special Eurobarometer 460, a survey conducted by TNS opinion & social at the request of the European Commission.

Table 2 shows the number of respondents per country and sub-major occupational group. The highest coverage is observed for the major group managers (ISCO codes 11 – 14). The lowest coverage is observed for the major groups “Plant and Machine Operators and Assemblers” (ISCO codes 81-83) and “Elementary Occupations” (ISCO codes 91 – 96).



**Table 2: Occupational coverage by country**

Sub-major occupation	ISCO code	Germany	Estonia	France	Great Britain	The Netherlands	Norway	Spain	Czech Republic	Total
Chief Executives, Senior officials and Legislators	11	14	6	12	14	3	9	17	6	81
Administrative and Commercial Managers	12	13	9	12	13	14	11	21	15	108
Production and Specialized Services Managers	13	17	20	18	7	14	13	19	11	119
Hospitality, Retail and Other Services Managers	14	1	10	4	9	8	3	2	5	42
Science and Engineering Professionals	21	1	3	3	5	2	5	2	2	23
Health Professionals	22	1	1	7	4	11	7	4	0	35
Teaching Professionals	23	5	0	3	2	5	7	2	1	25
Business and Administration Professionals	24	3	3	8	9	5	3	8	1	40
Information and Communications Technology Professionals	25	3	2	4	4	2	0	3	2	20
Legal, Social and Cultural Professionals	26	4	2	2	4	4	1	12	3	32
Science and Engineering Associate Professionals	31	1	4	8	0	2	0	3	6	24
Health Associate Professionals	32	0	1	1	1	1	0	1	0	5
Business and Administration Associate Professionals	33	0	3	2	0	0	0	3	3	11

Table 2 (continued)										
Sub-major occupation	ISCO code	Germany	Estonia	France	Great Britain	The Netherlands	Norway	Spain	Czech Republic	Total
Legal, Social, Cultural and Related Associate Professionals	34	0	0	0	0	0	0	2	0	2
Information and Communications Technicians	35	2	0	1	0	4	3	4	4	18
General and Keyboard Clerks	41	1	0	8	3	14	4	5	5	40
Customer Services Clerks	42	1	2	0	2	3	1	10	0	19
Numerical and Material Recording Clerks	43	0	0	6	0	2	3	5	1	17
Other Clerical Support Workers	44	2	1	6	1	4	0	6	0	20
Personal Services Workers	51	3	1	6	2	3	3	4	9	31
Sales Workers	52	7	12	8	3	9	7	9	9	64
Personal Care Workers	53	3	1	4	1	3	0	2	1	15
Protective Services Workers	54	0	0	0	1	1	1	1	0	4
Market-oriented Skilled Agricultural Workers	61	1	3	1	1	2	1	3	1	13
Market-oriented Skilled Forestry, Fishery and Hunting workers	62	0	0	0	0	0	1	0	1	2
Subsistence Farmers, Fishers, Hunters and Gatherers	63	2	0	0	0	1	0	1	1	5
Building and Related Trades Workers (excluding Electricians)	71	0	1	2	2	3	4	4	5	21

Table 2 (continued)

Sub-major occupation	ISCO code	Germany	Estonia	France	Great Britain	The Netherlands	Norway	Spain	Czech Republic	Total
Metal, Machinery and Related Trades Workers	72	0	2	0	0	0	1	2	4	9
Handicraft and Printing Workers	73	3	0	0	2	2	0	0	3	10
Electrical and Electronic Trades Workers	74	0	1	0	0	0	0	1	1	3
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers	75	3	1	0	0	1	4	2	1	12
Stationary Plant and Machine Operators	81	0	3	0	0	1	1	2	0	7
Assemblers	82	0	1	0	1	0	0	0	2	4
Drivers and Mobile Plant Operators	83	0	0	0	0	2	1	0	1	4
Cleaners and Helpers	91	0	0	1	1	0	2	0	0	4
Agricultural, Forestry and Fishery Labourers	92	0	0	0	1	0	0	0	0	1
Labourers in Mining, Construction, Manufacturing and Transport	93	1	2	1	1	0	0	1	1	7
Food Preparation Assistants	94	0	0	1	0	0	0	2	0	3
Street and Related Sales and Services Workers	95	0	0	0	1	0	0	1	0	2
Refuse Workers and Other Elementary Workers	96	0	0	0	0	0	1	0	0	1
<b>Total</b>		92	95	129	95	126	97	164	105	903

## 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>	

  

<b>Ask only if NOT Q007 - VBJ,6</b>	
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	?	?	?	?	?
Robots are necessary as they can do jobs that are too hard or too dangerous for people	?	?	?	?	?

B003 - BBD: Robot/ AI statements      End block