



CRITICAL OCCUPATIONS LIST 2019/2020

OCCUPATION REPORT

UPDATED AND PUBLISHED ON 28th FEBRUARY 2020 BY

CSC

Critical Skills Monitoring Committee



Table of Contents

OCCUPATIONS ON THE 2019/2020 CRITICAL OCCUPATIONS LIST.....	1
DOVETAILING REPORTS OF OCCUPATIONS ON THE 2019/2020 CRITICAL OCCUPATIONS LIST	13
DOVETAILING REPORTS OF OCCUPATIONS EXCLUDED FROM THE 2019/2020 CRITICAL OCCUPATIONS LIST.....	199



OCCUPATIONS ON THE 2019/2020 CRITICAL OCCUPATIONS LIST

The **Critical Occupations List (COL)** shows occupations that are **skilled, sought-after, and strategic** across 18 sectors in Malaysia.

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
1	Managing Director and Chief Executive (1121)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Chief Executive Officer; Chief Operating Officer; Executive Director; Deputy Executive Director; Managing Director; Airport Manager; Director-General of Organization; Manager; General Manager; Operations Manager; Administrator; President; Technical Manager; Manager Grade P2; Senior Manager Grade P1; Head of Operation; Assistant Manager; Assistant Chief Operating Officer
2	Finance Manager (1211)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Finance Manager; Account Manager; Audit Manager; Audit and Risk Management Manager; Chief Financial Officer; Credit Manager; Insurance Manager; Fund Manager; Financial and Institution Manager; Tax Manager; Finance Director; Chief Financial Controller; Risk Manager; Procurement Manager; Risk Modelling Manager; Actuarial Valuation Manager
3	Human Resource Manager (1212)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Human Resource Manager; Occupational Safety & Health Manager; Recruitment Manager; Occupational Safety Manager; Learning & Organization Development Manager; Health, Safety, Environment & Quality Manager
4	Policy and Planning Manager (1213)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Strategic Planning Manager; Policy and Research Manager; Project Planning Manager; Project Leader; Programme Manager; Regulatory Affairs Manager
5	Business Service Manager (1214)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Production Manager; Production and Business Operation Manager; Business Services Development Manager; Production Planner; Production Controller; Business Development Manager; Compliance Manager; Fashion and Garment Manager; Sustainability Manager



Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
6	Business Services and Administration Manager Not Elsewhere Classified (1219)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Quality Control Manager; Quality Assurance Manager; Facilities Manager; Quality Assurance Manager (Halal Food Manufacturing)
7	Sales and Marketing Manager (1221)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Sales Manager; Sales and Marketing Manager; Marketing Manager; Sales Promotion Manager; Market Research Manager; Product Manager; Brand Manager; Supermarket Manager; Outlet Manager; Channel Partner Manager; Sales Director; Assistant Branch Manager
8	Agricultural, Forestry and Livestock Production Managers (1311)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Plantation Manager; Agricultural Manager; Estate Manager; Assistant Park/Estate Manager (Grade G29)
9	Manufacturing Manager (1321)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Manufacturing Manager; Production and Operation Manager (Manufacturing); Factory Manager; Ship Hull Manager; Mechanical Manager; Oil Mill Manager; Maintenance Manager; Electrical Manager
10	Construction Manager (1323)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Construction Manager; Construction Contract Manager; Construction Project Manager; Construction Site Manager; Structure and Construction Manager; Construction Engineering Director; Construction Engineering Manager
11	Supply, Distribution and Related Manager (1324)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Transport Manager; Warehouse Manager; Storage Manager; Logistics Manager; Purchasing Manager

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
12	Information and Communications Technology (ICT) Manager (1511)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Chief Information Technology Officer; Information Systems Manager; Information Technology Manager; Application Development Manager; Chief Information Officer; Information & Communications Technology (ICT) Development Manager; Information Systems Director; Animation Director; Information Technology Project Manager; Information Technology Infrastructure Manager; Information Technology Programme Manager; Information Technology Sales Manager; Creative Multimedia Manager; Network Operations Manager; Chief Information Security Officer; Information Technology Business Development Manager; Technology Transformation Manager; Information Technology Support Manager; Software Development Manager; Building Information Modelling (BIM) Manager
13	Chemist (2113)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Chemist; Chemist (Rubber); Chemist (Polymer); Chemist (Research and Development); Chemist (Quality Control); Chemist (Industrial); Chemist (Dye); Chemist (Textile); Chemist (Pharmaceutical); Sedimentologist
14	Geologist and Geophysicist (2114)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Geophysicist; Geologist; Geologist (Engineering); Geologist (Mining); Geologist (Petroleum); Hydrologist; Petroleum Geoscientist; Geoscientist; Reservoir Geologist; Geomodeller; Geophysical Specialist
15	Mathematician, Actuary and Statistician (2121)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Mathematician (Actuarial Science); Statistician (Social Science); Statistician (Engineering); Data Scientist; Data Analyst; Data Mining Analyst; Data Modeller; Data Miner; Big Data Analyst; Analytical Consultant; Appointed Actuary; Pricing Actuary; Valuation Actuary; Geographic Information Systems (GIS); Data Architects; Big Data Engineer

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
16	Industrial and Production Engineer (2141)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Automation Engineer; Robotics Engineer; Industrial Engineer; Production Engineer; Planning Engineer; Systems Design Engineer; Printing Technologist; Textile Technologist; Plant Engineer; Package Design Engineer; Industrial Automation Engineer; Robotic Technologist; Process Development Engineer; Facilities Competent Engineer; Reliability Engineer; Physical Design Engineer; Automation Design Engineer; Industry 4.0 Technologist; Quality Management System Engineer (QMS); Special Tooling (Mould) Engineer; Special Tooling (Die) Engineer
17	Civil Engineer (2142)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Engineer; Technologist; Civil Engineer; Site Engineer; Civil Engineer (Construction); Civil Engineer (Building Construction); Civil Engineer (Tower Construction); Civil Engineer (Structural); Civil Engineer (Road Construction); Civil Engineer (Bridge Construction); Facilities Engineer; Maintenance Engineer; Geotechnical Engineer; Structural Engineer; Assistant Engineer; Reliability and Safety Engineer; Construction Engineer; Civil and Structure Design Engineer
18	Mechanical Engineer (2144)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Mechanical Engineering Technologist; Mechanical Engineer; Machinery and Tools Industrial Engineer; Lift Engineer; Mechanical Engineer (Instruments); Engines Engineer; Internal Combustion Engine Engineer; Mechanical Engineer (Gas Turbine); Steam Engineer; Welding Technologist; Mechanical Engineer (Agriculture); Mechanical Engineer (Aerospace); Thermal Engineer; Hydraulic Design Engineer; Technology Technical Engineer; Equipment Engineer; Welding Engineer; Instrumentation Engineer; Mechanical Maintenance Engineer; Rotating Equipment Engineer; Engineering Technologist; R&D Engineers; Assistant Welding Engineer; CNC Machining Engineer; CAD / CAM Engineer; Computer-Aided Design (CAD) Design Automation Engineer; Computer-Aided Design (CAD) Engineer; CNC Programmer; Mechatronic Engineer

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
19	Mining Engineer, Metallurgist and Related Professional (2146)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Mining Engineer; Mining Coal Engineer; Petroleum Mining Engineer; Metallurgist; Casting Engineer; Drilling Engineer; Technical Section Leader; Subsea Engineer; Reservoir Engineer; Facilities (Equipment Design) Engineer; Wellsite Corrosion Engineer; Hydraulics Engineer; Materials and Metallurgical Engineer; Water Management Engineer; Product Design R&D Engineer; Pipeline Project Engineer
20	Engineering Professional (Excluding Electrotechnology) Not Elsewhere Classified (2149)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Quantity Surveyor; Project Engineer; Process Engineer; Quality Assurance Engineer; Quality Control Engineer; Technical Service Adviser; Materials Engineer; Optical Engineer; Safety Engineer; Industrial Safety Engineer; Industrial Health and Safety Engineer; Quality Engineer; Procurement Engineer; Commissioning Engineer; Photonic Engineer; Inspection (QA/QC) Engineer; Survey Engineer; Product Engineer; Engineering Coordinator
21	Electrical Engineer (2151)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Electrical Engineer; Electrical Systems Engineer; Electrical Testing Engineer; Electrical Engineer (High Voltage); Electrical Engineer (Electric Power Distribution); Electrical Engineer (Electric Power Transmission); Electrical Engineer (Electromechanical Equipment); Embedded System/ Firmware Engineer; IC Design Engineer; RF Electrical Engineer; R&D Electrical Engineer (includes Product Design); R&D Electrical Design Engineer; Electrical Superintendent (HT 33KV)
22	Electronic Engineer (2152)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Electronics Engineer; Computer Engineer (Software); Pre-Silicon Validation Engineer; Wirebond Engineer; Industrial Electronic Engineer; Test/Masurement Engineer (Electronic); R&D Electronic Engineer (includes Product Design); Electronic Component Design Engineer; Electronic Structural Designer; Register-transfer Level (RTL) Designer

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
23	Telecommunications Engineers (2153)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Telecommunications Engineer; Telecommunications Engineer (Aerospace); Telecommunications Engineer (Telephone); Network Architect/ Designer/ Planner/ Tester; Radio Optimisation and Capacity Engineer; Network Implementation and Construction Engineer; Network and System Engineer; Telecommunications Consultant; Sound Systems Engineer; Audio Designer; Acoustic Engineer
24	Graphic and Multimedia Designer (2166)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Graphic Designer; Typographical Designer; Animator; Multimedia Designer; Creative Designer; Design Architect; Graphics Illustrator; Character Designer; Flash Animator; 2D Animator; 3D Artist; Layout Artist; Systems/Computer Designer; 3D Modeller; Visual Effects Artist; Lighting Artist; UI Designer (User Interphase); UX Designer (User Experience); Digital Designer; Roto Artist; Storyboard Artist; Render Wrangler
25	Manufacturing Professional (2182)	<p>The following job title within this occupation is included:</p> <ul style="list-style-type: none"> • Manufacturing Executive; Quality Assurance Executive; Quality Assurance Analyst; Quality Control Executive; Production Executive; Warehouse Executive; Maintenance Executive; Manufacturing Quality Controller Executive; Product Quality Controller; Procurement Manufacturing Engineer; Manufacturing Specialists; Boiler Superintendents; Supply Chain/ Procurement Specialist; Manufacturing Engineer; Technical Executive; Oil Mill Engineer
26	Specialist Medical Practitioner (2212)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Eye Specialist; Ophthalmologist; Cardiologist; Neurologist; Obstetrician and Gynaecologist (Fertility); Surgeon; Surgeon (Cardiothoracic); Surgeon (Neurosurgery); Surgeon (Urology); Surgeon (Vascular); Paediatrician; Paediatrician (Haematology); Physician (Haematology); Physician (Nephrology); Physician (Respiratory Medicine); Podiatrist; Radiologist (Radiotherapy); Urologist; Application Specialist (Haematology)

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
27	Environmental and Occupational Health and Hygiene Professional (2263)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Sanitarian; Occupational Health and Safety Officer; Environmental Officer; Safety and Health Officer; Occupational Safety and Health Officer; Waste Management Competence Person; Landfill Engineer
28	University and Higher Education Professional Teacher (2311)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Lecturer; Professor; Lecturer (College); Lecturer (University); Professor (University); Pharmacy Lecturer Grade DUF45
29	Accountant (2411)	<p>All job titles within this occupation are included:</p> <ul style="list-style-type: none"> Accountant; Cost Accountant; Tax Accountant; Tax Consultant; Chartered Accountant; Account Executive; Cost Controller; Financial Controller; Auditor; Audit Executive; Audit and Risk Assessment Executive; Adjuster; Internal Auditor; Cost Estimator; Account Officer
30	Financial and Investment Adviser (2412)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Corporate Financial Adviser; E-Commerce Adviser; Finance Executive; Sales Analyst; Leasing Executive
31	Financial Analyst (2413)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Financial Analyst, Risk Operation Analyst, Research Analyst, Investment Analyst, Equity Analyst, Risk Management Officer, Risk Modeller, Financial Reporting Analyst, Credit Risk Management
32	Advertising and Marketing Professional (2431)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Business Efficiency Officer; Patent Agent; Sales Specialist; Business Compliance Executive; Marketing Communications Specialist; Compliance Officer; Shariah Compliance Officer; Compliance Analyst; Trade Product Specialist; Business Development Engineer; Export Executive; Sales Executive; Marketing Executive; Product Brand Executive; Marketing Engineer; Digital Marketing Executive; Marketing Officer; Sales Officer; Sales Coordinator; Merger and Acquisition

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
33	Communications Technology (ICT) Sales Professional (2434)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Information Technology Sales Engineer; Customer Support Representative; Product Support Officer; Product Development Engineer; Digital Banking/Internet Technology Specialist; Customer Support Officer (IT)
34	Systems Analyst (2511)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Computer Systems Analyst; IT Systems Consultant; Information Technology Business Analyst; Information Technology Systems Designer; RPG System Analyst; Structured Query Language (SQL) Database Analyst; Information Technology Security Analyst; Enterprise Resource Planning (ERP) Programmer Analyst (ABAP); Technical Specialist (.Net); Application Specialist Support (Navision); System Engineer (Oracle); Enterprise Systems Specialist (IT); Enterprise Resource Planning (ERP) Technical Specialist (IT); Information Technology Specialist (SAP); Security Analyst (IT); Design Engineer (IT); SAP Consultant; ICT Specialist; Cyber Security Analyst
35	Software Developer (2512)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Software Developer; Multi-Media Software Developer; Software Designer; Design Engineer; Application Developer (.Net); Application Engineer (.Net); Software Engineer (.Net); C/C++ Developer; C/C++ Software Engineer; Cobol Developer; Java Application Developer; Java Developer; Web Programmer (PHP); System Architect (IT); Net Sharepoint Developer (IT); Software Engineer (Sharepoint) (IT); Software Analyst; Software Design Engineers; SAP IT and Finance Applications Developers; SAP Application Developer; Network Security; Debug Software Engineer; Computer Engineer; Software; iOS Developer; Android Developer; Mobile Application Developer; System Application Engineer; Blockchain Developer ; Linux Software Engineer
36	Applications Programmer (2514)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Computer Programmer; Software Programmer; Technical Programmer; Information Technology Programmer; Systems Programmer; Analyst Programmer; Applications Programmer; Software Programmer (.Net); C/C++ Programmer; JavaScript Programmer; Hypertext Preprocessor (PHP) Programmer; Database Application Specialist; PLC Engineer (Programmable Logic Controllers); Tools Programmer

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
37	Software and Applications Developer and Analyst Not Elsewhere Classified (2519)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Software Tester; Systems Tester; Product Quality Assurance Engineer (IT); Test Engineer (IT); Solution Architect (IT); Application Security Engineer (IT); Software QA Engineer (IT); Siebel Solution Architect; Application Consultant; Information Technology Auditor; Tester (Selenium and Cucumber)
38	Database Designer and Administrator (2521)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Database Administrator; Oracle Database Engineer; Structured Query Language (SQL) Database Engineer; Business Database Analysts; Machine Learning Engineer
39	Systems Administrator (2522)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Information Technology Support Officer; Systems Administrator; Information Technology Executive; Project Coordinator (IT); Project Administrator (IT); System Engineer (IT); Technical Specialist (IT); System Support Specialist; Information Systems Maintenance Engineer; Cloud Computing Solution Architect; Web and Mobility Developer; IT Architects; Technical Support Engineer (IT); Integration Technology Specialist; Infrastructure Specialists (IT); Technical Information (Information Scientist); Hardware Design Engineer; IP Logic Design Engineer; Information Technology Engineer; Technical System Administrator; BIM Coordinator (Building Information Modelling)
40	Computer Network Professional (2523)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Network Administrator; Network Infrastructure Administrator; Network Engineer; Radio Network Planning Consultant; IT Network System Engineer
41	Database and Network Professional Not Elsewhere Classified (2529)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Information and Communication Technology Security Executive; Cyber Security Executive; Digital Forensic Specialist; Security Specialist (IT); IT Security Architect; Application Security Specialist; Network Penetration Tester
42	Civil Engineering Technician (3112)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Industrial Instrument Technician; Civil Engineering Technician; Clerk-Of-Work; Technician; Engineering Designer; Building Inspector; Fire Inspector; Process Instrument Technician; Test Technician; Assistant Engineer

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
43	Electrical Engineering Technician (3113)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Electrical Engineering Technician; High Voltage Electrical Engineering Technician; Electrical Engineering Assistant; Electrical Technical Assistant; Electrical Supervisor; Electrical Technician; Electrical High Voltage Technician; Assistant Electrical Engineer
44	Mechanical Engineering Technician (3115)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Mechanical Engineering Technician; Mechanical Engineering Technician (Industrial Machinery and Tools); Mechanical Engineering Technician (Motors and Engines); Mechanical Engineering Technician (Instruments); Mechanical Engineering Assistant; Mechanical Engineering Estimator; Marine Engineering Technician; Hydraulic Hose Technician; Test Technician (Mechanical); Mechatronics Technician; Machine Technician; CNC Technician; Welding Technician; Mechanical Technician; CNC Supervisor; Assistant Mechatronic Engineer; CAD/CAM Technician; Rope Access Technician; Autocad Drafter; Pneumatic Supervisor
45	Physical and Engineering Science Technician Not Elsewhere Classified (3119)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Methods Engineering Technician; Robotics Technician; Maintenance Technician; Quality Control Technician; Industrial Technician; Production Technician; Moulding Technician; Waste Water Technician; Painting Technician; PLC Assistant Engineer; Tooling Technician
46	Manufacturing Supervisor (3122)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Manufacturing Supervisor; Production Supervisor; Packaging Supervisor; Cutting Supervisor; Plywood Inspection Supervisor; Chief Hookman Supervisor; Quality Control Supervisor; Quality Controller; Technical Supervisor; Non-Destructive Testing (NDT) Inspector
47	Construction Supervisor (3123)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Operation Supervisor; Construction Supervisor; Site Supervisor; Site Coordinator; Site Safety Supervisor
48	Others Supervisor Not Elsewhere Classified (3129)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Supervisor; Logistics Supervisor; Store Supervisor; Shift Supervisor; Assistant Supervisor; Delivery Supervisor

Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
49	Commercial Sales Agent (3322)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Salesperson; Sales Representative; Salesperson (Travel); Engineering Sales Agent; Technical Adviser; Salesperson (Business Services Advertising); Sales Executive; Marketing Executive; Business Development Executive; Pre-Sales Support; Salesperson (Car); Salesperson (Motor Vehicle); Sales Engineer; Technical Sales Engineer; Assistant Marketing Officer; Digital Marketing Executive
50	Buyer (3323)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Purchasing Executive; Buyer; Production Purchasing; Procurement Executive; Purchasing Agent; Procurement Officer; Purchasing Merchandiser
51	Metal Moulder and Coremaker (7211)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Mould Maker; Moulder (Metal); Moulder
52	Toolmaker and Related Worker (7222)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Tool and Die Maker; Pattern-Maker (Metal Foundry)
53	Agricultural and Industrial Machinery Mechanic and Repairer (7233)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Machinery Mechanic; Mining Machinery Mechanic; Mechanic (Machine-Tool); Mechanic (Industrial Machinery); Mechanic (Plant Maintenance); Industrial Machinist; CNC Machinist
54	Electrical Mechanic and Fitter (7412)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • High Voltage Restriction Chargeman; Electrical Fitter; Wireman; Foreman (Electrical), Foreman (Maintenance); Maintenance Fitter; Vehicle (Electrician); Chargeman; AO Chargeman; BO Chargeman; Electrical Wireman



Table 1: Critical Occupations List – Full List (58 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
55	Steam Engine and Boiler Operator (8182)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Plant Operator Grade H11; Boilerman; Boilerman Grade K2; Engine Driver
56	Stationary Plant and Machine Operator Not Elsewhere Classified (8189)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Machine Operator; Production Operator; Equipment & Machine Operator; Heavy Machinery Operator; Line Leader
57	Heavy Truck and Lorry Driver (8332)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Lorry Driver; Assistant Lorry Driver; Dumper Driver; Truck Driver; Tanker Driver; Driver (Halal Logistics)
58	Mobile Farm and Forestry Plant Operator (8341)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Operator (Motorized Farm Equipment); Driver (Farm Tractor); Operator (Harvester)

Note: The Critical Occupations List (COL) is constructed based on the Malaysia Standard Classification of Occupations (MASCO) 2013
Source: Authors



DOVETAILING REPORTS OF OCCUPATIONS ON THE 2019/2020 CRITICAL OCCUPATIONS LIST

Occupation: Managing Director and Chief Executive					
MASCO 2013 (4-Digit Code): 1121					
MASCO 2013 (6-Digit Code): 1121-01; 1121-02; 1121-03; 1121-05; 1121-06; 1121-09;1121-15; 1121-20; 1121-21; 1121-23; 1121-25; 1121-26; 1121-28; 1121-29; 1121-30; 1121-32;1121-33; 1121-34					
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Chief Executive Officer; Chief Operating Officer; Executive Director; Deputy Executive Director; Managing Director; Airport Manager; Director-General of Organization; Manager; General Manager; Operations Manager; Administrator; President; Technical Manager; Manager Grade P2; Senior Manager Grade P1; Head of Operation; Assistant Manager; Assistant Chief Operating Officer			
This occupation appears on COL:					
		2015	No	2017	Yes
		2016	Yes	2018	Yes
Source of evidence:					
Top-down indicators		Passes 3 out of 12 indicators			
Bottom-up CfE survey		84 nominations			
Consultation		3 nominations			
Talent/Skills studies		<ul style="list-style-type: none"> Food and Beverages Environmental Scan Maritime (Shipbuilding and Ship Repair) Environmental Scan 			
Top-down Data:					
Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)	
No	No	No	Yes	Yes	
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	
No	No	No	Yes	No	

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. English Language
3. Planning

Top Sectors:

1. Manufacturing
2. Financial and Insurance/Takaful Activities
3. Education

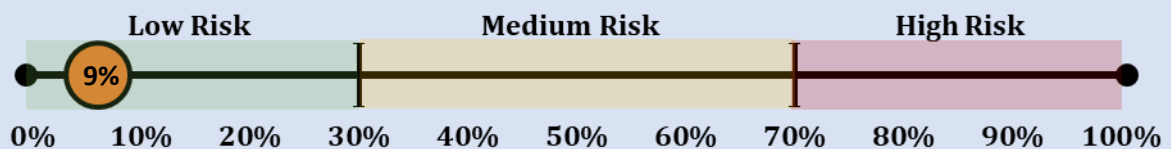
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Applicants lack other required skills

Top Strategies to Meet Shortages:

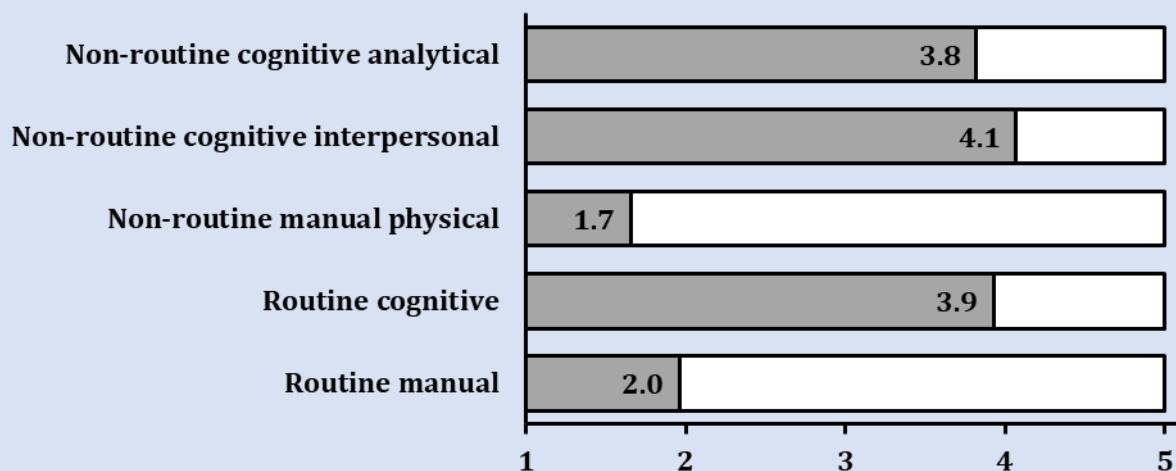
1. Expanding local recruitment efforts
2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for operations managers, technical managers and general managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle and senior level with equivalent to 5 to 10 years working experience. In addition, the applicants lack relevant job experience and technical skills are the most-cited reasons behind the occupation being hard-to-fill. The most common time to fill for this occupation is reported to be 2 to 3 months. However, companies have reported that this occupation has become neither more nor less hard to fill as compared to a year ago. Malaysian Institute of Accountants (MIA) also cited that the reason for this occupation being hard to fill due to lack of qualified personnel.
- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in Call-for-Evidence survey. Respondents reported that applicants need certifications to qualify for this occupation. Certified Financial Planner (CFP) and Investor Protection Professional Certification (IPPC) are among certifications cited for this position. Malaysian Institute of Accountants (MIA) also cited MIA Membership/ Professionals Certifications is needed for this post.
- iv. The top skills identified by companies are problem solving, analytical skills and technical skills.
- v. The Food and Beverages Environmental Scan indicated managing directors and chief executives are critical for manufacturing, food and beverage services and accommodation sub-sector. In addition, this occupation was also identified as critical in the Maritime (Shipbuilding and Ship Repair) Environmental Scan.
- vi. Consultation with Free Industrial Zone, Penang, Companies' Association (FREPENCA) indicated a need to review current university curriculum particularly for local universities to keep pace with the requirements of industry. Meanwhile, Malaysian Association of Private Colleges and Universities (MAPCU) mentioned that talents for this occupation are in shortage due to high turnover rate and the market is competitive as talents seek global employment opportunities or shift employment across sectors.
- vii. The top-down result shows growth in employment, wage premium and increase in number of vacancies rate. Supported by two environmental scans and high nominations from the bottom-up evidence which indicates this occupation is in demand, this occupation is included in the COL.



Occupation: Finance Manager

MASCO 2013 (4-Digit Code): 1211

MASCO 2013 (6-Digit Code): 1211-01; 1211-02; 1211-04; 1211-05; 1211-06; 1211-07; 1211-08; 1211-09; 1211-11; 1211-14; 1211-16; 1211-17; 1211-19; 1211-21; 1211-22; 1211-23

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Finance Manager; Account Manager; Audit Manager; Audit and Risk Management Manager; Chief Financial Officer; Credit Manager; Insurance Manager; Fund Manager; Financial and Institution Manager; Tax Manager; Finance Director; Chief Financial Controller; Risk Manager; Procurement Manager; Risk Modelling Manager; Actuarial Valuation Manager

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 5 out of 10 indicators
Bottom-up CfE survey	44 nominations
Consultation	8 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan Food and Beverages Environmental Scan Maritime (Shipbuilding and Ship Repair) Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
Yes	No	Yes	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Accounting
2. Finance
3. Budgeting

Top Sectors:

1. Financial and Insurance/Takaful Activities
2. Professional, Scientific and Technical Activities
3. Manufacturing

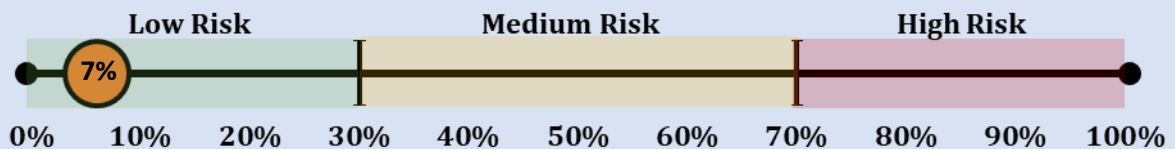
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants' expected compensation is beyond the market rate
3. Applicants lack relevant job experience

Top Strategies to Meet Shortages:

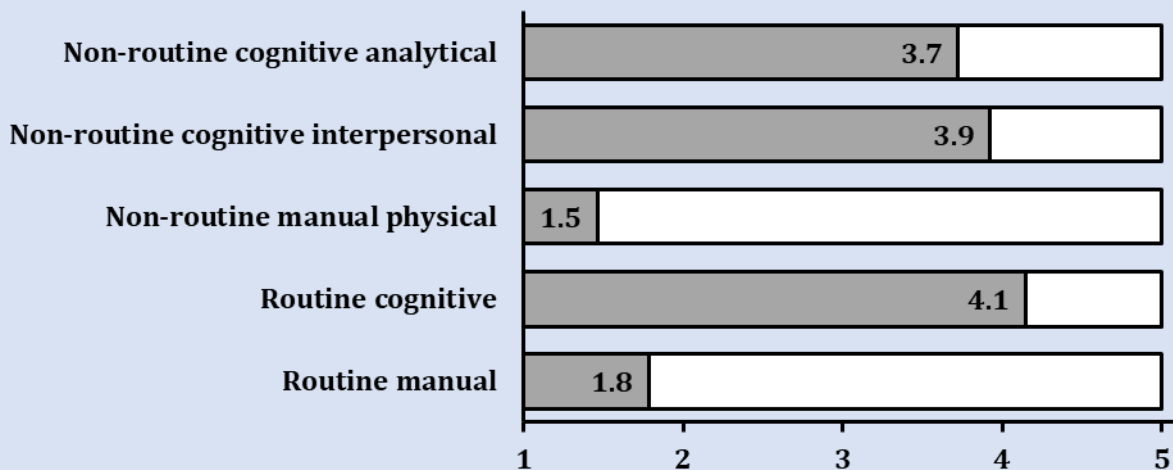
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for finance managers and account managers.



- ii. Companies have reported that vacancies within this occupation group are for middle to senior level with a most common time to fill of 2 to 3 months.
- iii. Most companies require a minimum of bachelor's degree. Some cases require a minimum of a master's degree with inter-field experience, for example, in Risk Management. Respondents reported that applicants need particular certifications such as:
 - a) Association of Chartered Certified Accountants (ACCA)
 - b) Chartered Institute of Management Accountants (CIMA)
 - c) Chartered Financial Analyst (CFA)
 - d) Member of Malaysian Institute of Accountant (MIA)
 - e) Member of Malaysian Institute of Certified Public Accountants (MICPA)
 - f) Chartered Tax Institute of Malaysia (CTiM) qualified
- iv. The skills deemed to be important by companies vary from technical to soft. Examples of soft skills highlighted are leadership, creative thinking and management. In addition, some of the specific skills cited include risk and assessment, transfer pricing, sourcing, negotiation, financial statement analysis, business development and sales.
- v. Finance managers was listed in the Maritime (Shipbuilding and Ship Repair) Environmental Scan. The Chemical and Petrochemical Environmental Scan has also highlighted that many companies faced challenges in hiring finance managers in chemical, petrochemical and oleochemical sub-industries. In the rubber products sub-industry particularly, the longest average time taken to fill this occupation was close to a year. This occupation was also cited to be critical in the food and beverage halal industry, from the Food and Beverages Environmental Scan.
- vi. Despite facing recruitment issue such as having applicants' expectation of remuneration to be above market rate, companies are still raising wages to meet shortages other than increasing local recruitment efforts and increasing workers' training.
- vii. The top-down data also indicates an increase in vacancy which could point to the fact that more companies are seeking after talents for this occupation and is facing recruitment difficulties in filling them up. Based on both strong bottom-up and top-down evidence, this occupation is included in the COL.

Occupation: Human Resource Manager

MASCO 2013 (4-Digit Code): 1212

MASCO 2013 (6-Digit Code): 1212-01; 1212-04; 1212-06; 1212-07; 1212-08; 1212-12

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Human Resource Manager; Occupational Safety & Health Manager; Recruitment Manager; Occupational Safety Manager; Learning & Organization Development Manager; Health, Safety, Environment & Quality Manager

This occupation appears on COL:

2015	No	2017	No
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 10 indicators
Bottom-up CfE survey	21 nominations
Consultation	-
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan Food and Beverages Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
Yes	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills and English Language
2. Planning
3. Performance Management

Top Sectors:

1. Construction
2. Manufacturing
3. Agriculture, Forestry and Fishing

Top Reasons of Hard-to-Fill:

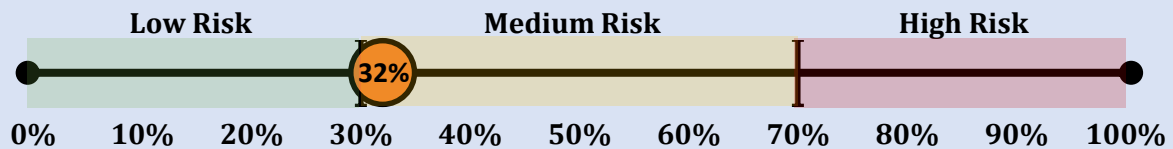
1. Applicants lack the required technical skills

Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased

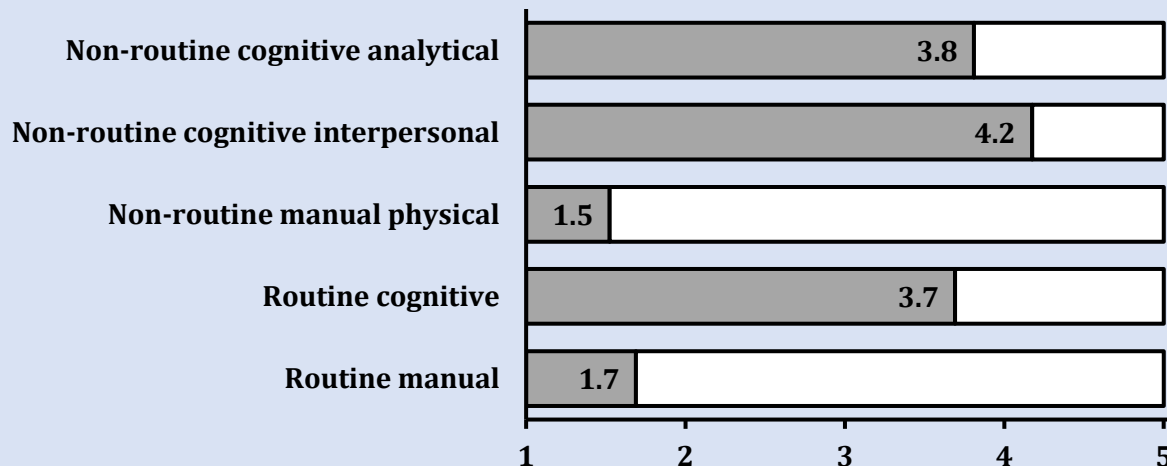
2. Applicants lack the required credentials or certification	presence at career fairs, increased use of recruitment firms, etc.) 2. Increasing worker training 3. Hiring less well qualified applicants
3. Applicants lack relevant job experience	

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for occupational safety & health managers, human resource managers and recruitment managers.
- ii. Companies have reported that vacancies within this occupation group are for middle and senior candidates with more than 5 years of working experience. In addition, majority of respondents are seeking applicants with a bachelor’s degree. The most commonly reported time to fill vacancies for this occupation is 2 to 3 months. However, to some extent it could take more than 6 months and companies found that it is harder to fill as compared to a year ago.



- iii. There is a gap in specialised certifications. Some respondents have highlighted that applicants need Green Book or Yellow Book certifications to qualify for occupational safety & health managers and health, safety, environment & quality managers. On top of that, applicants with detailed analytical skills are also preferred to identify, investigate and audit non-compliance or unsafe acts, conditions or hazards. Plus, having an excellent planning and organising skills in order to facilitate training for the respective project requirements is an additional advantage.
- iv. Besides that, companies also mentioned that they are looking for human resource managers with problem solving abilities, good analytical skills and other soft skills including presentation, briefing, conducting meeting and interview.
- v. Based on Chemical and Petrochemical Environmental Scan, human resource managers have been nominated as one of the critical occupations in rubber product sub industry. The report mentioned that the average time taken to fill vacancies is up to 12 months. Furthermore, Food and Beverages Environmental Scan also cited that this position is critical in food and beverage halal industry.
- vi. With the fact that companies have resorted to hiring less well qualified applicants as one of the strategies to address the shortage show many employers are experiencing challenges in finding skilled workers for this occupation. There is strong bottom-up evidence to support this claim, with this occupation being highlighted in 2 environmental scans as critical occupation and high number of nominations from various companies across 9 sectors, this occupation is believed to be critical for the industries.
- vii. Additionally, there are growth in working hours, number of vacancies and vacancies rate relative to total employment as well as reduction in employer requirements for experience which indicates a growing demand for this occupation. Therefore, based on the evidence obtained, this occupation is included in the COL.

Occupation: Policy and Planning Manager

MASCO 2013 (4-Digit Code): 1213

MASCO 2013 (6-Digit Code): 1213-02; 1213-04; 1213-05; 1213-06; 1213-07; 1213-08

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Strategic Planning Manager; Policy and Research Manager; Project Planning Manager; Project Leader; Programme Manager; Regulatory Affairs Manager

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	14 nominations
Consultation	-
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. English Language
3. Microsoft Excel

Top Sectors:

1. Construction
2. Financial and Insurance/Takaful Activities
3. Manufacturing

Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience

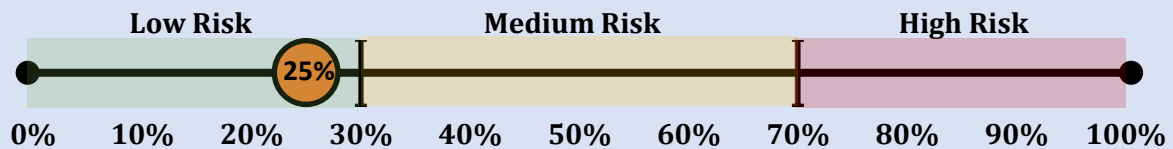
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased

2. Applicants lack the required technical or occupational skills
3. Too few applicants or no applicant at all

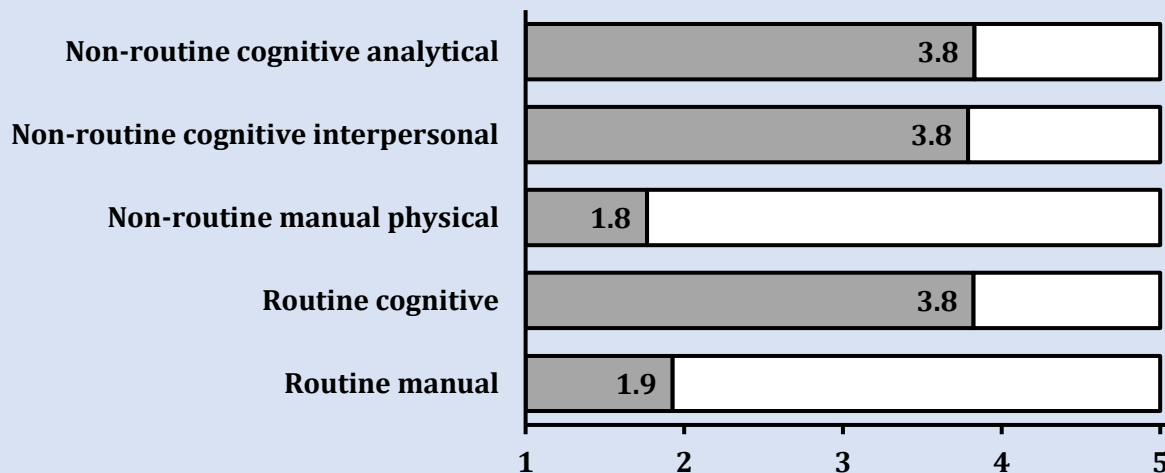
- presence at career fairs, increased use of recruitment firms, etc.)
2. Raising wages
 3. Expanding international recruitment efforts.

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for project planning managers, project leaders, and programme managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior to senior level staff with median time to fill of 2 to 3 months. The minimum qualification required for this occupation is a bachelor's degree.
- iii. Most respondents reported applicants lack of relevant job experience and required technical skills as among the main contributing factors to the shortage for this occupation. To address this, respondents have reported to expanding both local and international recruitment efforts, as well as to raise wages.



- iv. Through a validation session with the Public Relations Consultants' Association of Malaysia (PRCA), the Association has highlighted that there is a significant gap in the expectation of companies versus graduates existing skills. Many applicants were also reported to be incompetent in writing and speaking, mostly in English and Bahasa Malaysia. These applicants also lack other soft skills such as relationship building and presentations skills which are essentials to the nature of this occupation.

- v. The top-down result also shown growth in vacancies rate and reduction in requirement for applicants' experience, pointing to indication of shortage for this occupation. Supported by a significant number of bottom-up nomination, it justifies the inclusion of this occupation in the COL.



Occupation: Business Services Manager

MASCO 2013 (4-Digit Code): 1214

MASCO 2013 (6-Digit Code): 1214-01; 1214-02; 1214-03; 1214-04; 1214-05; 1214-06; 1214-07; 1214-08; 1214-12

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Production Manager; Production and Business Operation Manager; Business Services Development Manager; Production Planner; Production Controller; Business Development Manager; Compliance Manager; Fashion and Garment Manager; Sustainability Manager

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 1 out of 8 indicators
Bottom-up CfE survey	51 nominations
Consultation	7 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	Yes	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Communication Skills
3. Teamwork / Collaboration

Top Sectors:

1. Manufacturing
2. Financial and Insurance/Takaful Activities
3. Professional, Scientific and Technical Activities

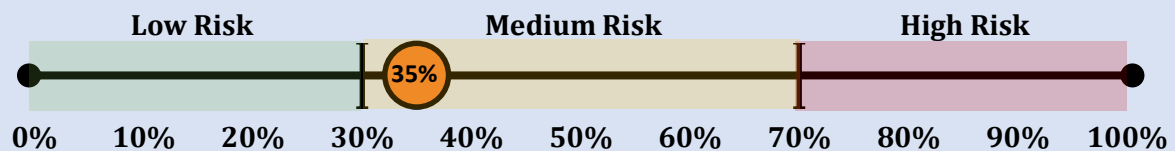
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical or occupational skills
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

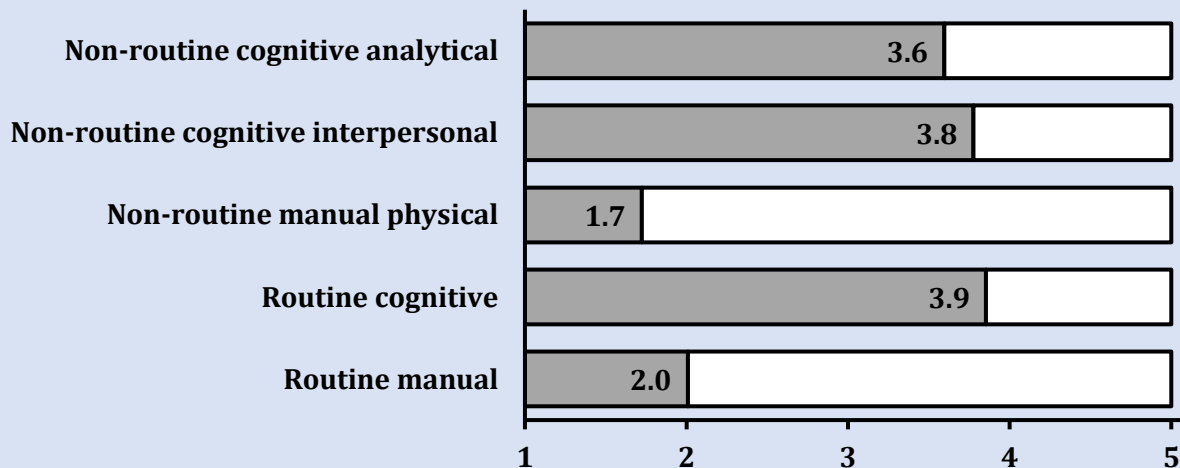
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for production managers, business development managers, and compliance managers.



- ii. Majority of companies have reported that vacancies within this occupation group are for middle and senior candidates with at least 5 years of working experience. They also reported that the median time to fill for this occupation is 2 to 3 months. However, a significant number of respondents also reported more than 5 months' time taken to fill this occupation. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in the Call-for-Evidence (CfE) survey. In addition to this, some respondents have highlighted the need for specific qualifications such as the Certified Financial Planner (CFP) certification.
- iii. From the consultation conducted with the Machinery & Engineering Industries Federation (MEIF), the need for experienced personnel who can fill in managerial position requires them to look at highly skilled talent. For this reason, they highly take into account candidates with many years of past experiences. Additionally, the industry has seen decrease in appeal and many talents are not interested to pursue career in this occupation. The issue of remuneration gap due to slow pace of adjusting difference in salaries by companies has also worsen the situation. In overcoming these issues, MEIF suggests for better access to upskilling opportunities by government, especially for engineers, to assume higher roles. However, the real challenge lies in the small and medium enterprises (SMEs) participation as most SMEs could not afford to provide adequate training for their employees.
- iv. Further input from the Life Insurance Association of Malaysia (LIAM) have noted that this occupation requires a good combination of strong business acumen and technical skills, substantial stakeholder management experience, and the ability to lead teams in executing strategies to generate quantifiable results. For some companies, strategies to overcome low supply of talents include training junior employees to assume business development and sales coach roles. Companies are also practicing internal staff movement to meet immediate demand. Within a certain role such as compliance manager, companies are looking for agile candidates that are responsive to ever-changing and increasing regulations. Some specific requirements were also listed by LIAM which includes;
 - a) Registered Financial Planner (RFP)
 - b) Software Development Life Cycle (SDLC)
 - c) Process Reengineering
 - d) Business Analysis
- v. Additional insights were also gathered from the Malaysian Agricultural Producers Association (MAPA). To overcome low supply of talents issue, MAPA have introduced the Structured Training Program for plantation cadets. Through this program MAPA focuses on producing outstanding performers to assume bigger roles in a short timeframe. Even so, there are instances where this position is hard to fill due to geographical issue as many find it difficult to work in remote areas. Commenting on automation, MAPA senses that as automation evolve, demand for manual labour will reduce and necessitates mastery in data and digital technology related knowledge. Concurrently, there will be more sophisticated machines to handle. In response to the aforementioned impacts, MAPA foresees that more high-skilled talents for this occupation is needed to handle the new and upcoming technologies. For this occupation, MAPA listed bachelor's degree in Mechanical Engineering with 1st Grade Steam Engineer as specific qualification needed for this occupation in the role of Production Manager.



- vi. The Malaysian Organisation of Pharmaceutical Industries (MOPI), through a consultation, shared that the growth in the pharmaceutical industry and the increasing regulations by the National Pharmaceutical Control Bureau (NCB) have indirectly increase the need for efficient managerial team to develop better business model. Due to the uniqueness of role in this occupation for pharmaceutical industry, many companies tend to look at international hiring as the suitable talents are hard to be found locally. MOPI requires for talent with at least a bachelor's degree in Science with 6 years (and above) related pharmaceutical experience.
- vii. Consistent with the claim that this occupation receives too few applicants or not applicant at all, as well as lacking relevant job experience and required, most companies have resorted to expanding local recruitment efforts, raising wages, and increasing worker training. On top of these strategies, companies have also reported expanding international and local recruitment efforts, and hiring less well qualified applicants.
- viii. On the basis of available evidence, particularly the overwhelming bottom-up nomination which stands at 58 nominations, this occupation is included in the COL.



Occupation: Business Services and Administration Manager Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 1219

MASCO 2013 (6-Digit Code): 1219-02; 1219-03; 1219-04; 1219-06

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Quality Control Manager; Quality Assurance Manager; Facilities Manager; Quality Assurance Manager (Halal Food Manufacturing)

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 10 indicators
Bottom-up CfE survey	30 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	Yes	Yes	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. Project Management
3. English Language

Top Sector:

1. Manufacturing

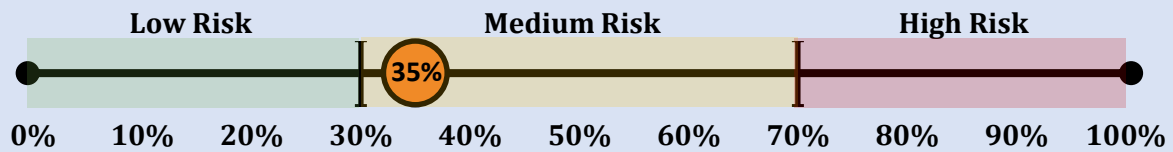
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Applicants lack the required credentials or certification

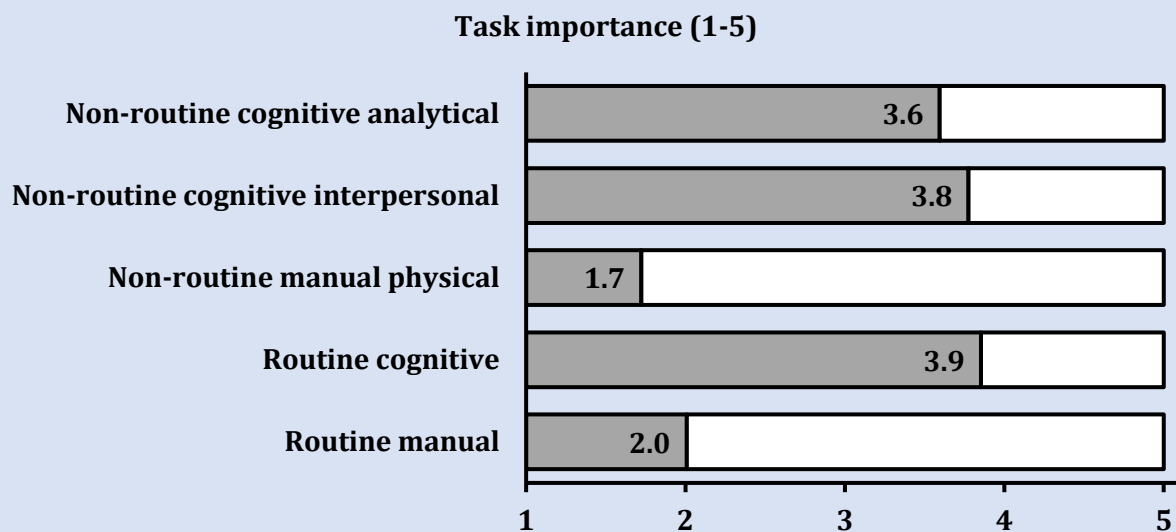
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need quality assurance and quality control managers.
- ii. Majority of the companies have reported that vacancies within this occupation group are from middle to senior level positions. The median time to fill reported is between 3 to 6 months, where to some extent it could be more than 6 months. In addition, companies have highlighted that this occupation has become harder to fill as compared to a year ago.
- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. They also prefer candidates with strong communication and leadership skills. Other skills needed include budgeting and planning.
- iv. Based on the consultation with Waste Management Association of Malaysia (WMAM), the waste management industry is facing a difficulty in hiring high skilled workers. There are no experts and insufficient experienced talent pool in the landfill facilities management.



- v. The Malaysian Retail Chain Association (MRCA) has also indicated that it is difficult to find quality assurance managers with high valuable skills for the industry.
- vi. The Chemical and Petrochemical Environmental Scan also cited that quality assurance managers are critical in the plastic products sub-industry. The average time taken to fill vacancies varies among positions, at between 3 to 6 months, with a minimum qualification requirement of a bachelor's degree.
- vii. This occupation passes the number of vacancies and vacancy rate threshold. Hence, combining with high nominations of bottom-up evidence and inputs from the stakeholders and the environmental scan study, we believe that this does point to a widespread shortage and thus supporting its inclusion in the COL.



Occupation: Sales and Marketing Manager

MASCO 2013 (4-Digit Code): 1221

MASCO 2013 (6-Digit Code): 1221-01; 1221-02; 1221-03; 1221-04; 1221-05; 1221-06; 1221-07; 1221-08; 1221-10; 1221-11; 1221-12; 1221-14

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Sales Manager; Sales and Marketing Manager; Marketing Manager; Sales Promotion Manager; Market Research Manager; Product Manager; Brand Manager; Supermarket Manager; Outlet Manager; Channel Partner Manager; Sales Director; Assistant Branch Manager
---	---

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	60 nominations
Consultation	10 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan Medical Devices Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

- Sales
- Communication Skills
- Marketing

Top Sectors:

- Manufacturing
- Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
- Information and Communication

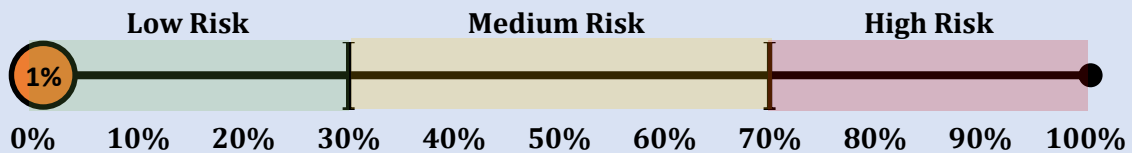
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

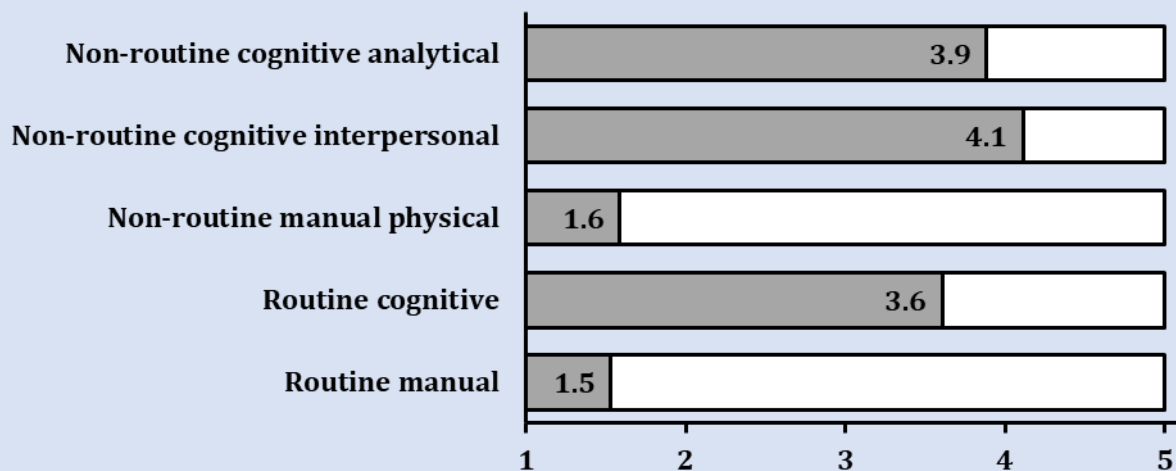
1. Expanding local recruitment efforts
2. Raising wages
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for sales managers and marketing managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle and junior level positions with a median time to fill of 2 to 3 months. Most companies stated that this position is neither more or less hard to fill than a year ago.
- iii. The majority of respondents reported that applicants were required to have bachelor's degree while some require candidates to have a degree in specialised courses (for example, degree in Engineering), depending on the industries.



- iv. Employers emphasised their requirement towards soft skills such as sales strategy, communication and marketing skills which are relevant to the position.
- v. From the Call-for-Evidence (CfE) survey, companies face challenges in finding applicants with relevant job experience and technical skills. Thus, companies have resorted to expanding local recruitment efforts, raising wages and hiring less qualified candidates to alleviate the short supply of labour.
- vi. From the consultation with Malaysia Retail Chain Association (MRCA), small medium enterprises are facing employment issues such as hiring of sales and marketing managers. This occupation is deemed as highly valued job in retail industry, however, most of the workers lack in passion and patience to be in long term employment for this occupation. Hence, various companies face higher turnover rate within the retail industry.
- vii. Malaysian Association of Amusement Themepark and Family Attractions (MAATFA) stated that sales and marketing manager is highly in demand and currently facing severe labour shortage with relevant experience in hospitality or theme park. The main cause to this shortage is that this occupation shares similar tasks and skills with other services industries which tend to be more favourable. Companies usually require talents for this occupation to have clear marketing strategies on the product and services offered by the theme park to boost attraction and clear communication with potential customers and current customers. Certain theme park operators invest in training the less experienced candidates to resolve the short supply of labour.
- viii. One of the member companies of the Free Trade Industrial Zone, Penang, Companies' Association (FREPENCA) stated that sales and marketing manager is a challenging occupation to fill due to location and product knowledge. For example, they require talents who have knowledge on aerospace and aviation industry.
- ix. Life Insurance of Association Malaysia (LIAM), require senior level position for sales managers with extensive experience in bancassurance, insurance local compliance and well connected with insurance industry. LIAM stated that there is a high turnover rate for this occupation, causing them to bear excessive external cost for rehiring and training new applicants. Hence, they sought to impose talent mobility within the companies by allowing employees to move to other preferred department or secondment of employees from other departments and ensuring adequate talent pipeline and succession planning. Sales managers was also pointed out as critical in the hotel industry, by Malaysian Association of Hotel Owners (MAHO).
- x. Malaysian Organisation of Pharmaceutical Industries (MOPI) face challenges in hiring brand managers who have degree in Science with 6 years and above related pharmaceutical industry experience. This is due to lack of applicants with good soft skills such as communication skills and no experience in pharmaceutical industry. This cause recruitment to be lengthy and longer time to fill in the vacancy. To mitigate with the current shortage, they look into their internal pool of employees before fill in position with external candidates.



- xi. This occupation is also cited as critical in the Medical Devices and Chemical and Petrochemical Environmental Scans with the need for the candidates to have relevant working experience and expertise. For example, candidates must possess engineering knowledge to work as sales and marketing managers in the chemical industry.
- xii. Top down indicators show increase in premium wage and vacancies as well as high nominations from the bottom up findings provide strong evidence that this occupation should be included in the COL.



Occupation: Agricultural, Forestry and Livestock Production Manager

MASCO 2013 (4-Digit Code): 1311

MASCO 2013 (6-Digit Code): 1311-03; 1311-06; 1311-09; 1311-10

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Plantation Manager; Agricultural Manager; Estate Manager; Assistant Park/Estate Manager (Grade G29)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 8 indicators
Bottom-up CfE survey	26 nominations
Consultation	5 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	Yes	Yes	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Communication Skills
3. Planning

Top Sectors:

1. Agriculture, Forestry and Fishing
2. Manufacturing
3. Administrative and Support Service Activities

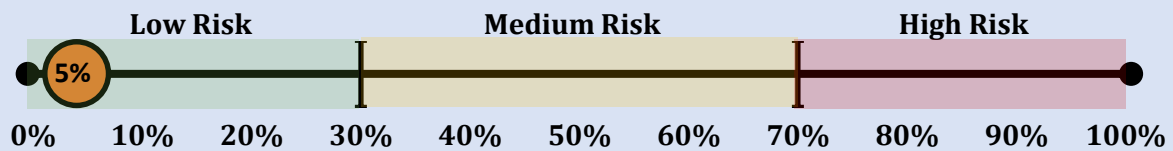
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack other required skills
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

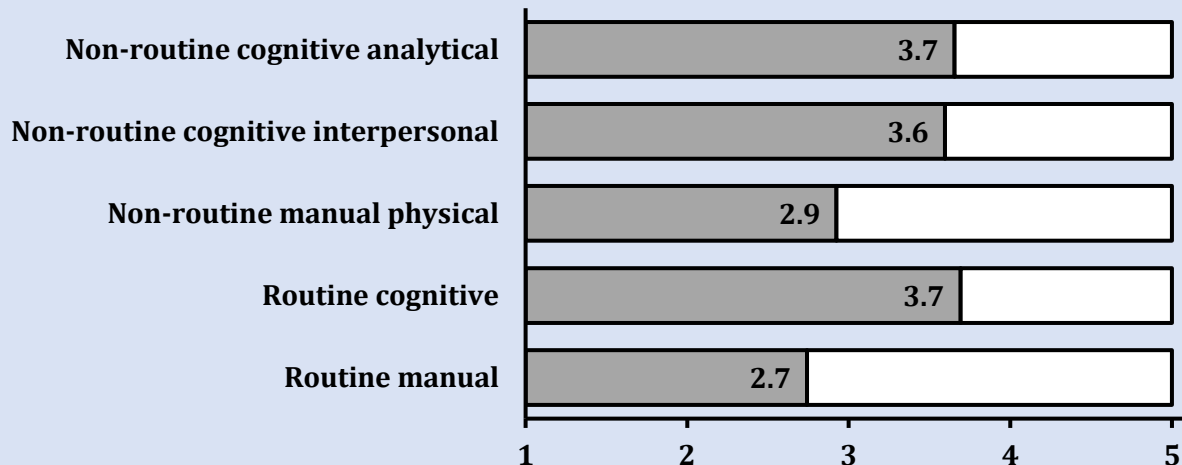
1. Increasing worker training
2. Raising wages
3. Automating tasks performed in this occupation

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for estate managers, plantation managers, and agricultural managers.
- ii. The majority of companies have reported that vacancies within this occupation group are across all level of staff. The median time to fill for this occupation is reported to be 2 to 3 months. Respondents reported that applicants would require at least a diploma, advance diploma, or bachelor's degree.



- iii. Through a consultation conducted with the Malaysia Palm Oil Board (MPOB), it was highlighted that tough working environment is a significant factor influencing the lack of talent supply for this occupation. Amongst the strategies that have been taken and are considered by MPOB to address lack of talent issue includes working together with public universities and local companies to make high-technology mechanism to be available in the near future as this will attract talents towards this industry, especially the youth. Additionally, MPOB suggest for more involvement by the government in establishing agricultural zones in each state to deter youth from steering away from this occupation. MPOB has also highlighted that companies have resorted to hire fresh graduates to become assistant manager, despite lack of experience and needed skills. After the period of 3 to 4 years of employment, these talents will be appointed as manager, if there is vacancy. However, most companies do not hire assistant manager because it will incur additional cost. Although MPOB agrees that automation will impact more low-skilled tasks, the same cannot be said of managerial positions. The role will significantly require human power and subsequently create more high skilled jobs to oversee new technologies and changes.
- iv. Further input was gathered from a consultation with the Malaysian Agricultural Producers Association (MAPA). MAPA reported that the long tenure and training for employees before reaching managerial level especially in the plantation manager, agricultural manager, and estate manager roles is one of the reasons why this occupation is hard to fill – placing huge impact to employees’ productivity. MAPA have resorted in providing their employees with the Structured Training Program that is crafted to train junior employees and equip them with the necessary skills and knowledge to climb up the career ladder much faster. Similar to many respondents and consultation, MAPA is optimistic with the fate of this occupation in facing the rise of automation. MAPA believes that automation can create more demand for this occupation as current and developing technologies will require better managerial supervision. MAPA listed two specific requirements that they look for in candidates;
 - a) Bachelor’s degree in Agriculture
 - b) Membership of Incorporated Society of Planters
- v. Consistent with the claim that this occupation requires sufficient job experience, as well technical and non-technical skills, companies have resorted in increasing workers training, raising wages, and automating tasks performed in this occupation.
- vi. On the basis of significant number of bottom-up nominations that points out to acute shortage for this occupation, it is included in the COL.



Occupation: Manufacturing Manager

MASCO 2013 (4-Digit Code): 1321

MASCO 2013 (6-Digit Code): 1321-01; 1321-02; 1321-03; 1321-06; 1321-07; 1321-09; 1321-12; 1321-13

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Manufacturing Manager; Production and Operation Manager (Manufacturing); Factory Manager; Ship Hull Manager; Mechanical Manager; Oil Mill Manager; Maintenance Manager; Electrical Manager

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	26 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan Medical Devices Environmental Scan Food and Beverages Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. Planning
3. Quality Assurance and Control

Top Sectors:

1. Manufacturing
2. Construction
3. Transportation and Storage

Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience

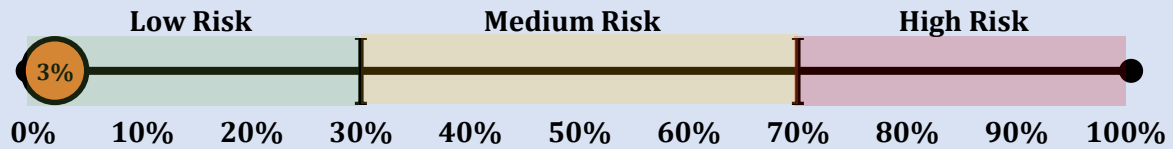
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts

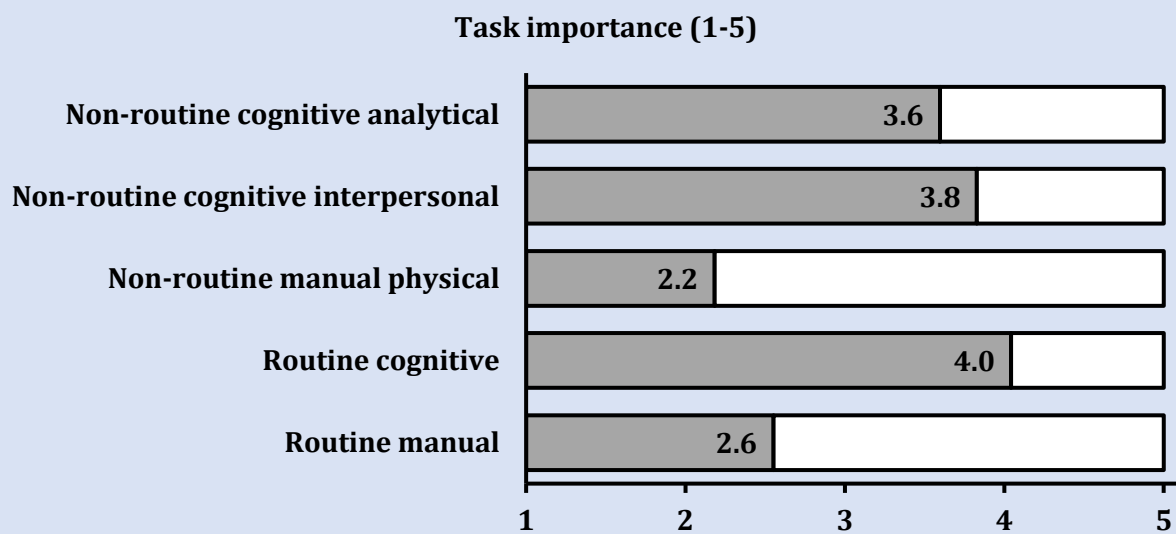
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for maintenance managers, production and operation managers (manufacturing), factory managers and oil mill managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle and senior level position with more than 5 years of working experience. The median time to fill for this occupation is reported to be 5 to 6 months and companies have stated this occupation is harder to fill as compared to a year ago.
- iii. The bachelor's degree in Mechanical Engineering, Marine Engineering or Ship Building and Textile Technology were among the specified field of studies required by companies for some related occupations. While, in terms of skills, applicants who have a good knowledge in health, safety and environment, strong technical, management, financial and cost control skills, as well as problem solving abilities are also preferred. Additionally, MAPA also stated that companies



require candidates with minimum 10 years of working experience in oil mill, have strong leadership and possess high discipline and strict compliance with standard operating procedure (SOP) as well as have a good knowledge of ISO in quality management system (QMS) and environmental management system (EMS).

- iv. Both of the consultations with Malaysian Palm Oil Board (MPOB) and Malayan Agricultural Producers Association (MAPA) indicated that oil mill manager is critical to the agricultural industry. MPOB mentioned that the reason behind the shortage in this occupation is due to insufficient pool of talent that can understand and adapt to this industry, where most of them find the environment to be unattractive. This is consistent with MAPA's input where talents are unlikely to work in estate or isolated location (e.g. in the interior of Sabah) influenced by the lack of infrastructure and township amenities for children, spouse and education.
- v. MPOB suggested that the government should consider to establish agricultural zones in each state and opined with the introduction of high technology mechanisms would possibly be the new attraction for local, especially youths to be in this industry. MPOB works together with public university to make these mechanisms available in the near future. MPOB also shared that local companies carry out research to establish new mechanism for the digitalization of the industry as well.
- vi. Malaysian Association of Amusement Theme Park and Family Attractions (MAATFA) also indicated that maintenance manager who have strong technical skills and job experience in theme park are in shortage. Companies are looking for applicants who are experienced in audio visual, animatronics, lighting, theme park rides maintenance.
- vii. The Chemical and Petrochemical Environmental Scan cited production & operations managers (manufacturing) and manufacturing managers to be critical in chemical, petrochemical & oleochemical and plastic & rubber products subsectors respectively. The Medical Devices and Food & Beverages Environmental Scan have mentioned that manufacturing managers is also critical in the respective industries.
- viii. Given the high number of nominations with sufficient evidence from 3 industry associations, and increase in vacancies rate and number of vacancies, the evidence indicates that there is a growing demand and acute shortage of skilled workers for this occupation. Therefore, this occupation to be included in the COL.

Occupation: Construction Manager

MASCO 2013 (4-Digit Code): 1323

MASCO 2013 (6-Digit Code): 1323-01; 1323-03; 1323-05; 1323-06; 1323-09; 1323-13; 1323-15

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Construction Manager; Construction Contract Manager; Construction Project Manager; Construction Site Manager; Structure and Construction Manager; Construction Engineering Director; Construction Engineering Manager
---	---

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 11 indicators
Bottom-up CfE survey	38 nominations
Consultation	1 nomination
Talent/Skills studies	<ul style="list-style-type: none"> Maritime (Shipbuilding and Ship Repair) Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	NA	NA	NA	

Occupation Overview:

Top Skills:

- Construction Management
- English Language
- Project Management

Top Sectors:

- Construction
- Mining and Quarrying
- Electricity, Gas, Steam and Air Conditioning Supply

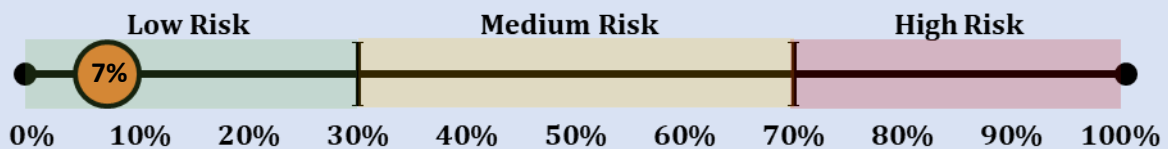
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

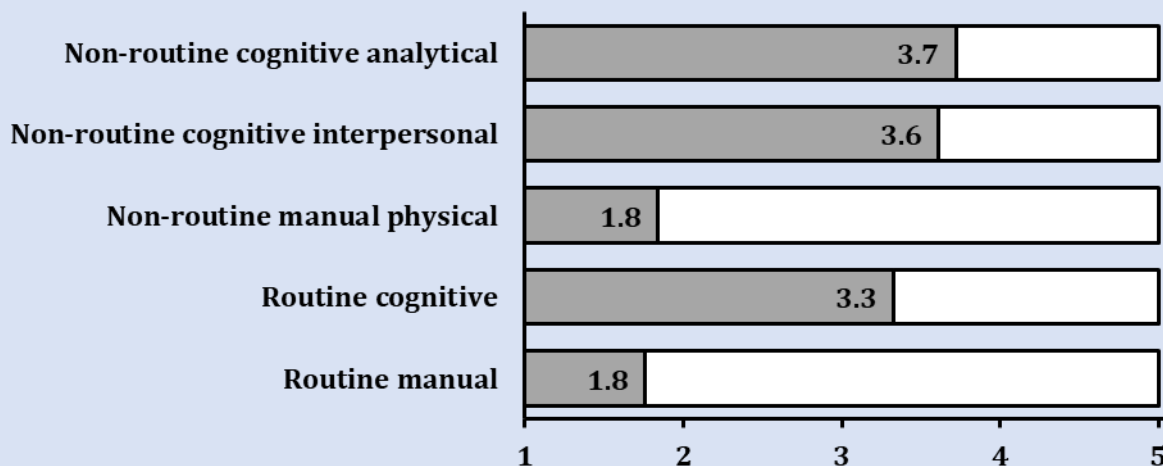
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Raising wages
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for construction project managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle to senior level candidates. The median time to fill for this occupation is reported to be 2 to 3 months.
- iii. Most companies require a minimum of a bachelor's degree for this occupation. Some specified requirements (depending on the role) highlighted include quantity surveying, civil engineering and being a member of the Board of Engineers Malaysia (BEM).



- iv. The skills identified by companies for this occupation are analytical skills, problem solving abilities and good communication skills. Other specified skills include presentation, negotiation and leadership skills. One of the companies in real estate activities sector have also highlighted the need for project managers who have working experience in management of property development projects.
- v. From our consultation with Malaysia Chamber of Mines (MCOM), it was highlighted that construction managers with sufficient (5 to 10 years) experience are difficult to find. One of the requirements include having both engineering and construction background, with relevant qualifications to become a manager. Further validation with Construction Industry Development Board (CIDB) Malaysia also highlighted that construction managers are in demand within civil engineering subsector. This occupation was also listed as critical in the Maritime (Shipbuilding and Ship Repair) Environmental Scan, especially for shipbuilding subsector.
- vi. Top-down evidence shows that there is increase in wage and vacancies. This is further supported by bottom-up evidences where companies have reported to be raising wages to attract more talents as well as expanding local recruitment efforts. Therefore, this occupation is included in the COL.



Occupation: Supply, Distribution and Related Manager

MASCO 2013 (4-Digit Code): 1324

MASCO 2013 (6-Digit Code): 1324-02; 1324-04; 1324-11; 1324-13; 1324-18

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Transport Manager; Warehouse Manager; Storage Manager; Logistics Manager; Purchasing Manager

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	12 nominations
Consultation	-
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Planning
2. Communication Skills
3. Logistics

Top Sector:

1. Manufacturing

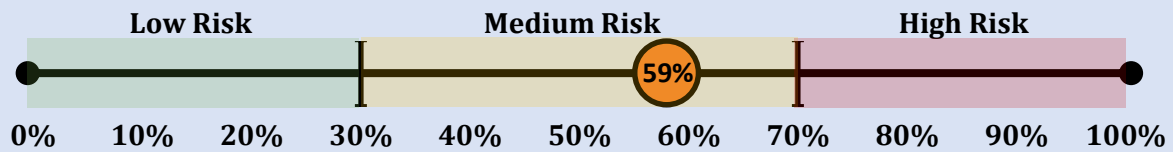
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Applicants lack other required skills

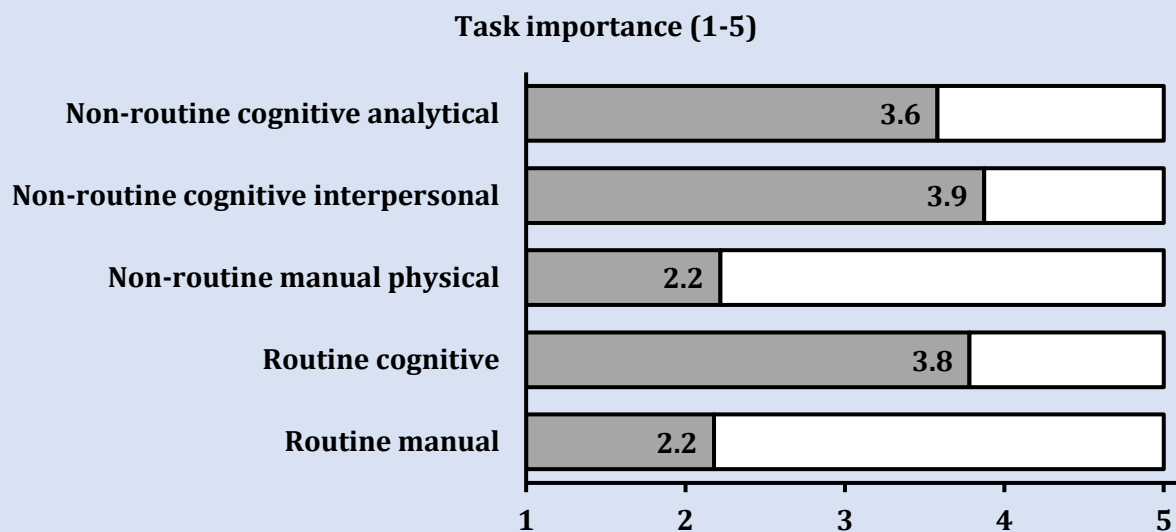
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Raising wages
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for logistics and warehouse managers.
- ii. Most of the companies have reported that vacancies within this occupation group are for middle level positions. The median time to fill reported is between 3 to 6 months. In addition, companies reported that this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. A minimum requirement of a bachelor's degree is needed for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey with strong problem-solving abilities, communication skills and logistics knowledge. Additionally, skills related to supply chain management and knowledge are also preferred.



- iv. Further validation with the Federation of Malaysian Manufacturers (FMM) agreed that these positions are critical with several reasons as follows:
 - a) Transport manager, warehouse manager, storage manager, logistics manager – long hours and stressful working conditions; and
 - b) Unattractive salary package. Companies are able to recruit these positions provided good salaries are being offered and the employers are willing to invest in their career developments.
- v. The Chemical and Petrochemical Environmental Scan has stated supply managers and warehouse managers to be critical in the plastic products sub-industry. On average, they have found that these occupations take an average of 3 months to fill, with a minimum qualification requirement of a bachelor's degree or equivalent.
- vi. From the top down results, this occupation passes the number of vacancies and vacancy rate threshold, which indicates an increasing demand for talent. Plus, with moderate nominations of bottom-up evidence and supported by the inputs from the key stakeholder and environmental scan study, this occupation is included in the COL.



Occupation: Information and Communications Technology Manager

MASCO 2013 (4-Digit Code): 1511

MASCO 2013 (6-Digit Code): 1511-02; 1511-04; 1511-05; 1511-08; 1511-09; 1511-11; 1511-12; 1511-15; 1511-19; 1511-20; 1511-21; 1511-22; 1511-25; 1511-27; 1511-29; 1511-30; 1511-31; 1511-32; 1511-33; 1511-34

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Chief Information Technology Officer; Information Systems Manager; Information Technology Manager; Application Development Manager; Chief Information Officer; Information & Communications Technology (ICT) Development Manager; Information Systems Director; Animation Director; Information Technology Project Manager; Information Technology Infrastructure Manager; Information Technology Programme Manager; Information Technology Sales Manager; Creative Multimedia Manager; Network Operations Manager; Chief Information Security Officer; Information Technology Business Development Manager; Technology Transformation Manager; Information Technology Support Manager; Software Development Manager; Building Information Modelling (BIM) Manager

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 10 indicators
Bottom-up CfE survey	29 nominations
Consultation	5 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	Yes	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills and English
2. Planning and Project Management
3. Troubleshooting

Top Sectors:

1. Information and Communication
2. Professional, Scientific and Technical Activities
3. Manufacturing

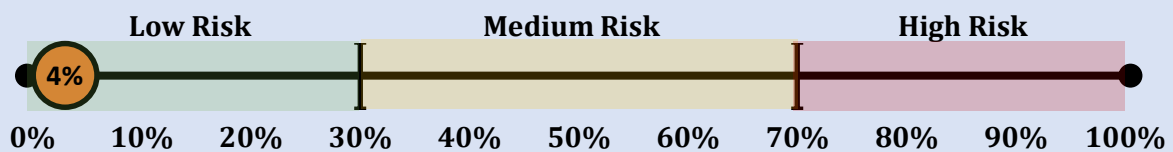
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience
3. Applicants lack the required technical skills

Top Strategies to Meet Shortages:

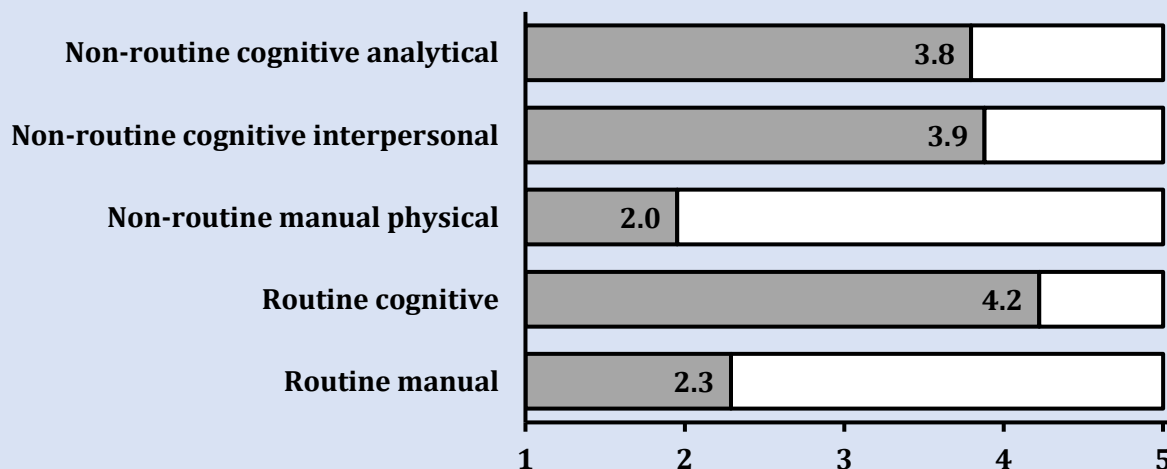
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Expanding international recruitment efforts
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for information technology managers and information technology project managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle and senior positions. Although the most common time taken to fill for this occupation have been reported to be 2 to 3 months, most companies cited that this occupation is harder to fill as compared to a year ago. In addition to this, about one-third of respondents also reported that they require about 4 to 6 months to find skilled employees for this job.
- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Some specialised certification or qualification highlighted for the information technology project managers include project management office (PMO) and information technology (IT) software engineering.
- iv. The skills identified by companies for this occupation are IT skills, problem solving abilities, good communication skills and analytical skills. Other specified skills needed include excellent strategic planning and business direction as well as stakeholder and project management.
- v. Consultation with one of the key players in communication industry indicated a need for information technology managers who have excellent knowledge of technical management, information analysis and of computer hardware or software systems, expertise in data centre management and data governance as well as knowledge on cybersecurity. This shortage causes poaching of talents from similar or other industries.
- vi. Further input from Malaysia Digital Economy Corporation (MDEC), also paints a picture that animated video games are the most popular trend at the moment and creative industry became one of the fastest growing industries in Southeast Asia and globally, where there are ample opportunities for Malaysians in both animation and gaming areas. This is consistent with the government's target to develop and create an optimum healthy ecosystem in the local e-Sports industry. Thus, MDEC cited that game directors and animation directors are in demand as well.
- vii. Besides that, information technology managers and information technology business development managers have been highlighted as top trending jobs in the information and communication sector by surveyed companies in MDEC Digital Talent Report.
- viii. There is a strong bottom-up evidence from high nominations by companies from 8 industries and supported by additional input from 2 key industry players. Combined with top-down evidence, an increase of vacancy rate and number of vacancies somewhat indicate that this occupation is sought-after. Therefore, this occupation is included in the COL.

Occupation: Chemist

MASCO 2013 (4-Digit Code): 2113

MASCO 2013 (6-Digit Code): 2113-05; 2113-06; 2113-13; 2113-16; 2113-21; 2113-23; 2113-25; 2113-26; 2113-27; 2113-35

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Chemist; Chemist (Rubber); Chemist (Polymer); Chemist (Research and Development); Chemist (Quality Control); Chemist (Industrial); Chemist (Dye); Chemist (Textile); Chemist (Pharmaceutical); Sedimentologist

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	12 nominations
Consultation	1 nomination
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan Pharmaceutical Manufacturing Environmental Scan Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

- Chemistry
- Quality Assurance and Control
- Research

Top Sectors:

- Manufacturing
- Construction

Top Reasons of Hard-to-Fill:

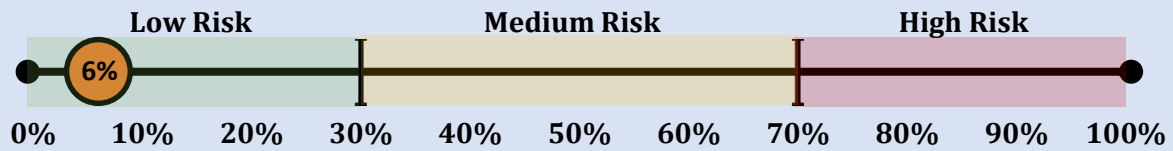
- Applicants lack the required technical skills

Top Strategies to Meet Shortages:

- Expanding local recruitment efforts

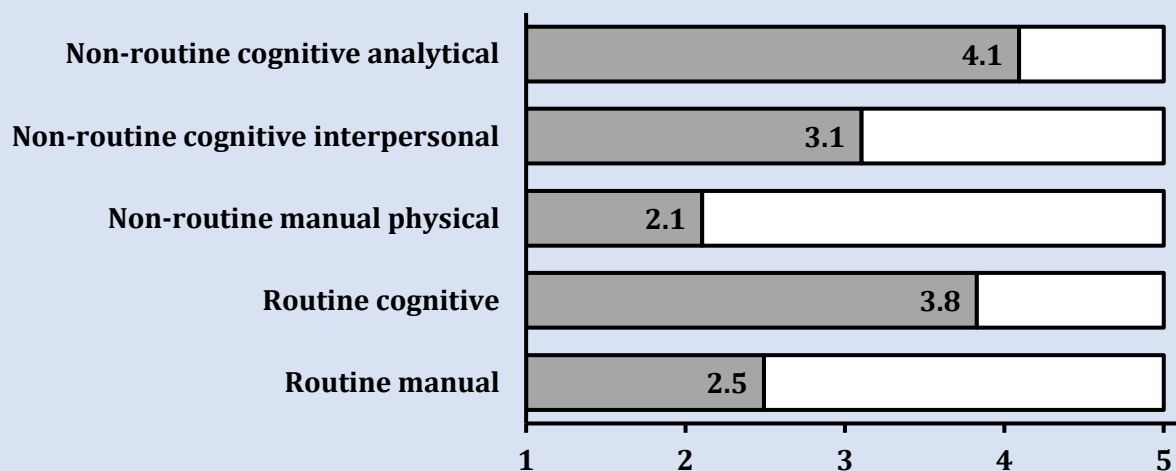
- | | |
|--|--|
| 2. Applicants lack the required credentials or certification | 2. Partnerships with education or training providers focused on recruitment of graduates |
| 3. Applicants lack relevant job experience | 3. Hiring less well qualified applicants |

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job title nominated reflect mostly the need for chemists in research and development area.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior and middle level candidates. The median time to fill up the vacancies is within 2 to 3 months and half of respondents have stated this occupation harder to fill as compared to a year ago.
- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. In addition, some companies also reported that applicants who have good knowledge in analytical chemistry, problem-solving abilities or strong technical skills are preferred for this occupation. Even so, some companies are willing to hire less well qualified applicants due to recruitment difficulties.



- iv. Based on our consultation with the Malaysian Textile Manufacturers Association (MTMA), they have highlighted the challenge to find chemists specialising in textile field as there is insufficient talents. Competition exists not only among textile companies but other industries as well. Talents with degree in Polymer Chemistry or Chemical Engineering with 2 to 3 years working experience are sought after by companies for this position. This is also supported by the Professional Services Activities Environmental Scan which cited that chemist positions are hard to fill because of small pool of talent with technical competencies and this position requires very specialised knowledge.
- v. The Chemical and Petrochemical Environmental Scan have mentioned chemists as one of the critical occupations in the chemical, petrochemical and oleochemical subsectors. According to their survey, the average time taken to fill vacancies is within 5 to 9 months and this position requires a certification from Chemicals Commission. Moreover, The Pharmaceutical Manufacturing Environmental Scan also stated that pharmaceutical chemist is observed to be a critical occupation. At the moment, this position is typically filled by expatriates from India. There is need to groom local talent to fill this role as this occupation is crucial for formulation processes.
- vi. In overall rating, this occupation did pass the top-down shortage threshold. Plus, with strong additional evidence from the environmental scans and consultation from various sectors, it shows that this occupation facing a widespread shortage. Therefore, this occupation is included in the COL.

Occupation: Geologist and Geophysicist

MASCO 2013 (4-Digit Code): 2114

MASCO 2013 (6-Digit Code): 2114-06; 2114-07; 2114-08; 2114-09; 2114-12; 2114-29; 2114-36; 2114-37; 2114-41; 2114-43; 2114-47

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Geophysicist; Geologist; Geologist (Engineering); Geologist (Mining); Geologist (Petroleum); Hydrologist; Petroleum Geoscientist; Geoscientist; Reservoir Geologist; Geomodeller; Geophysical Specialist

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 1 out of 4 indicators
Bottom-up CfE survey	12 nominations
Consultation	6 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Geotechnical Engineering
2. English Language
3. AutoCAD

Top Sectors:

1. Construction
2. Mining and Quarrying
3. Electricity, Gas, Steam and Air Conditioning Supply

Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Too few applicants or no applicant at all

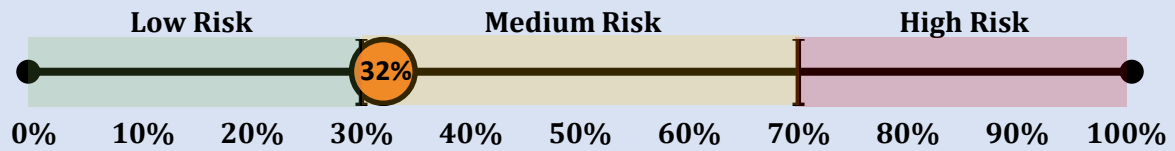
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Expanding international recruitment efforts

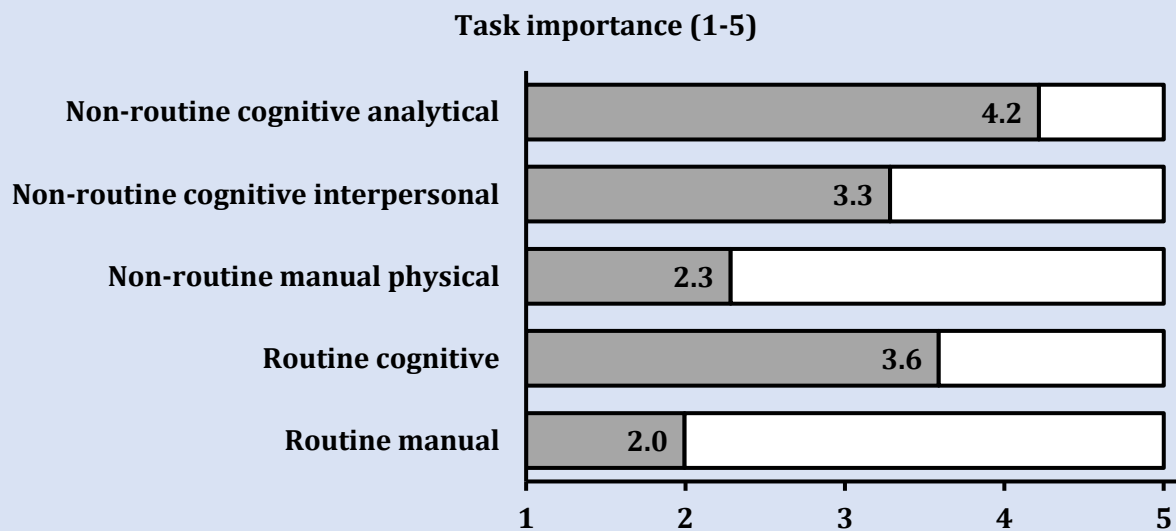
3. Applicants lack relevant job experience

3. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for geologists and geophysicists.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle level to senior staff with a median time to fill of 2 to 3 months. Most companies require applicants to have a minimum of bachelor's degree and in some cases, a master's degree.
- iii. Companies have also reported that talents should be well equipped with analytical skills, IT skills, soft skills such as problem-solving abilities and communication skills. Companies are also looking for talents who are able to work well in a team.



- iv. From our consultation with the Malaysian Chamber of Mines (MCOM), it is understood that the industry needs geologists who are well equipped with basic knowledge and masters the relevant terminologies. The industry also needs talents who are willing to work in rough and tough environment. They have also mentioned the difficulty of recruiting talents with specific degrees in mining. From another consultation, one of the key players in the oil and gas industry have cited recruitment challenges which include the factor of location (particularly in Sabah and Sarawak).
- v. In line with respondents' claim that most applicants lack the required technical skills, increasing workers' training is one of the most adopted strategies to address current shortages. Companies are also expanding partnerships with education and training providers so as to potentially improve future graduates' skills and employability in this field.
- vi. Strong bottom-up evidence indicates the need to include this occupation in the COL.



Occupation: Mathematician, Actuary and Statistician

MASCO 2013 (4-Digit Code): 2121

MASCO 2013 (6-Digit Code): 2121-07; 2121-18; 2121-19; 2121-26; 2121-27; 2121-29; 2121-30; 2121-31; 2121-32; 2121-33; 2121-34; 2121-35; 2121-36; 2121-37; 2121-40; 2121-41

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Mathematician (Actuarial Science); Statistician (Social Science); Statistician (Engineering); Data Scientist; Data Analyst; Data Mining Analyst; Data Modeller; Data Miner; Big Data Analyst; Analytical Consultant; Appointed Actuary; Pricing Actuary; Valuation Actuary; Geographic information Systems (GIS); Data Architects; Big Data Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	28 nominations
Consultation	18 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Microsoft Excel
2. Research
3. Statistics

Top Sectors:

1. Financial and Insurance/Takaful Activities
2. Information and Communication
3. Manufacturing

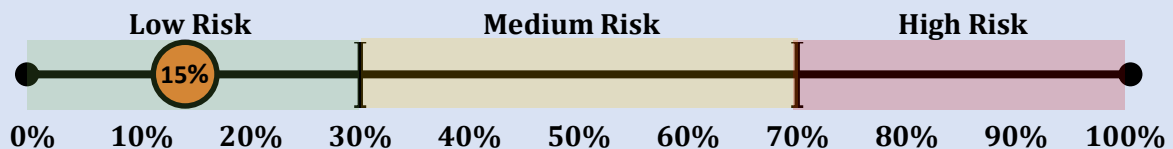
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Too few applicants or no applicant at all
3. Applicants lack the required credentials or certification

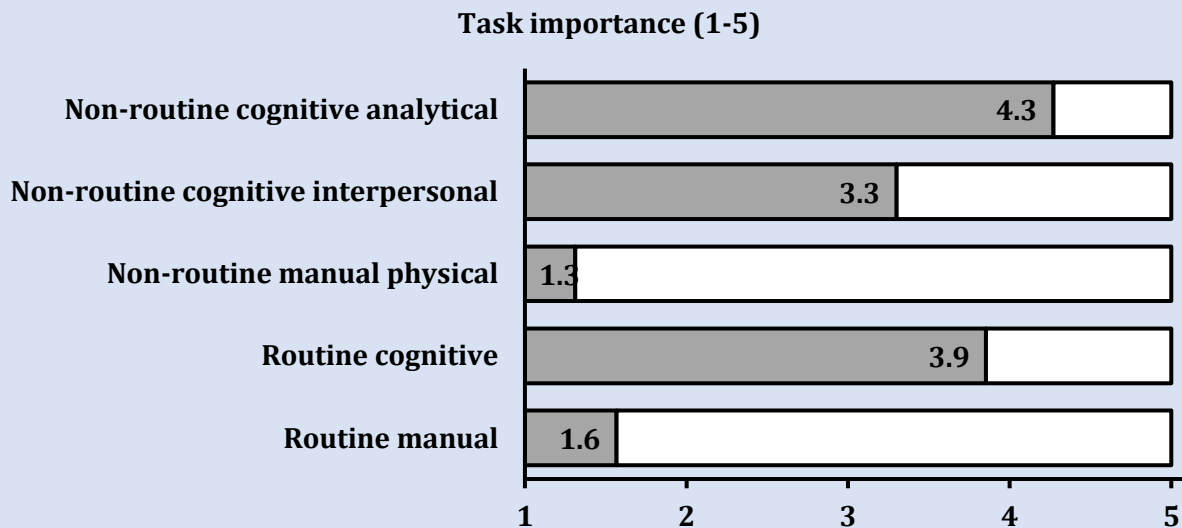
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Increasing worker training
3. Expanding international recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for data scientists, data analysts, big data analysts, and big data engineers.

- ii. The majority of companies have reported that vacancies within this occupation group are for all level of staff with median time to fill of 2 to 3 months. Most companies would prefer at least a bachelor's degree and only a small amount of companies would require master's degree and PhD as educational qualification.
- iii. The MDEC Digital Talent Report has recognised some of the sought-after jobs in this occupation such as data analyst, data scientist, and data engineer are among the top trending digital industry job titles but may also be difficult to fill in the future.
- iv. Consistent with the claim that this occupation requires a particular set of technical skills, most respondents have reported increasing worker training, and expanding both local and international recruitment efforts. Instead, the companies have resorted to expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.). Additionally, companies have also partnered with education or training providers to mitigate the issue of skills mismatch. However, only small amount of companies has reported raising wages to address having too few or no applicants applying for this occupation.
- v. The Association of Banks Malaysia (ABM) commented through a consultation that the growth in financial technology (FINTECH) and big data have contributed to the advancement of digital solutions and consequently have created many new platforms for banks to pursue higher innovation and growth. This development necessitates banks to seek for skilled talents for this occupation. At the moment, many banks resort to hiring foreign talent to fill the shortage caused by scarcity of skilled local talents. ABM specified the followings as among the required niche skills for this occupation;
 - a) Python Coding
 - b) Apache Spark
 - c) Data Modelling
 - d) OLAP Design
- vi. Meanwhile, through a consultation conducted with one of the key players in the communication industry, the scarcity that they face is mostly in terms of skills rather than headcounts. However, increasing digitalisation that highly deals with data has made the occupation more critical each day. Among the skills required for this occupation as listed by the key players are;
 - a) Apache tools such as Cludera, Zookeeper, Hive, and HBase
 - b) Data warehousing solutions such as ETL, SAP Data Management, and SSIS
 - c) Google Analytics.
 - d) Power BI
- vii. The consultation conducted with the Life Insurance Association of Malaysia (LIAM) shown that the shortage of qualified actuaries with required post-qualification experience is high. Most insurance companies expect talents for this occupation to have specific expertise in medical insurance and corporate strategy. In addition, LIAM also requires candidates to have fellowship of recognised Actuarial Professional bodies with at least 3 years of post-qualification experience.



- viii. Additionally, the Malaysia Digital Economy Corporation (MDEC) reveals that the shortage for this occupation in its industry is highly contributed by local talents migration abroad for better salary package. Candidates with diploma or bachelor's degree are welcomed to fill this occupation while at the same time trainings are given to current students who are interested in freelancing to earn side income while studying. This is to better mitigate the gap in expected experience as graduates enter the job market.
- ix. The Waste Management Association of Malaysia (WMAM) explained that most companies in the industry are looking for candidates with substantial years of experience in related field that is able to keep up with the rapid growth of disruptive technologies. The shortage in this field has made the strategic movements of companies within this industry to move at a slow pace. To overcome this problem, WMAM has collaborate with industry leaders from other countries to enhance the knowledge transfer program in Malaysia.
- x. From the consultation conducted with one of the key players in the oil and gas industry, the shortage for this occupation in the industry is mostly due to lack of applicants with sufficient hands-on experience in big data and artificial intelligence. The key player also shared that companies are no longer looking to fill traditional IT roles and are now focused on the new generation of IT jobs which are more consultative in nature. As for automation, the key player is positive that the new wave of technology can benefit this occupation as companies' innovation hub aims to hire more automation specialists.
- xi. Whereas for The Free Industrial Zone, Penang, Companies' Association (FREPENCA), the lack of talented candidate residing in Penang is the key factor leading to the shortage in the state for this occupation. Many talents are concentrating in Kuala Lumpur and commonly refuse to relocate to other cities. For FREPENCA, the way forward for automation in the country could create small factories that enable company to obtain real-time data and shifting more into self-service, further demanding for the shortage in this occupation to be addressed soon.
- xii. On the basis of substantial bottom-up evidence, this occupation is included in the COL.

Occupation: Industrial and Production Engineer

MASCO 2013 (4-Digit Code): 2141

MASCO 2013 (6-Digit Code): 2141-01; 2141-02; 2141-03; 2141-04; 2141-09; 2141-11; 2141-19; 2141-22; 2141-24; 2141-25; 2141-31; 2141-32; 2141-33; 2141-35; 2141-36; 2141-41; 2141-42; 2141-50; 2141-51; 2141-52; 2141-53

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Automation Engineer; Robotics Engineer; Industrial Engineer; Production Engineer; Planning Engineer; Systems Design Engineer; Printing Technologist; Textile Technologist; Plant Engineer; Package Design Engineer; Industrial Automation Engineer; Robotic Technologist; Process Development Engineer; Facilities Competent Engineer; Reliability Engineer; Physical Design Engineer; Automation Design Engineer; Industry 4.0 Technologist; Quality Management System Engineer (QMS); Special Tooling (Mould) Engineer; Special Tooling (Die) Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	39 nominations
Consultation	10 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Electrical and Electronic Environmental Scan Chemical and Petrochemical Environmental Scan Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2)

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Quality Assurance and Control
2. Communications Skills
3. English Language

Top Sectors:

1. Manufacturing
2. Construction
3. Mining and Quarrying

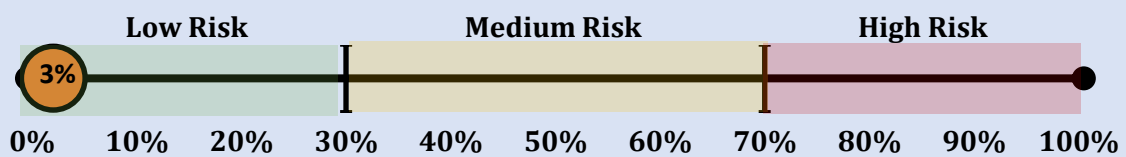
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

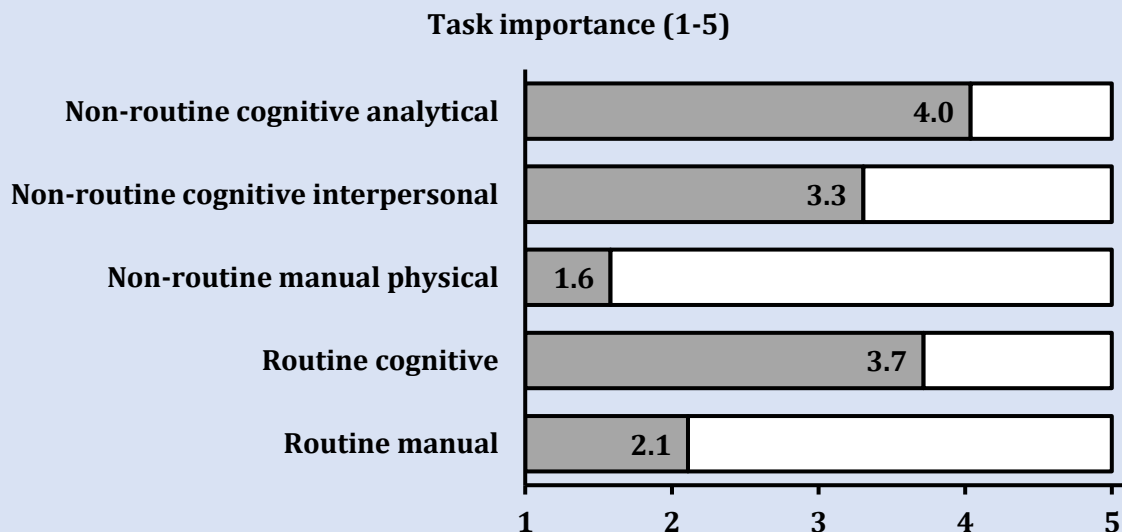
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for production engineers and automation engineers.

- ii. The majority of companies have reported that vacancies within this occupation group are for junior and middle level engineers. In addition, the applicants lack relevant job experience and lack the required technical skills are the most-cited reasons behind the occupation being hard-to-fill. The most common time to fill for this occupation reported is within 3 months. Companies also have reported this occupation neither more nor less hard to fill as compared to a year ago.
- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey, for example, in Mechanical or Petrochemical Engineering. Some respondents reported that applicants need particular certifications such as Primavera P6 and Project Management Professional (PMP).
- iv. Consistent with the claim that this occupation requires a particular set of technical skills, most respondents do not report hiring less well qualified workers. Instead, most of the companies have resorted to expand local recruitment efforts and increase workers' training to mitigate the shortages.
- v. The findings from Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) cited that automation engineers are termed as critical job for machinery and equipment (M&E) sub-sector. Meanwhile, Electrical and Electronic Environmental Scan highlighted that industrial and production engineers are critical in the semiconductor sub-sector. Chemical and Petrochemical Environmental Scan also highlighted that many companies faced challenges in hiring production engineers in chemical, petrochemical and oleochemical, plastic products as well as rubber products sub-industries. The plastic products sub-industry the longest average time taken to fill this occupation (6-12 months) as compared to other sub-industries.
- vi. Consultation session with Federation of Malaysian Manufacturers (FMM) indicated that there is insufficient supply of talents in Malaysia and most applicants do not possess hands-on experience in the technology. Malaysian Textile Manufacturers Association (MTMA) also highlighted that currently there are only 2 universities, namely University Technology MARA (UiTM) and University Tun Hussein Onn Malaysia (UTHM) offering textile technology or textile engineering and the number of graduates is very low each year. Hence, this causes stiff competition between companies from various sectors in hiring them.
- vii. Further input from Machinery & Engineering Industries Federation (MEIF) indicated that special tooling (mould) engineers, special tooling (die) engineers, robotic engineers and robotic technologists are hard to fill in the industry. This is because the skills needed for specialist tooling (mould & die) engineers are niche and engineers feel that they have limited opportunities to widen their technical skillset. There is also lack of interests amongst the candidates and longer period of time is needed to pick up all the relevant skills. In future plan of hiring engineers, employers found that location is also a significant factor to attract qualified candidates. For robotic engineers and technologists, application of theories learnt during studies in universities is challenging because there is no hands-on exposure for graduates to acquire the different skillsets required for different items within the job scope.



- viii. One of the member companies of the Free Industrial Zone, Penang, Companies' Association (FREPENCA) mentioned that industrial engineers are critical because applicants lack relevant work experience such as in lean manufacturing, hands on with value stream mapping and continuous flow manufacturing. Candidates are required to have degree in Industrial, Mechanical or Mechatronic Engineering.
- ix. There is a strong bottom-up evidence through high nomination and input from various industry associations, and supported by findings from 3 environmental scans. Plus, this occupation passes the wage premium, number of vacancies and vacancy rate threshold which indicates high demand for talents. Hence, this occupation is included in the COL.



Occupation: Civil Engineer

MASCO 2013 (4-Digit Code): 2142

MASCO 2013 (6-Digit Code): 2142-10; 2142-11; 2142-13; 2142-14; 2142-16; 2142-18; 2142-20; 2142-22; 2142-25; 2142-28; 2142-37; 2142-38; 2142-39; 2142-40; 2142-41; 2142-46; 2142-47; 2142-53

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Engineer; Technologist; Civil Engineer; Site Engineer; Civil Engineer (Construction); Civil Engineer (Building Construction); Civil Engineer (Tower Construction); Civil Engineer (Structural); Civil Engineer (Road Construction); Civil Engineer (Bridge Construction); Facilities Engineer; Maintenance Engineer; Geotechnical Engineer; Structural Engineer; Assistant Engineer; Reliability and Safety Engineer; Construction Engineer; Civil and Structure Design Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	50 nominations
Consultation	8 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2)

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	Yes

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skill
2. English Language
3. AutoCAD

Top Sectors:

1. Construction
2. Manufacturing
3. Professional, Scientific and Technical Activities

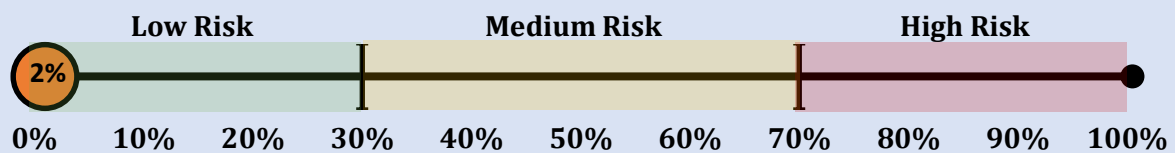
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical or occupational skills
2. Too few applicants or no applicant at all
3. Applicants lack relevant job experience

Top Strategies to Meet Shortages:

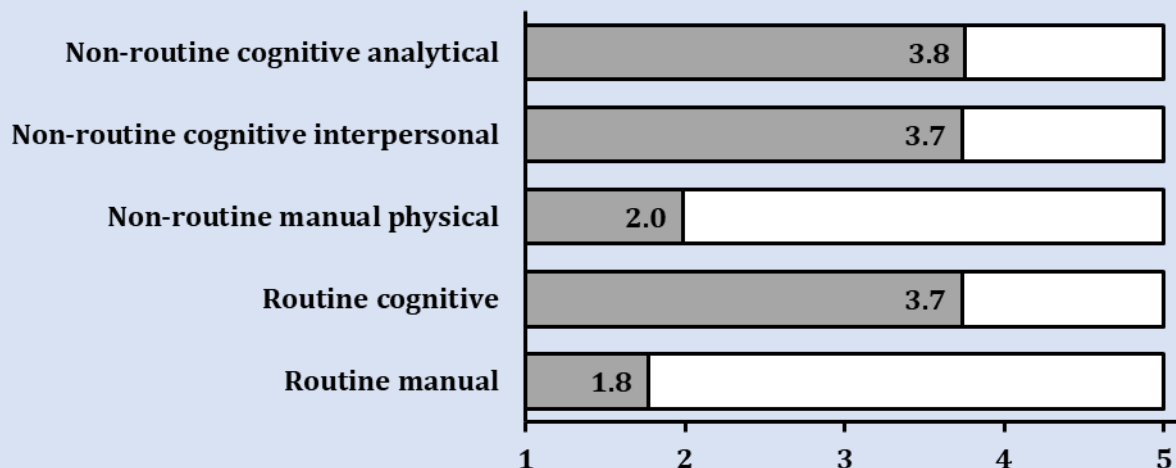
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for site engineers, civil engineers, and maintenance engineers.
- ii. The majority of companies have reported that vacancies within this occupation group are across all staff-level and most respondents would require applicants with at least bachelor's degree as educational qualification. The median time to fill for this occupation is 2 to 3 months.
- iii. Consistent with the claim that this occupation requires a particular set of technical skills, most respondents have reported increasing worker training and expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.). In mitigating the issues having few applicants applying for this occupation and mismatch in compensation's expectation, many respondents have turned to raising wages as a solution.
- iv. The findings from Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) cited that assistant engineers are termed as the third critical job by 76% of the Machinery and Equipment (M&E) firms and 24% of the Engineering Supporting Industry (ESI) firms respectively. There is also a demand for technologists in the industry.
- v. Input gathered from one of the key players in oil and gas industry shown that difficulty in getting motivated talent to pursue career in the oil gas industry has become one of the main issues contributing to the shortage in the industry. There are also the location challenges whereby most talents are not attracted to work outside of Peninsula Malaysia. The key player also suggested that local universities should diversify the syllabus and expand beyond research-based focus to meet industry needs. Indirectly, this can improve local graduates' competitiveness with overseas graduates, which at the moment, are given higher hiring priority.
- vi. The Machinery & Engineering Industries Federation (MEIF) highlighted that as automation become more significant, the need for talents in this occupation that are knowledgeable in handling new technologies increases. However, talents' robotic learning in universities is mostly theoretical and the gap lies at the application of the knowledge at work as different items required different handling skillset. This has in turn created the roles shifting whereby the roles of this occupation are given to other occupations such as technician to be executed. For this occupation, MEIF regards past experiences that relate to the occupation as the priority.
- vii. Further input was gathered from the Malaysian Agricultural Producers Association (MAPA). The Association mentioned that there is insufficient amenities and poor work-life balance to attract young engineers to be part of this occupation in this industry. According to MAPA, not many engineers and technicians are willing to work in isolated locations due to lack of infrastructure



and township amenities for children, spouse and education. This eventually creates higher demand in every field of engineering but employers cannot find the right candidate, resulting in companies turning to foreign talents to fill the shortage.

- viii. The Free Industrial Zone, Penang, Companies' Association (FREPENCA) highlighted that there is scarcity of candidates with the system or programming knowledge, meanwhile the right candidates for this occupation have developed high compensation package and demanding higher salary in other companies. FREPENCA proposes for technical schools to incorporate the SIEMENS programming module into the academic curriculum. Other than possessing a bachelor's degree with at least 5-8 years' experience, FREPENCA also prioritise candidates that are knowledgeable in;
- a) Manufacturing facilities system
 - b) SIEMEN PCS7 programming
- ix. The Institute of Engineers Malaysia (IEM) highlighted that while the number of varsity-trained engineers meets the country's target, Malaysia still faces a shortage of engineers – perhaps not in terms of actual numbers, but in terms of employability, and retention of talents. Engineers turn to other jobs because of either a lack of interest in the field or did not see career development within the company.
- x. On the basis of top-down result which shows growth in wage premium and increase in vacancies rate and overwhelming amount of nominations from the bottom-up evidence which point to existence of acute shortage, this occupation is included in the COL.

Occupation: Mechanical Engineer

MASCO 2013 (4-Digit Code): 2144

MASCO 2013 (6-Digit Code): 2144-03; 2144-04; 2144-05; 2144-06; 2144-07; 2144-13; 2144-16; 2144-20; 2144-24; 2144-27; 2144-28; 2144-30; 2144-32; 2144-34; 2144-37; 2144-38; 2144-39; 2144-40; 2144-41; 2144-42; 2144-46; 2144-49; 2144-51; 2144-53; 2144-54; 2144-55; 2144-56; 2144-58; 2144-63

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Mechanical Engineering Technologist; Mechanical Engineer; Machinery and Tools Industrial Engineer; Lift Engineer; Mechanical Engineer (Instruments); Engines Engineer; Internal Combustion Engine Engineer; Mechanical Engineer (Gas Turbine); Steam Engineer; Welding Technologist; Mechanical Engineer (Agriculture); Mechanical Engineer (Aerospace); Thermal Engineer; Hydraulic Design Engineer; Technology Technical Engineer; Equipment Engineer; Welding Engineer; Instrumentation Engineer; Mechanical Maintenance Engineer; Rotating Equipment Engineer; Engineering Technologist; R&D Engineers; Assistant Welding Engineer; CNC Machining Engineer; CAD / CAM Engineer; Computer-Aided Design (CAD) Design Automation Engineer; Computer-Aided Design (CAD) Engineer; CNC Programmer; Mechatronic Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	73 nominations
Consultation	13 nominations
Talent/Skills studies	<ul style="list-style-type: none"> • Chemical and Petrochemical Environmental Scan • Electrical and Electronics Environmental Scan • Professional Services Activities Environmental Scan • Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) • Medical Devices Environmental Scan • Maritime (Shipbuilding and Ship Repair) Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes

Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Mechanical Engineering
2. Communication Skills
3. Troubleshooting

Top Sectors:

1. Manufacturing
2. Construction
3. Professional, Scientific and Technical Activities

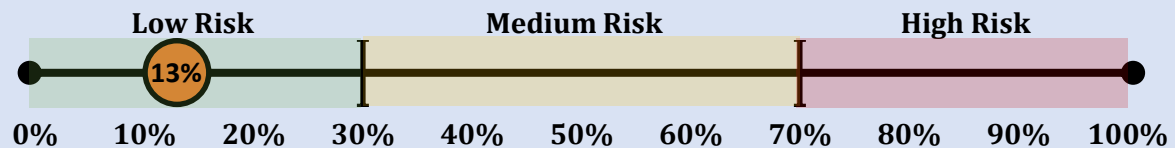
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants lack relevant job experience
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

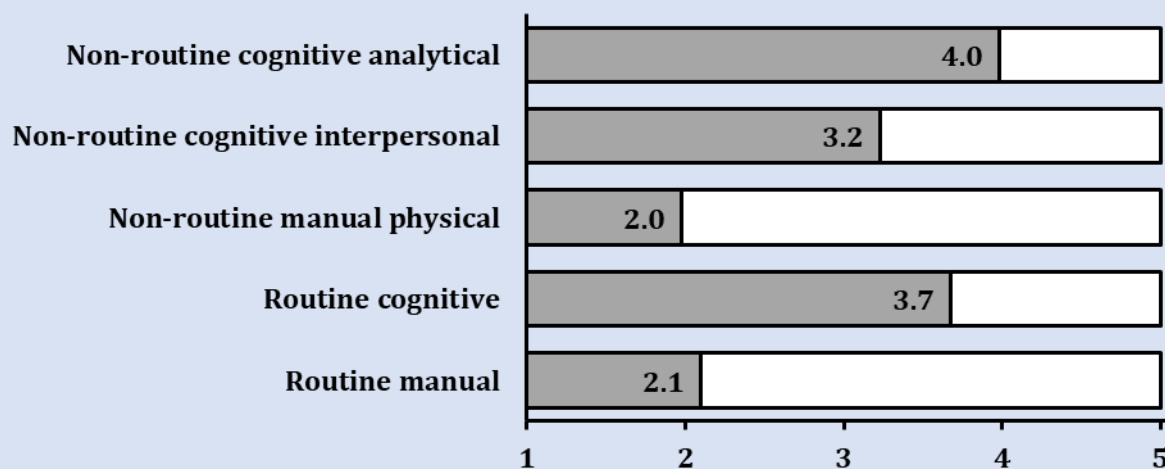
1. Increasing worker training
2. Expanding local recruitment efforts
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for mechanical engineers and mechanical maintenance engineers.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior to middle level positions with a median time to fill of 2 to 3 months. Most companies are looking for candidates with a minimum of a bachelor's degree, followed by diploma holders. The fact that jobs within this occupation are sought after in quite a number of sectors results to different sectors having different certification requirements. For example, some companies that are looking for CNC mechanical engineers require talents with CNC programming certificate. Companies in the transportation or aviation sector, on the other hand require license such as aircraft maintenance engineer license issued by the aviation authority.
- iii. Mechanical engineers were cited as critical in the Chemical and Petrochemical Environmental Scan for the Chemical, Petrochemical and Oleochemical subsector with an average time to fill of 5 to 9 months. The Electrical and Electronics Environmental Scan, on the other hand, has listed mechanical engineers as one of the critical occupations in the semiconductor subsector. It was also listed in Medical Devices Environmental Scan and Maritime (Shipbuilding and Ship Repair) Environmental Scan, for non-consumables and shipbuilding subsectors respectively. The Professional Services Activities Environmental Scan has also cited mechanical engineers as one of the critical occupations with a minimum requirement of a bachelor's degree. Finally, the Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) have cited welding technologists to be critical.
- iv. From our focus group discussion with member companies of the Free Industrial Zone, Penang, Companies' Association (FREPENCA), they have mentioned that mechanical engineers, computer aided design (CAD) engineers, CAD/CAM engineers, welding technologists and machinery & tools industrial engineers are critical for their respective industries. Mechanical engineer candidates, generally lacks the relevant work experience needed by industries. For machinery & tools industrial engineers, companies require candidates who have at least 7 years of experience in plastic tooling, with management and leadership skills. One of the member companies also highlighted the need for experience in plastic injection moulding, which requires not only mechanical background but also material science. Member companies of FREPENCA have also suggested for plastic tooling or toolshop module to be included in the syllabus of technical and vocational institutions.
- v. On a different consultation with the Institute of Engineers Malaysia (IEM), they have nominated for mechanical engineers, R&D engineers as well as machinery & tools industrial engineers to be critical. For mechanical engineers and machinery & tools industrial engineers, companies are generally looking for candidates with 3 to 5 years of working experience. To deal with current shortages, companies are increasing training for junior professionals and existing workforce.



On the other hand, for R&D engineers, companies are looking for mechanical engineering candidates with experience of 5 years and above who have exposure in research and development.

- vi. From a focus group discussion with Machinery and Engineering Industries Federation (MEIF), they have also highlighted the need for CAD engineers, CAD/CAM engineers, mechanical engineers and mechatronic engineers. They have mentioned that it takes longer years to train CAD engineers as well as mechatronic engineers. Factory location is also able to affect the interest of young mechanical engineer candidates to take up the vacancies available.
- vii. Evidence from top-down suggests an increase in wage and vacancies. This is further supported by companies' responses in our Call-for-Evidence (CfE) survey. Other strong elaborate bottom-up evidences such as inputs from environmental scans, consultations and validations indicate the need for this occupation to be included in the COL.

Occupation: Mining Engineer, Metallurgist and Related Professional

MASCO 2013 (4-Digit Code): 2146

MASCO 2013 (6-Digit Code): 2146-01; 2146-03; 2146-06; 2146-09; 2146-21; 2146-22; 2146-25; 2146-27; 2146-31; 2146-35; 2146-38; 2146-44; 2146-45; 2146-46; 2146-47; 2146-50

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Mining Engineer; Mining Coal Engineer; Petroleum Mining Engineer; Metallurgist; Casting Engineer; Drilling Engineer; Technical Section Leader; Subsea Engineer; Reservoir Engineer; Facilities (Equipment Design) Engineer; Wellsite Corrosion Engineer; Hydraulics Engineer; Materials and Metallurgical Engineer; Water Management Engineer; Product Design R&D Engineer; Pipeline Project Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 1 out of 8 indicators
Bottom-up CfE survey	20 nominations
Consultation	7 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. Teamwork and Collaboration
3. English Language

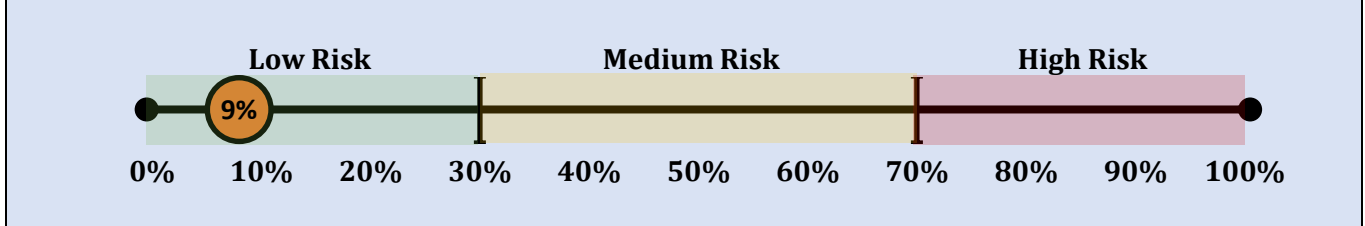
Top Sectors:

1. Manufacturing
2. Mining and Quarrying

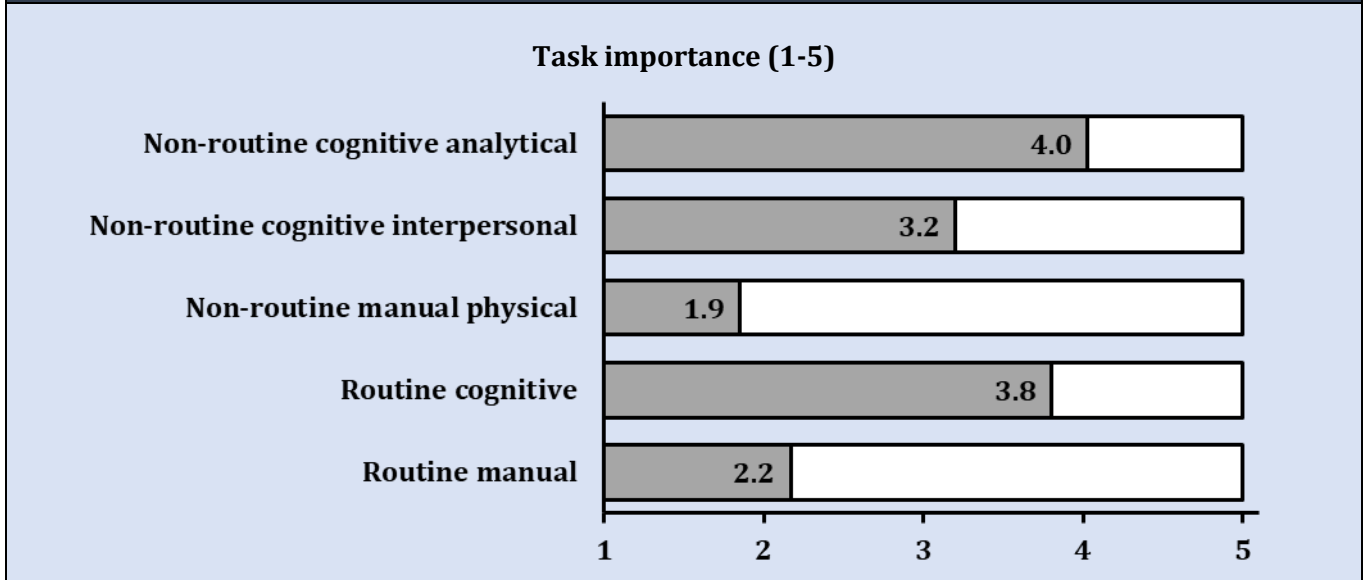
	3. Professional, Scientific and Technical Activities
--	--

Top Reasons of Hard-to-Fill: 1. Applicants lack the required technical skills 2. Too few applicants or no applicant at all 3. Applicants lack relevant job experience	Top Strategies to Meet Shortages: 1. Expanding international recruitment efforts 2. Raising wages 3. Expanding local recruitment efforts
---	--

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for mining engineers, facilities (equipment design) engineers and product design R&D engineers. This occupation is mainly for manufacturing and mining and quarrying sectors.
- The majority of companies have reported that vacancies within this occupation group are for middle and senior level staffs with more than 5 years of working experience. The median time to fill for this occupation is reported to be between 2 to 3 months. While most companies reported that this occupation is neither more or less hard to fill compare to a year ago, it is worth to note that some of the companies stated that this occupation is harder to fill than a year ago.

- iii. The minimum requirement for this occupation is bachelor's degree particularly in engineering courses. Besides technical and analytical skills, soft skills such as communication, problem solving and organisational are among skills to be deemed important by the companies.
- iv. Based on the consultation with the members of the Machinery & Engineering Industries Federation (MEIF), jobs such as metallurgists and hydraulic engineers are critical for the machinery and equipment industry. Both require specific or niche skills to qualify for the occupation. According to MEIF, it is not easy to find candidates who are specialised in metallurgy field. As for hydraulic engineers, companies cannot afford to provide specific training for the job. Hence, more opportunities to upskilling and reskilling the current employees should be provided to mitigate this issue.
- v. Malaysia Chamber of Mines (MCOM) claimed that mining engineers, materials and metallurgical engineers are critical in the mining industry. The main concern of the industry is to get suitable candidates, with basic knowledge and well versed with all mining terminologies. Furthermore, this industry requires talents that are willing to work in a rough and tough environment. Given that applicants do not have sufficient experience, companies are required to provide training at least for 5 years for the employees to fully understand the environment of the industry. MCOM also added that it is easier to get fresh graduates with degree in other field such as geology compared to those in mining, due to limitation of courses offered by the universities.
- vi. According to the members of the Free Industrial Zone, Penang, Companies Association (FREPENCA), facilities (equipment design) engineers with at least 5 to 8 years of working experience in manufacturing facilities systems, or Siemens SIMATIC PCS7 programming knowledge are critical for the industry. In addition, the available talents are demanding for higher compensation. They have urged for the revision of education regulations and curriculums to better adapt with the industries' requirements. For example, one of the proposals is for technical schools to incorporate the Siemens programming module into the academic curriculum.
- vii. The Institute of Engineers Malaysia (IEM) noted that product design R&D engineers are facing shortages due to several reasons. One of the main reasons is that applicants lack relevant technical knowledge, soft skills such as communication skills and certain fundamental principles of engineering. Additionally, the talent shortage in engineering would be severe in the future since many experienced and skilled engineers are retiring. As a result, the current engineers would need to support and develop the knowledge to fill the positions. Last but not least, the Master Builders Association Malaysia (MBAM) nominated material (non-destructive testing) engineers as critical for the construction industry.
- viii. Concrete bottom-up evidence such as high nominations from the survey and additional input from consultations with stakeholders strongly suggest that this occupation is facing a widespread shortage and is highly in demand. Thus, this serves for a strong justification for the inclusion of this occupation in the COL.



Occupation: Engineering Professional (Excluding Electrotechnology) Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 2149

MASCO 2013 (6-Digit Code): 2149-08; 2149-09; 2149-10; 2149-11; 2149-12; 2149-13; 2149-19; 2149-20; 2149-21; 2149-22; 2149-23; 2149-25; 2149-27; 2149-28; 2149-29; 2149-31; 2149-41; 2149-42; 2149-43

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Quantity Surveyor; Project Engineer; Process Engineer; Quality Assurance Engineer; Quality Control Engineer; Technical Service Adviser; Materials Engineer; Optical Engineer; Safety Engineer; Industrial Safety Engineer; Industrial Health and Safety Engineer; Quality Engineer; Procurement Engineer; Commissioning Engineer; Photonic Engineer; Inspection (QA/QC) Engineer; Survey Engineer; Product Engineer; Engineering Coordinator

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 6 out of 12 indicators
Bottom-up CfE survey	80 nominations
Consultation	5 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

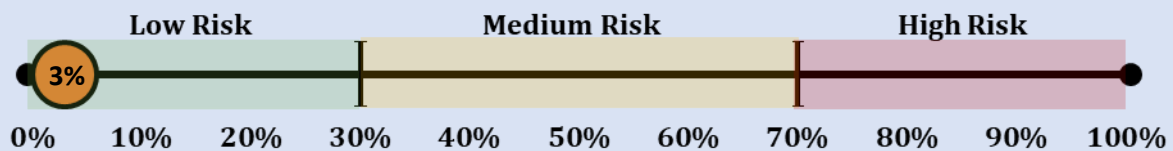
1. Communication Skills
2. English Language

Top Sectors:

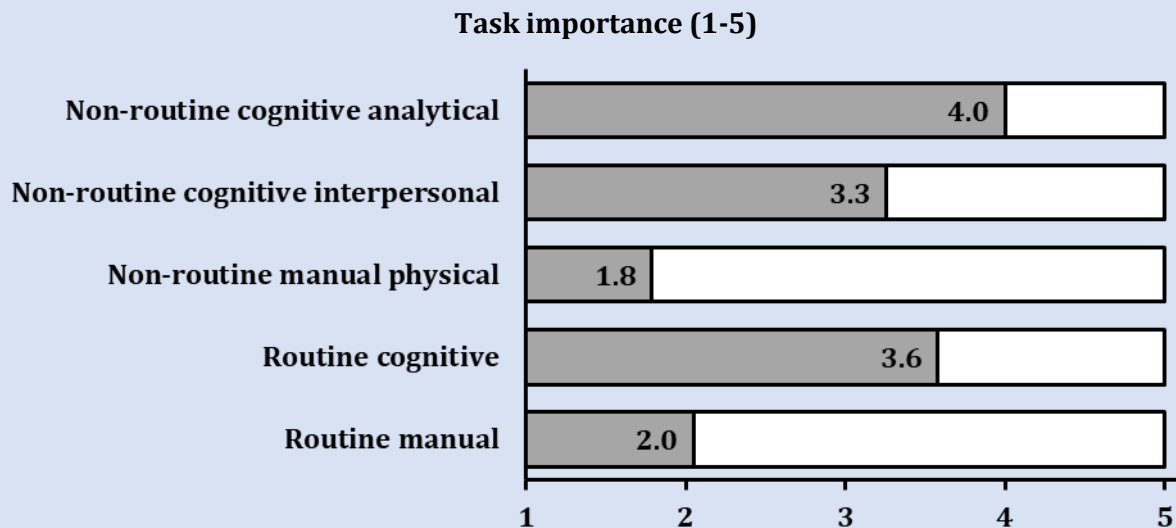
1. Manufacturing
2. Construction

3. Budgeting	3. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: 1. Applicants lack relevant job experience 2. Applicants lack the required technical skills 3. Too few applicants or no applicant at all	Top Strategies to Meet Shortages: 1. Expanding local recruitment efforts 2. Increasing worker training 3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for quantity surveyors and project engineers.
- Companies have reported that vacancies within this occupation group are for junior to middle level positions with a median time to fill of 2 to 3 months. Companies reported that this occupation has become neither more nor less hard to fill as compared to a year ago.
- A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Technical, problem solving and analytical skills are the most cited top skills for this occupation. In addition, respondents reported that applicants need particular certification such as Green Book, Professional Quantity Surveying and Certification Scheme for Welding Inspection Personnel (CSWIP 3.1).

- iv. During consultation with one of the key players in oil and gas industry, they cited their struggle to find experienced safety engineers and thus resorting to recruit talent from the Middle East countries. Some of the strategies taken by the key player is enabling their employees to upskill themselves by obtaining internal and external certification for both professional development and technical proficiency. Moreover, they highlighted that courses offered at local universities are more research based and does not meet requirements of the industry. To mitigate this issue, they aim to help universities with employability workshops, signing memorandum of understandings (MoU) with local universities to run immersion programmes and offer its own scholarship programme (4-6 recipients per year).
- v. Malaysian Plastic Manufacturers Association (MPMA) nominated process and project engineers as critical in the plastic sub-industry. As for process engineers, a minimum qualification of a diploma and above with a major in Engineering, Manufacturing or Mechanical is desired to qualify for this job. Candidates with injection moulding background with experience in mould set-up or trouble shooting and knowledge in plastic injection moulding process is an additional advantage. While for project engineers, a bachelor's degree in Mechanical or Chemical Engineering with at least 2 years of working experience in related field is also preferred. MPMA also shared that due to rigidity in the revision process of the existing curriculum offered by ILPs and other training institutions, the industry has moved to form the Malaysian Plastics Industry Talent Accreditation Council (MaPITAC) that consists of representatives from industry, academia, HRDF, SIRIM, Board of Engineers Malaysia and Petronas to certify courses offered that are relevant to the plastics industry.
- vi. The Institute of Engineers Malaysia (IEM) has also cited project engineers as critical for the industry. While the number of varsity-trained engineers meet the country's target, Malaysia is still facing a shortage of engineers in terms of employability and retention of talents within the engineering sector. There is a demand in every field of engineering but employers cannot find the right candidate due to local engineering graduates lack certain fundamental understanding of engineering principles. This has affected their ability to execute tasks or duties assigned effectively. Thus, IEM has pointed few strategies to mitigate this issue such as training junior professionals and existing employees, increasing worker training, expanding local recruitment efforts and promoting Science, Technology, Engineering and Mathematics (STEM) programme.
- vii. Based on the focus group discussion with members of the Free Industrial Zone, Penang, Companies' Association (FREPENCA), product engineers have been nominated as critical. There is lack of talent with experience in managing global acting customers, good technical skill and knowledge in product related. The Professional Services Activities Environmental Scan cited quantity surveyors as critical in the professional services. This report highlights that the top reasons for difficulty in hiring for this position are due to the lack of technical skills and competencies among the talent pool, followed by the lack of specialised knowledge required by position, and low remunerations.
- viii. With strong evidence from both bottom-up and top-down, it is clear that this occupation is facing a widespread shortage. Therefore, this occupation is included in the COL.



Occupation: Electrical Engineer

MASCO 2013 (4-Digit Code): 2151

MASCO 2013 (6-Digit Code): 2151-04; 2151-05; 2151-06; 2151-08; 2151-10; 2151-11; 2151-16; 2151-26; 2151-28; 2151-29; 2151-32; 2151-37; 2151-39

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Electrical Engineer; Electrical Systems Engineer; Electrical Testing Engineer; Electrical Engineer (High Voltage); Electrical Engineer (Electric Power Distribution); Electrical Engineer (Electric Power Transmission); Electrical Engineer (Electromechanical Equipment); Embedded System/ Firmware Engineer; IC Design Engineer; RF Electrical Engineer; R&D Electrical Engineer (includes Product Design); R&D Electrical Design Engineer; Electrical Superintendent (HT 33KV)

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 6 out of 12 indicators
Bottom-up CfE survey	16 nominations
Consultation	9 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Electrical and Electronic Environmental Scan Chemical and Petrochemical Environmental Scan Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
Yes	No	Yes	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Electrical Engineering
2. Communication Skills
3. Troubleshooting

Top Sectors:

1. Manufacturing
2. Construction
3. Mining and Quarrying

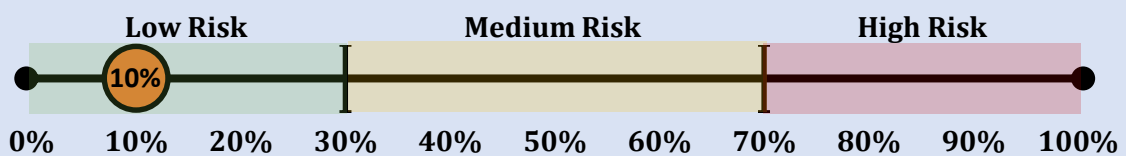
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Applicants lack the required credentials or certification

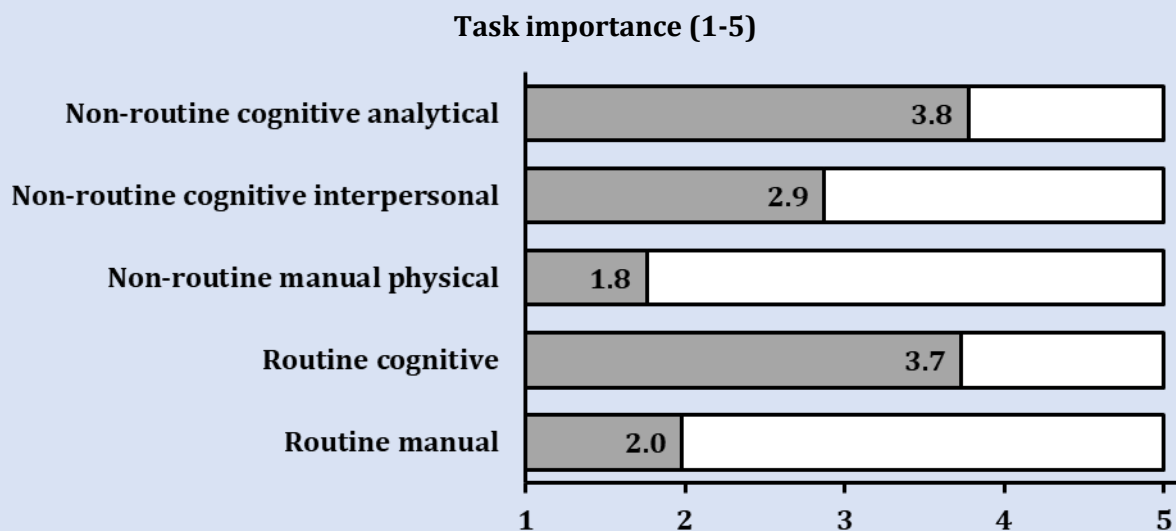
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Expanding local recruitment efforts
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for electrical engineers.
- The majority of companies have reported that vacancies within this occupation group are for junior and middle-level staff with a median time to fill of 2 to 3 months.

- iii. Most companies have also reported that this occupation has become less hard to fill as compared to a year ago. Although, there are a number of companies who found this occupation to be harder to fill.
- iv. Applicants lack relevant job experience and the required technical skills are the most-cited reasons behind the occupation being hard-to-fill. A minimum of a bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey.
- v. Based on our consultation with the Federation of Malaysian Manufacturers (FMM), they have pointed out analog or structural circuit design engineers, embedded software engineers and electrical superintendent as critical. It was highlighted that there were limited graduates and they lack relevant hands-on job experience. Candidates who would like to qualify for electrical superintendent position should possess HT 33KV credentials from Energy Commission. For analog or structural circuit design engineers, FMM mentioned that candidates should have:
 - a) good understanding of the Low-Power Double Data Rate Synchronous Dynamic Random-Access Memory (LPDDR) or JEDEC specifications and related Double Data Rate (DDR) protocols.
 - b) Experience with industry standard tools for Analog design such as Cadence ADE, Spectre, AMS verification, FEV, and StarRC.
 - c) Cross-discipline knowledge in any of these areas, such as Analog integration, RTL/System Verilog, Static timing analysis concepts, APR, Floor-planning, Metal-routing, Power-grid, Memory IO training MRC and HAS/MAS specification documentation.
- v. FMM also highlighted on the requirements for embedded software engineers. These include:
 - a) A bachelor's degree, master's degree or Ph.D. in Software Engineering, Computer Engineering, Electrical and Electronics Engineering or Engineering in a related field.
 - b) Experience in a system software development environment for Linux/Android/Windows/RTOS OS, strong knowledge of operating systems architecture with both kernel and user space.
 - c) Strong Programming Skills in C/C++. Knowledge of assembly language and hardware troubleshooting.
- vi. Meanwhile, Machinery & Engineering Industries Federation (MEIF) mentioned, due to shortages, roles that were performed by engineers are now shifted to technicians, which then lead to technicians leaving the company due to overburden and underpay. As a strategy, MEIF urges for upskilling opportunities to be made available by government for current Engineers. MEIF also foresees that the emergence of automation will benefit engineers as their skills will be highly needed in navigating the engineering of new technologies.
- vi. The Institute of Engineers Malaysia (IEM) cited while the number of varsity-trained engineers meets the country's target, Malaysia still facing a shortage of engineers in terms of employability and retention of talents, within the engineering sector and with Malaysian companies. They also mentioned that soft skills are very important especially in multinational companies. One of the member companies of the Free Industrial Zone, Penang, Companies' Association (FREPENCA) cited that currently they foster collaboration with Monash University Malaysia to work on competitive curriculum that matches requirements from job market.



However, this only serves as short-term strategy to address talent shortage. Sourcing from public universities would be ideal for long-term solution.

- vii. Electrical and Electronic Environmental Scan highlighted that electrical engineers are critical in the light-emitting diode (LED) sub-sector. Chemical and Petrochemical Environmental Scan highlighted that many companies faced challenges in hiring electrical engineers in chemical, petrochemical and oleochemical sub-industries. The average time taken to fill this occupation is 5 to 9 months. The Professional Services Activities Environmental Scan cited electrical engineers as critical occupation. This report highlights the top reasons for difficulty in hiring for this position are due to the lack of technical skills/competencies among the talent pool, followed by the lack of specialized knowledge required by position, and low remunerations.
- viii. This occupation passes the top-down shortage threshold, which indicated increase in premium wage, employment, working hours, number of vacancies and vacancy rates. This, supported by high number of nominations and robust bottom-up evidence, points to a widespread shortage across industries. Therefore, this occupation is included in the COL.

Occupation: Electronic Engineer

MASCO 2013 (4-Digit Code): 2152

MASCO 2013 (6-Digit Code): 2152-04; 2152-10; 2152-23; 2152-39; 2152-40; 2152-47; 2152-48; 2152-54; 2152-57; 2152-60

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Electronics Engineer; Computer Engineer (Software); Pre-Silicon Validation Engineer; Wirebond Engineer; Industrial Electronic Engineer; Test/Measurement Engineer (Electronic); R&D Electronic Engineer (includes Product Design); Electronic Component Design Engineer; Electronic Structural Designer; Register-Transfer Level (RTL) Designer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 12 indicators
Bottom-up CfE survey	11 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Electrical and Electronics Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

- Troubleshooting
- Communication Skills and English Language
- Systems Engineering

Top Sectors:

- Manufacturing
- Transportation and Storage
- Information and Communication

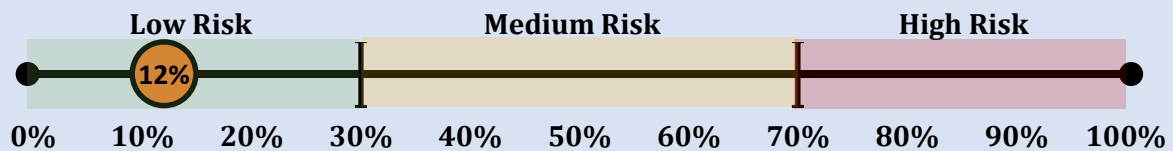
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience
3. Applicants lack the required technical skills

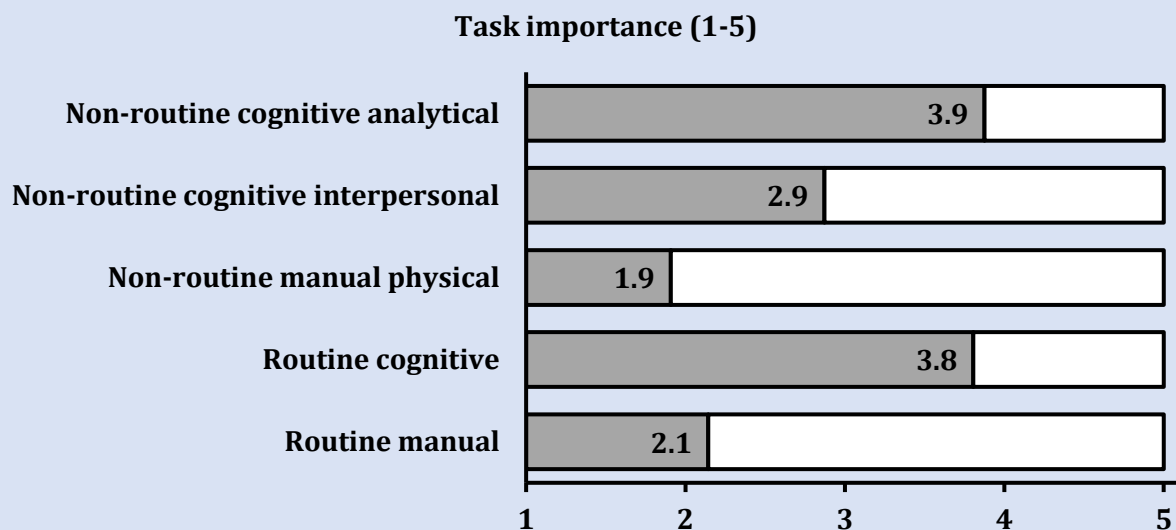
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Expanding international recruitment efforts
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for computer engineers (software) and electronics engineers.
- Respondents have reported that vacancies within this occupation group varies, from entry to senior level, where majority of them require junior level with 2 to 5 years working experience and have a minimum qualification of bachelor's degree. Although the median time to fill for this occupation is reported to be 2 to 3 months, most companies found that this occupation is harder to fill as compared to a year ago.

- iii. Further input from the Federation of Malaysian Manufacturers (FMM) stated that there is a lack of pre-silicon validation engineers and register-transfer level (RTL) designers with relevant hands-on experience in the technology. Due to this factor, companies have resorted to hiring experts from India or China instead of providing training and development to the less well qualified applicants hired. This is also consistent with the findings from our Call-for-Evidence survey where companies have resorted to expand international recruitment efforts as one of strategies to mitigate the shortages.
- iv. Besides that, FMM shared that companies are looking for register-transfer level (RTL) designers that have a degree in Electronics/Electrical Engineering with 1 to 3 years of experience in circuit, custom digital design or RTL design in very deep sub-micron (VDSM) technology nodes, proficiency with RTL coding and checkers (LEC, CDC, DFT). Meanwhile for pre-silicon validation engineers those who have strong technical skills are sought after. These skills include:
 - a) Pre-silicon system verification experiences in the areas of system on chip (SoC), field-programmable gate array (FPGA) and embedded microprocessor design verification
 - b) System Verilog, Universal Verification Methodology (UVM) and strong programming skills in scripting or C++
 - c) Gate Level Simulation (GLS) and/or Unified Power Format (UPF)
 - d) Well-versed in IA server system architecture and/or 2-3 major industrial standard I/O interfaces, e.g. Ethernet, peripheral component interconnect express (PCIe), USB, double data rate (DDR) or high bandwidth memory (HBM)
- vi. Additionally, the Electrical and Electronics Environmental Scan also mentioned that companies are facing difficulties in hiring this occupation in semiconductor, electronic manufacturing services (EMS) and light-emitting diode (LED) sub-sectors. The Machinery & Engineering Industries Federation (MEIF) echoed on the criticality of this occupation as well.
- vii. Considering the strong evidence supported by the findings from the Electrical and Electronics Environmental Scan against additional input from the consultation with FMM and MEIF, this occupation to be included in the COL despite of moderate nominations of bottom-up evidence.

Occupation: Telecommunications Engineer

MASCO 2013 (4-Digit Code): 2153

MASCO 2013 (6-Digit Code): 2153-01; 2153-02; 2153-08; 2153-15; 2153-16; 2153-18; 2153-23; 2153-24; 2153-30; 2153-31; 2153-32

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Telecommunications Engineer; Telecommunications Engineer (Aerospace); Telecommunications Engineer (Telephone); Network Architect/ Designer/ Planner/ Tester; Radio Optimisation and Capacity Engineer; Network Implementation and Construction Engineer; Network and System Engineer; Telecommunications Consultant; Sound Systems Engineer; Audio Designer; Acoustic Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	8 nominations
Consultation	6 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. Global System for Mobile Communications
3. Network Engineering

Top Sectors:

1. Information and Communication
2. Financial and Insurance/Takaful Activities
3. Manufacturing

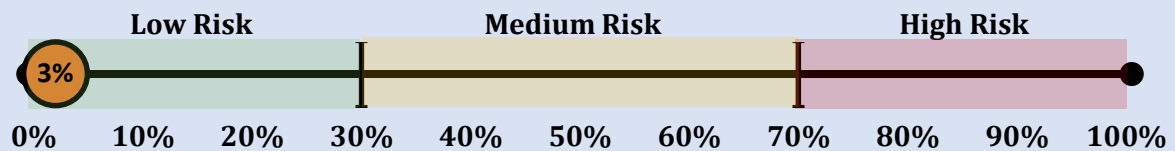
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants lack relevant job experience
3. Applicants lack the required credentials or certification

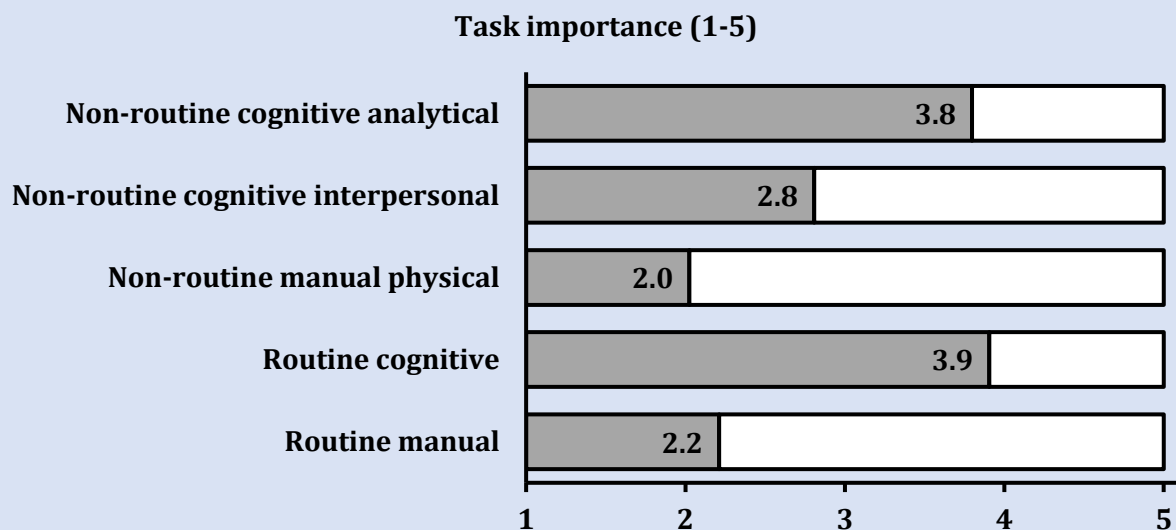
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for network architects/ designers/ planners/ testers as well as network and system engineers.
- The majority of companies have reported that vacancies within this occupation group are for entry to junior level positions, with a most common time to fill them reported to be 2 - 3 months. Most respondents require candidates with a minimum of a bachelor's degree to qualify for this occupation. Companies have also reported on the difficulty of finding candidates with sufficient experience in the market.



- iii. From our consultation with Association of Banks in Malaysia (ABM), they have conveyed that network architects/ designers/planners/ testers with 5 to 8 years of experience are difficult to find. Candidates with skills in visualisation, The Open Group Architecture Framework (TOGAF) and Zachman architectural modelling techniques are preferred.
- iv. One of the key players in the communication industry, on the other hand, has nominated for network and systems engineers to be critical. According to them, the hiring difficulty occurs more for senior level positions. They need candidates who has good knowledge and understanding of network infrastructure, network hardware, and has the ability to implement, administer and troubleshoot network infrastructure devices. Moreover, they also need candidates who have good knowledge application transport, cybersecurity as well as application transport and network infrastructure procedures.
- v. One of the member companies of the Free Industrial Zone, Penang, Companies' Association (FREPENCA) has nominated acoustic engineers to be critical. For this occupation, they are looking for candidates with experience in acoustic design, operating sound and audio measurement. Candidates must also be well versed in the matter of product noise emission. Although there is a preference for candidates with a few years of working experience, it was said that fresh graduates are also very much encouraged to apply for the occupation. On the other hand, the Recording Industry of Malaysia (RIM) has highlighted that sound system engineers and sound designers are very much sought after in the music industry. People who qualify for this occupation often deals with the technical aspects of sound and music production. They are required to mix, reproduce and manipulate the equalisation and electronic effects of sound. For these two occupations, it was said that candidates would need a minimum qualification of a diploma. Even so, their skills would be a stronger factor for employment.
- vi. In addition, one of the key players in the oil and gas industry has highlighted that telecommunication engineers with more than 8 years of experience are highly sought after. The difficulty in recruitment often revolves around the issue of candidates not having the relevant experience to qualify for the occupation.
- vii. On the basis of available bottom-up evidences, this occupation is included in the COL.

Occupation: Graphic and Multimedia Designer

MASCO 2013 (4-Digit Code): 2166

MASCO 2013 (6-Digit Code): 2166-04; 2166-05; 2166-10; 2166-12; 2166-18; 2166-19; 2166-21; 2166-24; 2166-27; 2166-32; 2166-33; 2166-36; 2166-38; 2166-39; 2166-40; 2166-43; 2166-44; 2166-45; 2166-46; 2166-48; 2166-49; 2166-51

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Graphic Designer; Typographical Designer; Animator; Multimedia Designer; Creative Designer; Design Architect; Graphics Illustrator; Character Designer; Flash Animator; 2D Animator; 3D Artist; Layout Artist; Systems/Computer Designer; 3D Modeller; Visual Effects Artist; Lighting Artist; UI Designer (User Interphase); UX Designer (User Experience); Digital Designer; Roto Artist; Storyboard Artist; Render Wrangler

This occupation appears on COL:

2015	Yes	2017	No
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 10 indicators
Bottom-up CfE survey	18 nominations
Consultation	14 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	Yes	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

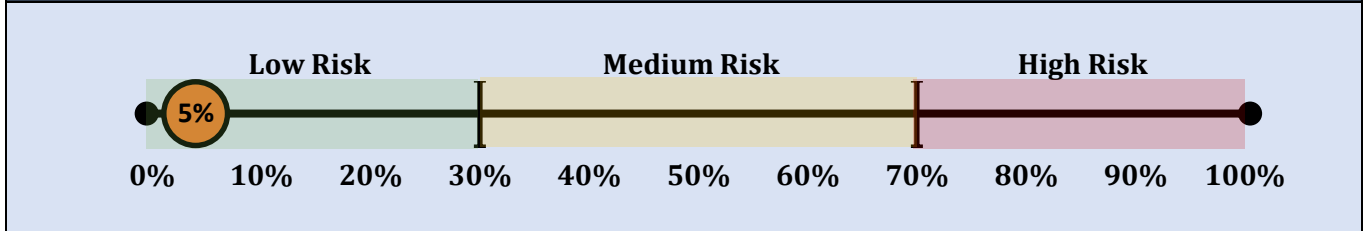
- Graphic Design
- Creativity

Top Sectors:

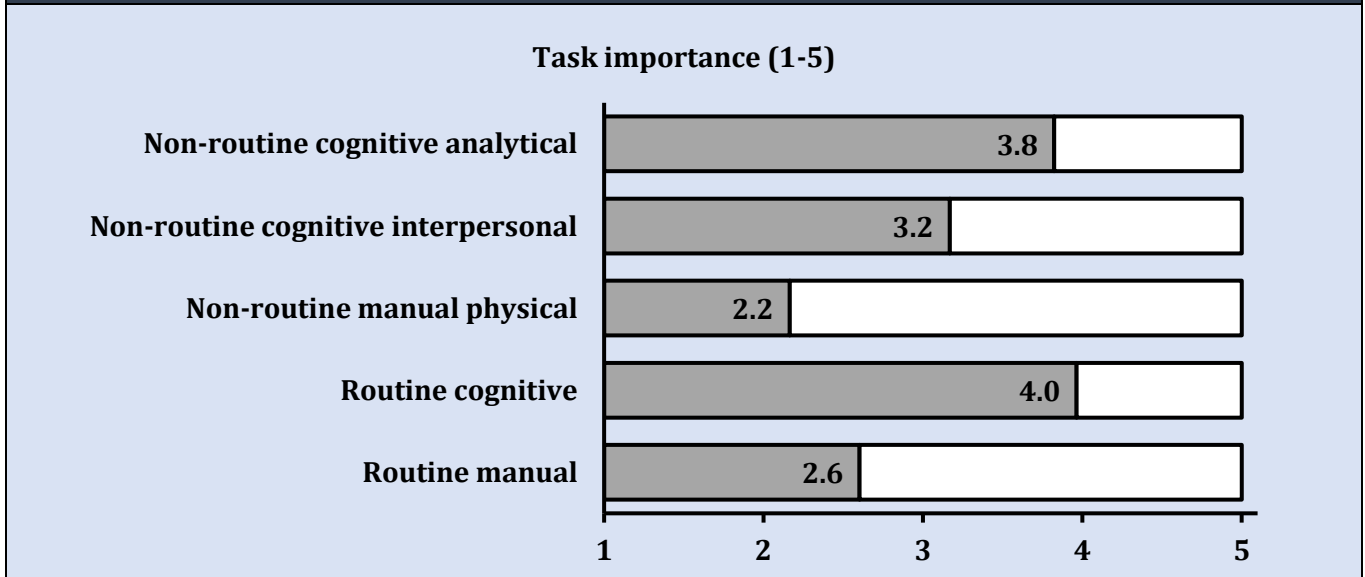
- Information and Communication
- Professional, Scientific and Technical Activities

3. Adobe Photoshop	3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
Top Reasons of Hard-to-Fill: 1. Too few applicants or no applicant at all 2. Companies cannot afford to pay the market rate for the applicants 3. Applicants lack the required technical skills	Top Strategies to Meet Shortages: 1. Hiring temporary or contract workers 2. Increasing worker training 3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for graphic designers, design architects, typographical designers, 3D artists and 3D modellers.
- ii. Companies have reported that vacancies within this occupation group vary, ranging from entry to senior level positions. The most common time to fill for this occupation is reported to be 2 to 3 months, meanwhile less than one-third of respondents have reported that it takes 4 to 6 months or more than 6 months. In addition to this, some companies have reported that this occupation is harder to fill as compared to a year ago.



- iii. A minimum of diploma or bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Moreover, there is evidence that there is some gap in specialised certifications. Some respondents reported that applicants need professional certificate in graphic design or have skills to master graphic design softwares such as 3D Maya, Substances Painter, Photoshop and Blender. Additionally, the preferred soft skills for this occupation include strong communication skills, teamwork, creative thinking and problem-solving abilities.
- iv. A variety of strategies have been adopted by companies in addressing this shortage. For example, they resort to raising wages to attract more candidates who are skilled and have relevant job experience for this occupation. However, some companies who cannot afford to pay the market rate for the applicants, prefer to hire temporary or contract workers instead of increasing current workers training.
- v. Our consultation with Malaysia Digital Economy Corporation (MDEC) also reflects that there is a demand for this occupation, e.g. layout artist, 2D animator, 3D modeller, motion graphic artist, lighting artist, render wrangler, roto artist, storyboard artist, character rigger, visual effects artist, video game artist, animator, 3D artist and creative designer. Companies are facing talent scarcity because those who have qualified skills tend to move overseas for better salary. Therefore, hiring freelancers has become an alternative for the companies to fill the gaps of those talents. Even so, some companies are worried in terms of knowledge retention and transfer through services rendered by potential freelancers. Based on their report, it is also noted that this occupation is hard to fill in the digital industry, specifically for Creative Content and Technologies (CCT) area.
- vi. Evidence from top-down show that there is a growth in employment, number of vacancies and vacancies rate relative to total employment which indicates a growing demand for this occupation. Plus, with high number of nominations from various companies in 9 sectors and additional input from MDEC Digital Talent Report, this strongly justifies the need for the inclusion of this occupation in the COL.

Occupation: Manufacturing Professional

MASCO 2013 (4-Digit Code): 2182

MASCO 2013 (6-Digit Code): 2182-01; 2182-02; 2182-03; 2182-04; 2182-05; 2182-06; 2182-08; 2182-10; 2182-12; 2182-14; 2182-17; 2182-18; 2182-19; 2182-20; 2182-21; 2182-27

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Manufacturing Executive; Quality Assurance Executive; Quality Assurance Analyst; Quality Control Executive; Production Executive; Warehouse Executive; Maintenance Executive; Manufacturing Quality Controller Executive; Product Quality Controller; Procurement Manufacturing Engineer; Manufacturing Specialist; Boiler Superintendent; Supply Chain/Procurement Specialist; Manufacturing Engineer; Technical Executive; Oil Mill Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 1 out of 10 indicators
Bottom-up CfE survey	26 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Electrical and Electronics Environmental Scan Medical Devices Environmental Scan Food and Beverages Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	Yes	NA	NA	

Occupation Overview:

Top Skills:

1. Tungsten Inert Gas (TIG) and Metal Inert Gas (MIG) Welding
2. English Language
3. Planning

Top Sectors:

1. Manufacturing
2. Agriculture, Forestry and Fishing
3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles

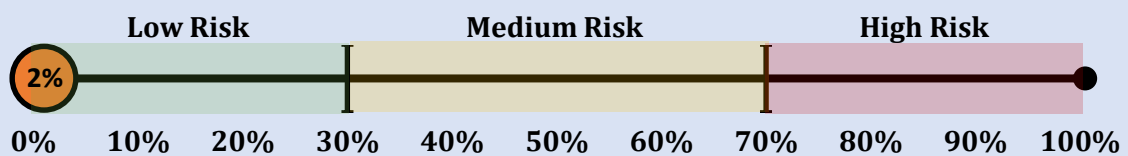
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants lack relevant job experience
3. Too few applicants or no applicant at all

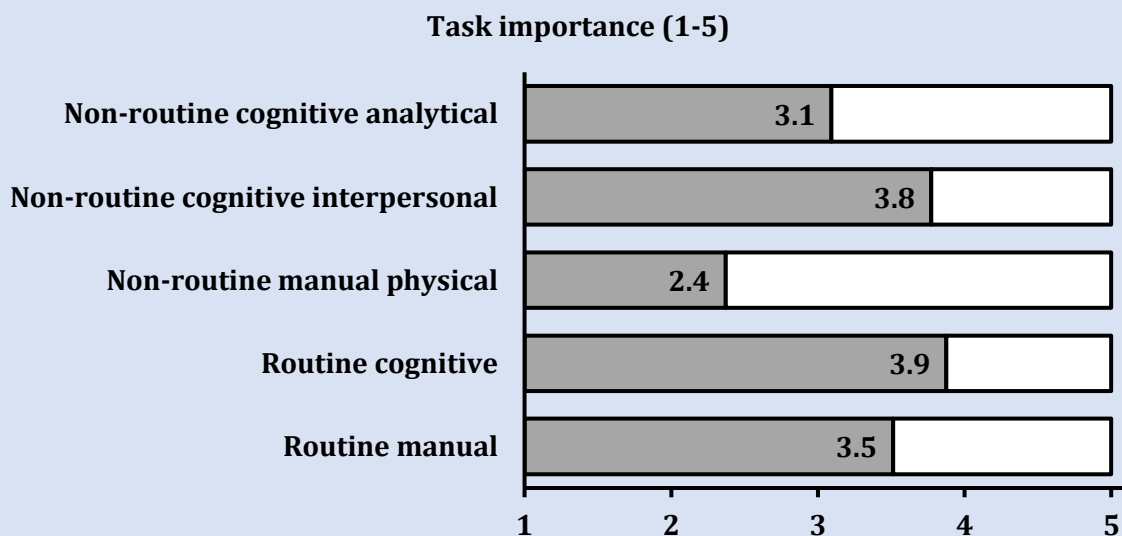
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for technical executives and manufacturing quality controller executives.



- ii. The majority of companies have reported that vacancies within this occupation group are for junior level staffs. The most common time to fill up the vacancies is within 2 to 3 months; however, some cases take even up to 6 months and companies found that this occupation is harder to fill. Even so, most of them remain to believe that it is neither more nor less hard to fill than a year ago. Additionally, the most-cited reasons behind the occupation being hard-to-fill are applicants lack the required technical skills and relevant job experience. To address the shortage, companies have resorted to expanding local recruitment efforts and increase worker training.
- iii. Based on our Call-for-Evidence (CfE) survey, most positions require a minimum of a bachelor's degree. Companies also mentioned that they need applicants with specific field of study background or knowledge for certain positions. For example, Logistics and Warehousing Management for warehouse executive, Production Management for manufacturing executive and ISO 9001 Quality Management System (QMS) for manufacturing quality controller executive.
- iv. The Electrical and Electronics, Medical Devices and Food & Beverages Environmental Scans highlighted manufacturing professionals as critical occupation for industrial electronics, medical devices non-consumables and food manufacturing sub-sectors respectively.
- v. Our consultation with Federation of Malaysian Freight Forwarders (FMFF) also reflects that there is a demand for warehouse executives. The industry definitely faces employment challenges as the candidates do not usually have the right prerequisites. Some of them do not know much about the terminologies within the industry even after having related degrees. The companies have to send them for training and it takes time to nurture them. Candidates with industrial training experience are likely to perform smoothly on the task.
- vi. Input from the Malaysian Retail Chain Association (MRCA) provided additional evidence that job within this occupation such as quality assurance executive is hard to fill due to candidates lacking the skills required by the firms. However, some employers look at attitude and commitment rather than work experience because employers are willing to provide training to new employees as long as they are related to the industry, have the basic knowledge about the sector and keen to learn.
- vii. One of the key players in oil and gas industry also mentioned that they are facing challenges in employing supply chain/procurement specialists at middle and senior level. They are looking for candidates that have relevant working experience and technical knowledge instead of just on business contract and procurement only.
- viii. With high number of nominations from various companies, this occupation is believed to be critical. There is also strong evidence to support this claim, as this occupation was highlighted in 3 environmental scans as critical in respective sectors. Therefore, we believe that this does point to a widespread shortage and this occupation should be included in the COL.



Occupation: Specialist Medical Practitioner

MASCO 2013 (4-Digit Code): 2212

MASCO 2013 (6-Digit Code): 2212-03; 2212-09; 2212-10; 2212-11; 2212-14; 2212-17; 2212-20; 2212-27; 2212-31; 2212-32; 2212-36; 2212-38; 2212-48; 2212-50; 2212-54; 2212-55; 2212-61; 2212-62; 2212-66

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Eye Specialist; Ophthalmologist; Cardiologist; Neurologist; Obstetrician and Gynaecologist (Fertility); Surgeon; Surgeon (Cardiothoracic); Surgeon (Neurosurgery); Surgeon (Urology); Surgeon (Vascular); Paediatrician; Paediatrician (Haematology); Physician (Haematology); Physician (Nephrology); Physician (Respiratory Medicine); Podiatrist; Radiologist (Radiotherapy); Urologist; Application Specialist (Hematology)

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	14 nominations
Consultation	7 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills and English Language

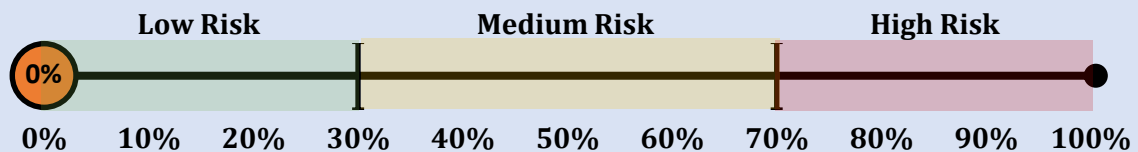
Top Sector:

1. Human Health and Social Work Activities

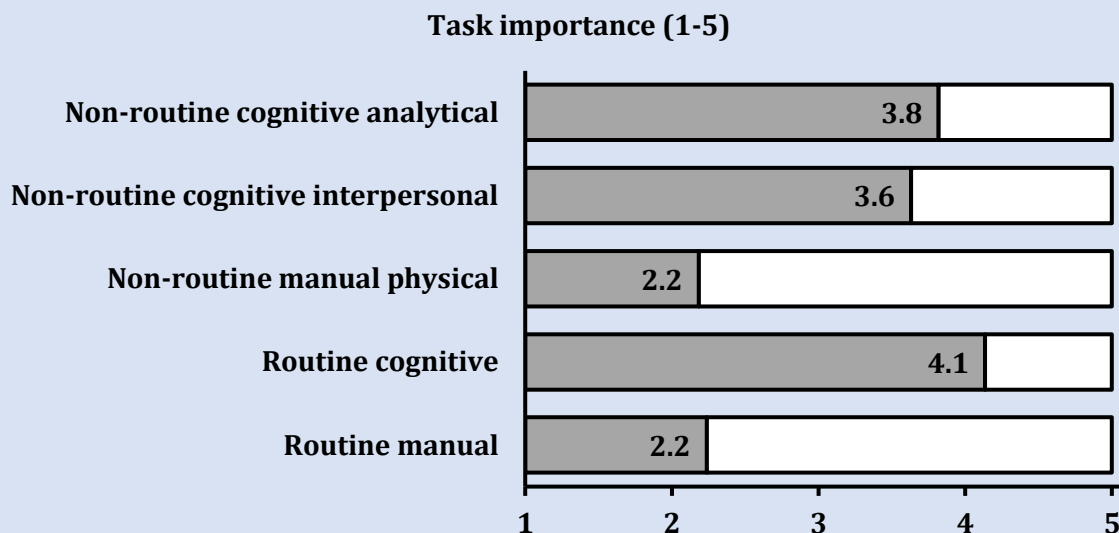
2. Surgery 3. Patient/Family Education and Instruction	
---	--

Top Reasons of Hard-to-Fill: 1. Too few applicants or no applicant at all 2. Applicants lack the required credentials or certification	Top Strategies to Meet Shortages: 1. Expanding international recruitment efforts 2. Expanding local recruitment efforts 3. Raising wages
---	--

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for physicians and paediatricians.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle to senior level staffs. The most common time to fill for this occupation is reported to be more than 6 months. In addition, half of companies found this occupation to be harder to fill while the other half remains to believe that this occupation is neither more nor less hard to fill as compared to a year ago. Companies also reported that this occupation is hard-to-fill because there are insufficient applicants and applicants lack the required credentials or certification.



- iii. There is some evidence of education-related barriers to fill these roles as a minimum of a master's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey.
- iv. To address the shortage, companies have commonly taken up the strategies of expanding international recruitment efforts and raising wages.
- v. Further input from the Association of Private Hospitals Malaysia (APHM) has provided evidence that medical specialists or consultants having trained in a specific field of medicine for years are most sought after. For example, new hospitals might face difficulty in getting qualified specialists in neurosurgery, neurology, urology and physician specialties as demand for them is forever growing.
- vi. National Heart Association of Malaysia (NHAM) cited that Malaysia faces a shortage of cardiologist as the current supply is insufficient. With rising cases related to heart diseases such as hypertension, high cholesterol, diabetes, obesity, smoking and sedentary lifestyle, more cardiologists are in demand.
- vii. Though evidence from top-down is insufficient, the additional input from associations do point out reasonable insights on a supply shortage for talents in this occupation. When combined with high nomination in our survey, it provides solid justification for the inclusion of this occupation in the COL.



Occupation: Environmental and Occupational Health and Hygiene Professional

MASCO 2013 (4-Digit Code): 2263

MASCO 2013 (6-Digit Code): 2263-03; 2263-06; 2263-10; 2263-10; 2263-11; 2263-15; 2263-30; 2263-43

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Sanitarian; Occupational Health and Safety Officer; Environmental Officer; Safety and Health Officer; Occupational Safety and Health Officer; Waste Management Competence Person; Landfill Engineer

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	18 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Occupational Health and Safety
2. Communication Skill
3. OHSAS 18001

Top Sectors:

1. Manufacturing
2. Construction
3. Mining and Quarrying

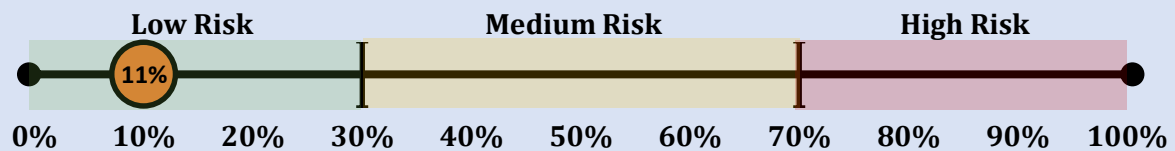
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required credentials or certification
3. Applicants lack the required technical skills

Top Strategies to Meet Shortages:

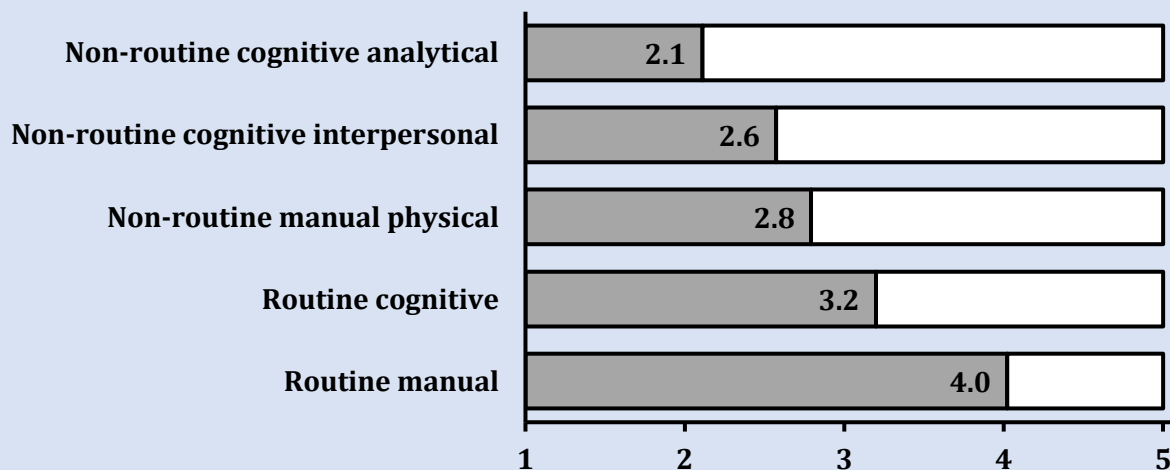
1. Increasing worker training
2. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for occupational health and safety officers.



- ii. The majority of companies have reported that vacancies within this occupation group are for junior level staff with median time to fill of 2 to 3 months. Most respondents are required to have at least a bachelor's degree, diploma and advanced diploma.
- iii. According to the result of the Call-for-Evidence (CfE) survey, most respondents reported that applicants lack relevant job experience, lack required credentials or certification, and they lack required technical skills. In mitigating these, companies have resorted to increasing worker training, expanding local recruitment efforts, and raising wages.
- iv. The Chemical and Petrochemical Environmental Scan mentioned that industrial safety officer - occupational safety and health is critical and need more than 5 months to fill. This role would at least need a diploma with certification from Department of Occupational Safety and Health (DOSH).
- v. From the consultation with the Waste Management Association of Malaysia (WMAM), the industry requires niche skills that are unique to the industry. Currently there are not enough experts in landfills, incinerators, and landfill management, and due to the criticality in finding talent with the right skillsets, many companies in this industry finds it hard to fill this occupation. Consequently, there is a lack of competent person to comply with environment laws. WMAM listed few strategies to address the issue which include establishing partnership with local universities, stronger collaboration with industrial training providers, increasing industrial apprenticeship programs, and encouraging knowledge transfer from industrial experts. WMAM enlisted leachate treatment knowledge as one specific skill required to fill the role of landfill engineer in this occupation.
- vi. Additional input from the Malaysia Chamber of Mines (MCOM) stated that companies need at least 5 years of training before employees can understand the environment of the industry. This occupation highly requires talents that are willing to work in rough and tough environment, and for this reason, MCOM suggested for government to provide better incentives and recognition for this industry. MCOM observes that automation will not pose significant disruption and instead could help the industry to increase its efficiency and consequently creating more positions within this occupation that are needed to handle the system.
- vii. Based on the top-down result which shows increase in wage premium that is consistent with companies' strategy in raising wages – along with increase in vacancies rate and significant bottom-up nominations, this occupation is to be included in the COL.



Occupation: University and Higher Education Professional Teacher

MASCO 2013 (4-Digit Code): 2311

MASCO 2013 (6-Digit Code): 2311-10; 2311-12; 2311-13; 2311-15; 2311-16; 2311-19

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Lecturer; Professor; Lecturer (College); Lecturer (University); Professor (University); Pharmacy Lecturer Grade DUF45

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 5 out of 12 indicators
Bottom-up CfE survey	17 nominations
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

- Lecturer
- English Language
- Research

Top Sector:

- Education

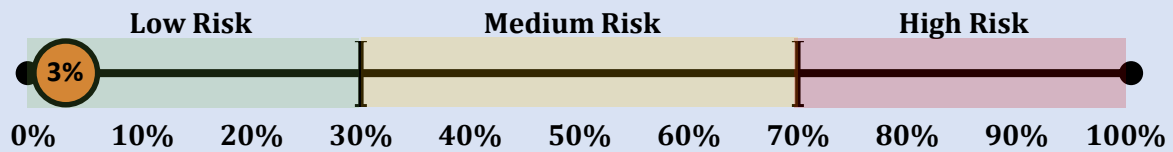
Top Reasons of Hard-to-Fill:

- Too few applicants or no applicant at all
- Applicants lack the required credentials or certification
- Applicants lack relevant job experience

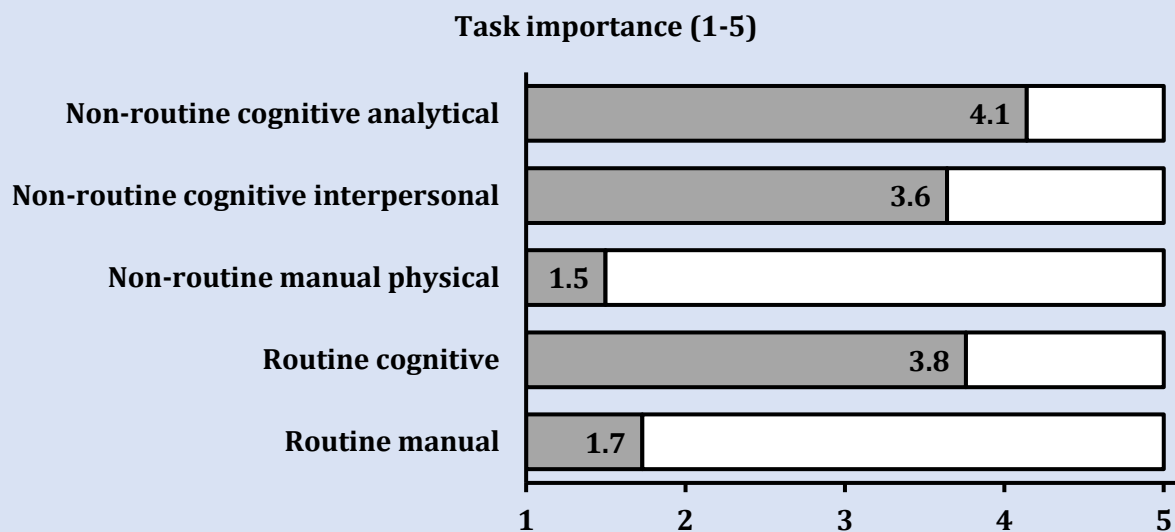
Top Strategies to Meet Shortages:

- Expanding local recruitment efforts
- Hiring temporary or contract workers
- Converting part-time workers to full time status

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for college and university lecturers.
- ii. The majority of the companies have reported that vacancies within this occupation group are between junior to senior level positions. The median time to fill reported is between 3 to 6 months, where to some extent it could be more than 6 months. In addition, most companies reported that this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. A minimum of bachelor's master is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey with strong technical, analytical, literacy and teaching skills. Additionally, specific skills are required in respective field of studies.
- iv. Based on the consultation with the Malaysian Association of Private Colleges and Universities (MAPCU), education industry is facing a shortage of supply due to the increased demand in salary as well as high turnover rate. MAPCU also emphasised that candidates with qualifications



below are high in demand:

- a) PhD in any field of study or master's degree with at least 5 years of academic experience
 - b) Subject expertise/specialist recognised by the institution plus research track record
 - c) Master's degree in specialisation discipline such as Actuarial Science, Engineering, Accounting or Surveying with minimum of 2 years of relevant industry experience
 - d) Master's degree in Data Science, Forensic or Cyber Security with minimum of 2 years of relevant industry experience
 - e) Bachelor's degree with 5 years of related work experience in the subject taught.
- v. Therefore, with strong nominations of bottom-up evidence, plus with input received from the key stakeholder as well as employment and wage growth point to the shortage in the top-down evidence justify the inclusion of this occupation the COL.



Occupation: Accountant and Auditor

MASCO 2013 (4-Digit Code): 2411

MASCO 2013 (6-Digit Code): 2411-10; 2411-11; 2411-12; 2411-13; 2411-16; 2411-21; 2411-23; 2411-25; 2411-35; 2411-36; 2411-37; 2411-50; 2411-54; 2411-56; 2411-59

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Accountant; Cost Accountant; Tax Accountant; Tax Consultant; Chartered Accountant; Account Executive; Cost Controller; Financial Controller; Auditor; Audit Executive; Audit and Risk Assessment Executive; Adjuster; Internal Auditor; Cost Estimator; Account Officer
---	---

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	46 nominations
Consultation	10 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Professional Services Activities Environmental Scan Maritime (Shipbuilding and Ship Repair) Environmental Scan Chemical and Petrochemical Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

- Accounting
- Communication Skills

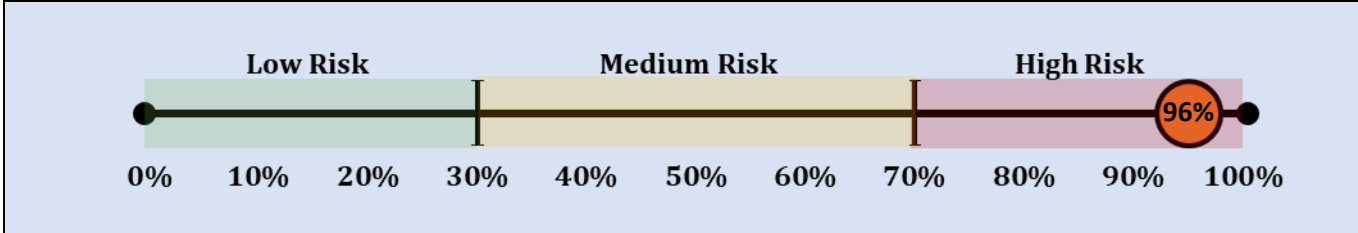
Top Sectors:

- Professional, Scientific and Technical Activities

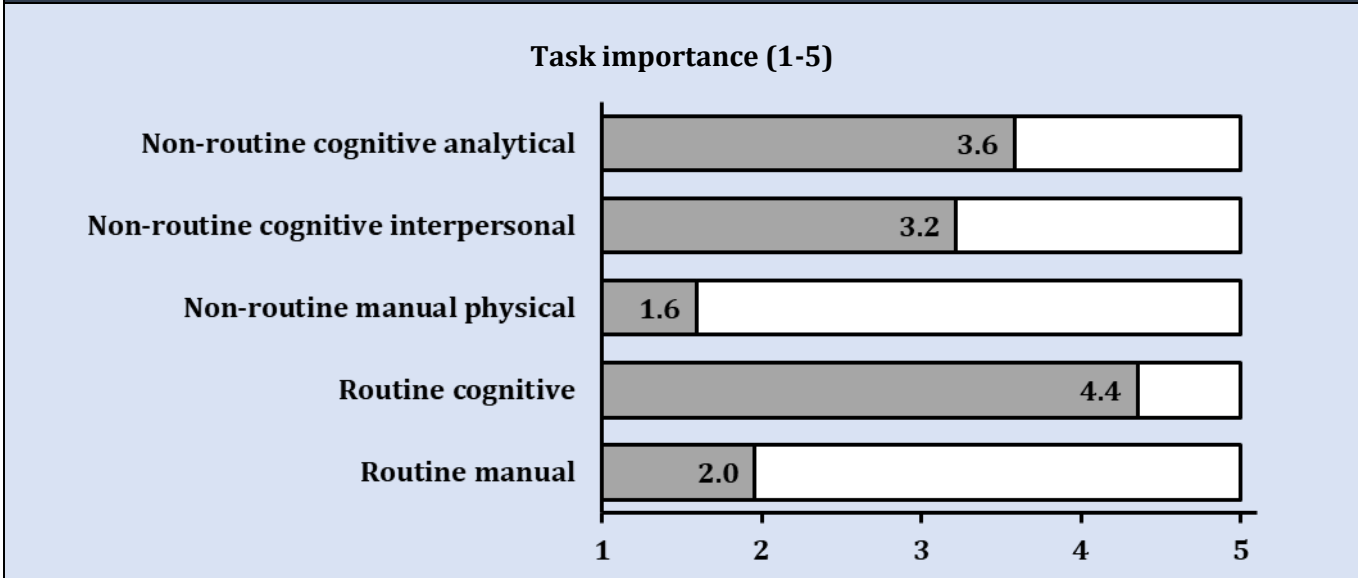
3. English Language	2. Manufacturing 3. Financial and Insurance/Takaful Activities
---------------------	---

Top Reasons of Hard-to-Fill: 1. Applicants lack the required technical skills 2. Too few applicants or no applicant at all 3. Applicants lack relevant job experience	Top Strategies to Meet Shortages: 1. Expanding local recruitment efforts 2. Increasing worker training 3. Raising wages
---	---

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for accountants, account executives, financial controllers, auditors and tax consultants.
- ii. Companies have reported that vacancies within this occupation group are for all staff level with a median time to fill of 2 to 3 months. Most companies have reported that this occupation is neither more nor less hard to fill as compared to a year ago. However, there are a significant number of companies who have reported that they found this occupation has been harder to fill.



- iii. While the positions are mostly for junior level who typically work less than 3 years, most of the companies cited that Malaysian Institute of Accountants (MIA) membership and experience are preferred for these occupations. MIA also reported that relevant working experience is required to be a membership. A bachelor's degree in Accounting or Finance is mostly required for this occupation group while having accredited with professional certificates are advantageous to secure this position as well as positive career growth.
- iv. Environmental scan from three different industries which are Professional Services, Maritime and Chemical & Petrochemical cited that this occupation group is important and critical for their sustainability of business operation, though different industries prefer the applicants to have similar industry working experience prior hiring.
- v. MIA, Federation of Malaysian Freight Forwarders (FMFF) and the Malaysian Retail Chain Association (MRCA) cited that the reasons behind this occupation being hard to fill are due to applicants lacking required technical skill, demanding compensation beyond the market rate and that there are too few talent pools available in the market. Additionally, MRCA responded to this by raising wages, increasing overtime hours of current workforce, hiring contract workers to fill in the current shortage, as well as engaging with other industry players to craft suitable syllabus and training for the industry.
- vi. The consultation with MIA also indicated that the ratio per population for accountants still lags behind Singapore. In response to this, Malaysia aims to have 60,000 certified professional accountants by 2030. The emerging smart and digital technology, continued globalisation of reporting or disclosure standards, and new forms of regulations are increasingly influencing the discussion of automatability for this occupation. MIA also shared that the growth of shared services centres has shifted traditional roles of accountants to assume more responsibilities.
- vii. One of the key players in the oil and gas industry has adapted new technologies to recover from oil & gas recession and hence, creating opportunity for these occupations. The key player also requires applicants with good background on logistic and procurement as opposed to only financial knowledge. Additional language proficiency especially in Thai, Vietnamese, Japanese or Arabic are also very much preferred. As a strategy, workers' training collaboration with local education have consequently been increased. They also encourage women career comeback to attract more women entering the industry.
- viii. With strong evidence from various industries' environmental scans and multiple consultations from different sectors, along with high nominations, this occupation is indeed presented to be critical and highly required by some, if not all, important sectors in Malaysia. Therefore, this occupation is significant to be included in the COL.



Occupation: Financial and Investment Adviser

MASCO 2013 (4-Digit Code): 2412

MASCO 2013 (6-Digit Code): 2412-05; 2412-07; 2412-08; 2412-13; 2412-19

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Corporate Financial Adviser; E-Commerce Adviser; Finance Executive; Sales Analyst; Leasing Executive

This occupation appears on COL:

2015	Yes	2017	No
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 7 out of 12 indicators
Bottom-up CfE survey	11 nominations
Consultation	4 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	Yes	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	Yes	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Sales
2. Planning
3. English Language

Top Sectors:

1. Financial and Insurance/Takaful Activities
2. Manufacturing
3. Real Estate Activities

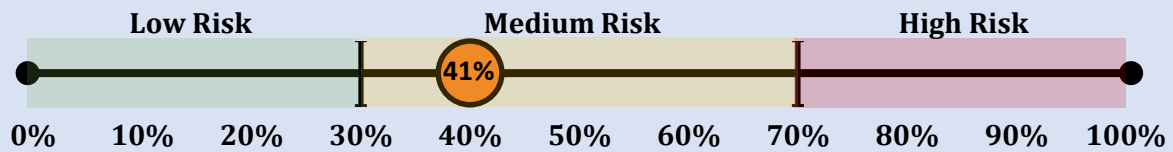
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants' expected compensation is beyond the market rate
3. Applicants lack other required skills

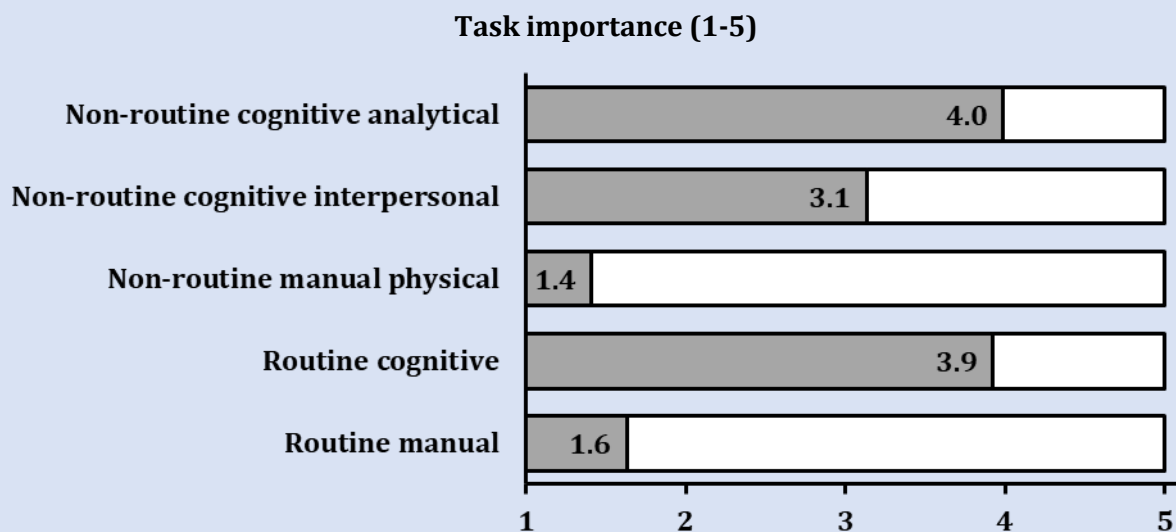
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for finance executives and corporate financial advisors.
- ii. The majority of companies have reported that vacancies within this occupation group are diversified between junior and middle level positions with a median time to fill of 2 to 3 months. Most companies reported that this occupation is neither more nor less hard to fill from a year ago, although some stated this occupation has been harder to fill.
- iii. Respondents reported that applicants do not need any particular certifications to qualify for this occupation, however, a minimum of a bachelor's degree in Accounting and Finance are mostly desirable. Companies also stated that candidates who have experience in financial industry is an additional advantage to secure a position in this occupation.
- iv. Companies identified sales strategy, planning and ability to use verbal and written English are important skills to acquire the occupation.

- v. Based on our Call-for-Evidence (CfE) survey, companies have cited that the reasons for this occupation being hard to fill are applicants lack job experience and other required skills (e.g. time management, ability to get along with others, teamwork, creativity and problem solving). Companies have responded by increasing local recruitment efforts and raising wages to promote this occupation and attract more applicants.
- vi. Consultation with Malaysian Institute of Accountants (MIA) provided additional input indicating that this occupation, especially finance executives, are sought-after as companies are looking for senior candidates who have relevant working experience in finance, for at least 3 years. On top of that, professional qualifications and high level of technical expertise are required to qualify for this occupation. Due to the shortage, some companies have to resort to acquiring foreign talents which pose higher hiring cost to the companies. MIA also stated that automation in financial services is not yet being adopted in full swing and that the impact of automation are increasing efficiency of tasks and works instead the reduction in headcount. Additionally, Malaysia Retail Chain Association (MRCA) also noted that finance executives are hard to fill because candidates are lacking the skills required by the firms.
- vii. Malaysian Association of Hotel Owners (MAHO) cited that e-commerce advisers have become increasingly important to hoteliers since there is a rise in trend for online booking and promotions. However, candidates with this analytical background are scarce and causing increasing talent poaching from other companies. MAHO mentioned that communication skills and ability to converse in English are also crucial to boost their confidence so they could communicate and become more articulate at the workplace. Besides that, MAHO suggested to increase internship period to at least 6 months so that the local graduates are able to learn and adapt the working conditions of hotels and employers have adequate time to assess the potentials of local talents.
- viii. Machinery & Engineering Industries Federation (MEIF) indicated that this occupation is favourable for applicants who possess skills in digital commerce while having knowledge on the machinery industries and industries' compliance regulations. Most companies embark on the e-commerce business strategy by taking advantage of increasing internet penetration in Malaysia, henceforth, resulting in vast outreach for potential customers. Thus, this occupation could be attractive to younger generation (especially millennials) as an option for employment, while at same time, increasing potential sales and recognition to industries.
- ix. In overall rating, this occupation passes the top down shortage threshold. It shows that there are employment, working hours and wage premium growth as well as high number of vacancies which demonstrate a high demand of talents for this occupation. This, when combined with nominations from CfE survey and solid input from stakeholders, suggest a very strong evidence that this occupation is significant to be included in the COL.



Occupation: Financial Analyst

MASCO 2013 (4-Digit Code): 2413

MASCO 2013 (6-Digit Code): 2413-01; 2413-04; 2413-06; 2413-08; 2413-10; 2413-12; 2413-17; 2413-20; 2413-21

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Financial Analyst, Risk Operation Analyst, Research Analyst, Investment Analyst, Equity Analyst, Risk Management Officer, Risk Modeller, Financial Reporting Analyst, Credit Risk Management

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	9 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

- Accounting and Finance
- Communication Skills

Top Sectors:

- Financial and Insurance/Takaful Activities
- Manufacturing

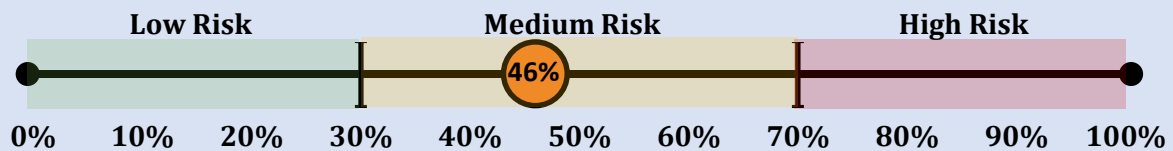
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical or occupational skills
2. Too few applicants or no applicant at all
3. Applicants lack relevant job experience

Top Strategies to Meet Shortages:

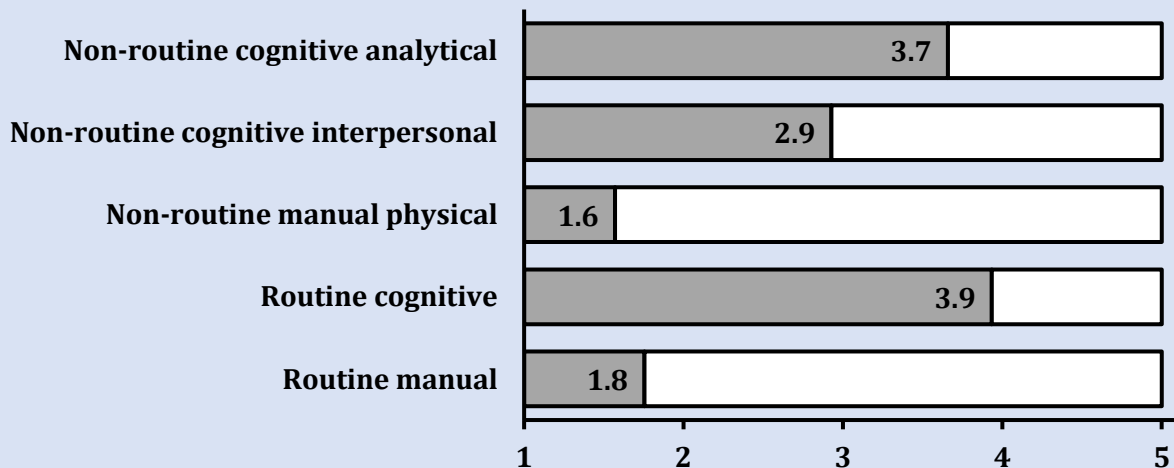
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for financial reporting analysts, and credit risk managements.
- The majority of companies have reported that vacancies within this occupation group are across all level with median time to fill of 2 to 3 months. Majority of the respondents indicated that they need applicants to have at least a bachelor's degree. Some companies would also prioritise applicants who had acquired the Association of Chartered Certified Accountants (ACCA) certification.



- iii. The Call-for-Evidence (CfE) survey has gathered that most candidates lack required technical skills on top of not having sufficient relevant job experience. Additionally, there is too few applicants or no applicants at all who are applying for this occupation. In addressing the issue of shortage, companies are expanding local recruitment efforts, raising wages and increasing worker training. Some companies have also resorted to have internal initiatives such as encouraging senior staff to delay retirement and to increase inter-department movements to take up hard-to-fill roles.
- iv. In the MDEC Digital Talent Report, financial analysts have been highlighted as one of the top trending jobs in the digital industry. This occupation might be difficult to fill up in the near future, specifically in global business services (GBS) area.
- v. Through the consultation conducted with the Life Insurance Association of Malaysia (LIAM), the disruption brought by financial technology (FINTECH) is impacting how business models are behaving in the current years and is consequently affecting the regulatory requirements within the industry. This has in turn create higher demand for role such as risk management officers who are crucially needed to keep up with rapid changes in business directions. In responding to changing environment, particularly the emergence of digitalisation, finding talent with sufficient experience in technology risk management is difficult as it is a new area to most companies. In this regard, LIAM foresees that although the new era of technology can create new jobs and that loss of headcount would only be at less than 5%, re-skilling and re-deploying would be a priority to them in years to come.
- vi. For the Free Industrial Zone, Penang, Companies' Association (FREPENCA), the challenge lies mainly at the geographical factor. Based in Penang, most companies under the Association are facing workers retention issue and are dealing with insufficient supply of qualified talent due to the small pool of talent in the state. It is also observed that many local talents are not open to the idea of relocation, even within Malaysia. Among other issues highlighted by FREPENCA include outdated university curriculum. This in turn has underprepared students to enter the market, affecting graduate's ability to perform well in the industry, which FREPENCA confirms with graduates' significant lack of social skills, among many. To address this, one of the member companies of FREPENCA has fostered partnership with Monash University Malaysia to work on competitive curriculum that matches the need of the job market.
- vii. The top-down result has also indicated increase in vacancies rate which points out to existence of shortage. Supported by the further evidence gathered in the bottom-up nominations, this occupation is included in the COL.



Occupation: Advertising and Marketing Professional

MASCO 2013 (4-Digit Code): 2431

MASCO 2013 (6-Digit Code): 2431-04; 2431-06; 2431-08; 2431-09; 2431-10; 2431-11; 2431-12; 2431-13; 2431-14; 2431-15; 2431-18; 2431-19; 2431-20; 2431-23; 2431-31; 2431-35; 2431-36; 2431-37; 2431-38; 2431-39

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Business Efficiency Officer; Patent Agent; Sales Specialist; Business Compliance Executive; Marketing Communications Specialist; Compliance Officer; Shariah Compliance Officer; Compliance Analyst; Trade Product Specialist; Business Development Engineer; Export Executive; Sales Executive; Marketing Executive; Product Brand Executive; Marketing Engineer; Digital Marketing Executive; Marketing Officer; Sales Officer; Sales Coordinator; Merger and Acquisition

This occupation appears on COL:

2015	Yes	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 10 indicators
Bottom-up CfE survey	37 nominations
Consultation	8 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	Yes	Yes	Yes

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Marketing
2. English Language
3. Social Media Skill

Top Sectors:

1. Manufacturing
2. Financial and Insurance/Takaful Activities
3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles

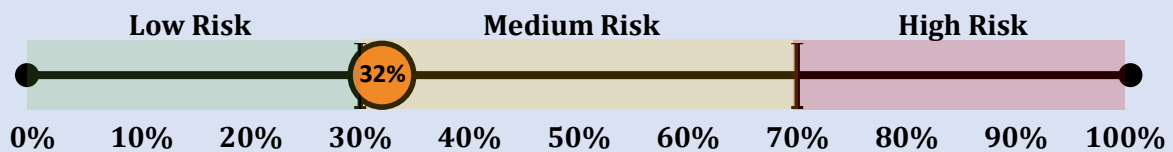
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

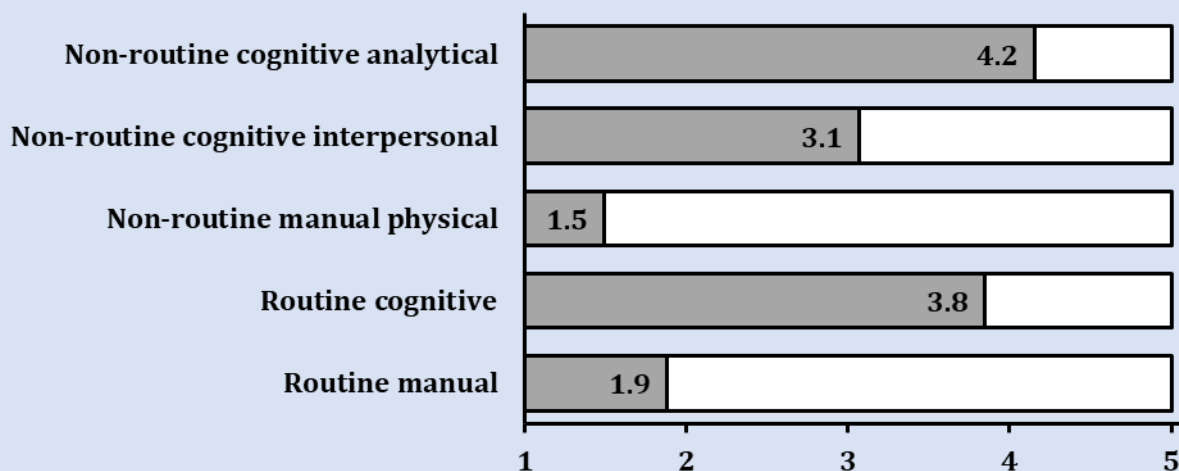
1. Expanding local recruitment efforts
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for sales specialists, compliance officers, and sales executives.
- ii. The majority of companies have reported that vacancies within this occupation group are for all staff level with median time to fill of 2 to 3 months. However, there are significant numbers of companies who have reported average time to fill ranging from 4 to 6 months. Most respondents required candidates with at least a bachelor's degree, preferably in related fields.
- iii. The Professional Services Activities Environmental Scan highlighted that the rapid transition from traditional advertising to new media advertising have encouraged emergence of social media and growing internet audience. This increases demand for advertising professionals but not many are taking up advertising jobs. The industry now mainly attracted marketing and communication graduates, unlike years ago where advertising industry could attract graduates from various backgrounds.
- iv. The consultation with the Association of Banks in Malaysia (ABM) has highlighted that the advancement of digital solutions provided banks with new platform to pursue higher innovation, boost digital capabilities, and increase demands for sophisticated banking needs. In parallel to these developments, the demand for talents to fill in this occupation has seen an increase in order for banks to engage efficiently with customers. ABM also mentioned that automation would also mean evolving regulations and this would require candidates that are knowledgeable in compliance as a way to handle new regulations efficiently.
- v. Through the consultation with the Federation of Malaysian Freight Forwarders (FMFF), the association nominated export executives as the role in shortage under this occupation. As trade and transportation goes hand in hand, the industry performance is affected by the economic conditions. Additionally, the shortage in this occupation for FMFF is also due to migration of talent to Singapore due to attractive salary package. On the note of automation within the logistics industry, FMFF have informed that more things such as clearance, shipping booking, and delivery are done online. In consequence, talents are required to be more agile and skilful than ever for this occupation. Thus, FMFF urges the industry to keep track of rapid disruption within automation.
- vi. Meanwhile from the consultation conducted with the Malaysia Retail Chain Association (MRCA), candidate for this occupation is in shortage due to the lack of required skills, in line with the responses of most companies through the Call-for-Evidence (CfE) survey. To address the shortage, MRCA has resorted to increase salary, certifying supervisors, diversifying roles for existing staff, and to collaborate with other industry players to craft relevant syllabus and training modules. MRCA is in the view that automation would change how companies study consumers' choices and this would encourage the emergence of new roles for this occupation.



- vii. Through another consultation, one of the key players in communication industry have stated that the competition among telcos, especially on infrastructure, price war, and demands from customers have affected the key player revenue. This has, more than ever, urge for this position to be filled up with skilled candidates. They mentioned that for this occupation, skills are valued much more and that it is not critical in terms of supply but rather in terms of skills. The key player had listed few niche skills that are important for this occupation;
 - a) Data Analysis
 - b) Google Adwords
 - c) Facebook Targeting
 - d) Third-Party Ads Network Platform
- viii. Further input from the Life Insurance Association of Malaysia (LIAM) stated that the changing environment in the industry has also created shift in regulations. This has resulted in increasing demand for compliance officer and analyst roles under this occupation. LIAM requires talents with few years of experience in compliance area. On automation, LIAM views it as force that will influence regulations over time and will demand more talents with compliance knowledge in the long run.
- ix. Consistent with the bottom-up evidence which shows companies resorting to expanding recruitment and raising wages, the top-down result shows indication of reduced requirements for education qualifications and required experienced. This further justifies the inclusion of this occupation in the COL.



Occupation: Information and Communications Technology (ICT) Sales Professional

MASCO 2013 (4-Digit Code): 2434

MASCO 2013 (6-Digit Code): 2434-04; 2434-05; 2434-07; 2434-09; 2434-10; 2434-11

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Information Technology Sales Engineer; Customer Support Representative; Product Support Officer; Product Development Engineer; Digital Banking/Internet Technology Specialist; Customer Support Officer (IT)

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Insufficient Data
Bottom-up CfE survey	6 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

- Sales
- Communication Skills
- Software Sales

Top Sectors:

- Manufacturing
- Transportation and Storage
- Information and Communication

Top Reasons of Hard-to-Fill:

- Applicants lack the required technical skills
- Too few applicants or no applicant at all

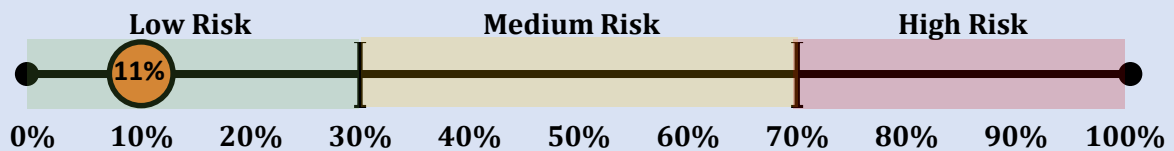
Top Strategies to Meet Shortages:

- Increasing worker training

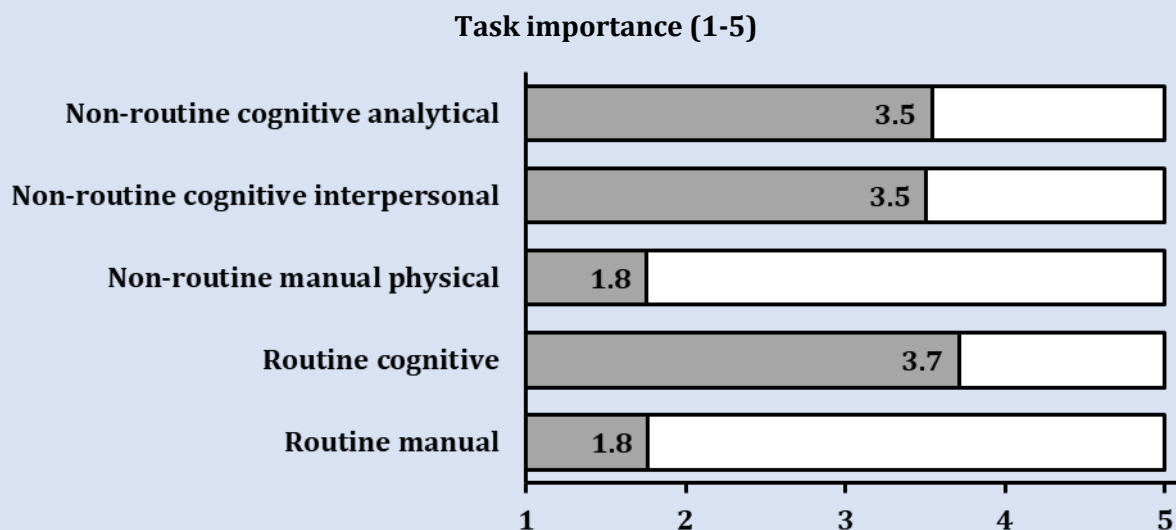
3. Applicants lack the required credentials or certification

2. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates
3. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for product development engineers.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior level positions, with a most common time to fill of 2 to 3 months. In addition, most companies have reported requiring candidates to have a minimum of a bachelor's degree to qualify for this occupation.



- iii. The MDEC Digital Talent Report have cited customer support representatives, product development engineers and customer support engineers (IT) as some of the top trending digital jobs.
- iv. On top of that, from our consultation with The Free Industrial Zone, Penang, Companies' Association (FREPENCA), one of the member companies have highlighted about the demand for customer support representatives and customer support officers (IT). According to them, these are technical support roles that, apart from needing skills such as troubleshooting (tier 1 and tier 2 services), would need candidates who are multilingual. Other than English, Japanese and Korean language proficiency are also in demand to be able to assist customers from abroad.
- v. From another consultation with Life Insurance Association of Malaysia (LIAM), they have highlighted that digital banking/internet technology specialists (at managerial levels) equipped with new digital skillsets are sought after in the industry. Coping with current shortage has the industry upskilling employees from different business units for them to be able to take up rising digital roles. Increasing workers' training is also seen as one of the most adopted strategy for respondents of our survey.
- vi. Strong bottom-up evidences suggest that this occupation should be included in the COL.



Occupation: Systems Analyst

MASCO 2013 (4-Digit Code): 2511

MASCO 2013 (6-Digit Code): 2511-04; 2511-06; 2511-08; 2511-11; 2511-14; 2511-17; 2511-18; 2511-20; 2511-25; 2511-35; 2511-42; 2511-46; 2511-47; 2511-48; 2511-56; 2511-59; 2511-69; 2511-73; 2511-75

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Computer Systems Analyst; IT Systems Consultant; Information Technology Business Analyst; Information Technology Systems Designer; RPG System Analyst; Structured Query Language (SQL) Database Analyst; Information Technology Security Analyst; Enterprise Resource Planning (ERP) Programmer Analyst (ABAP); Technical Specialist (.Net); Application Specialist Support (Navision); System Engineer (Oracle); Enterprise Systems Specialist (IT); Enterprise Resource Planning (ERP) Technical Specialist (IT); Information Technology Specialist (SAP); Security Analyst (IT); Design Engineer (IT); SAP Consultant; ICT Specialist; Cyber Security Analyst

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	22 nominations
Consultation	16 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. English Language
3. Systems Applications and Products in Data Processing (SAP)

Top Sectors:

1. Financial and Insurance/Takaful Activities
2. Information and Communication
3. Manufacturing

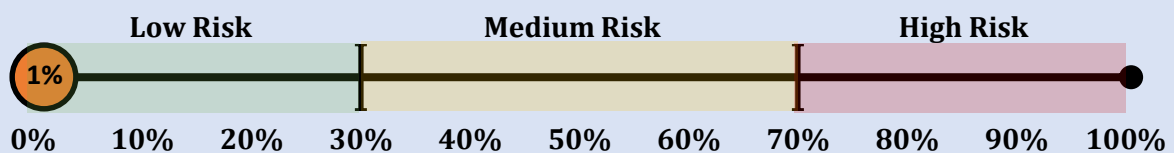
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills
3. Applicants lack relevant job experience

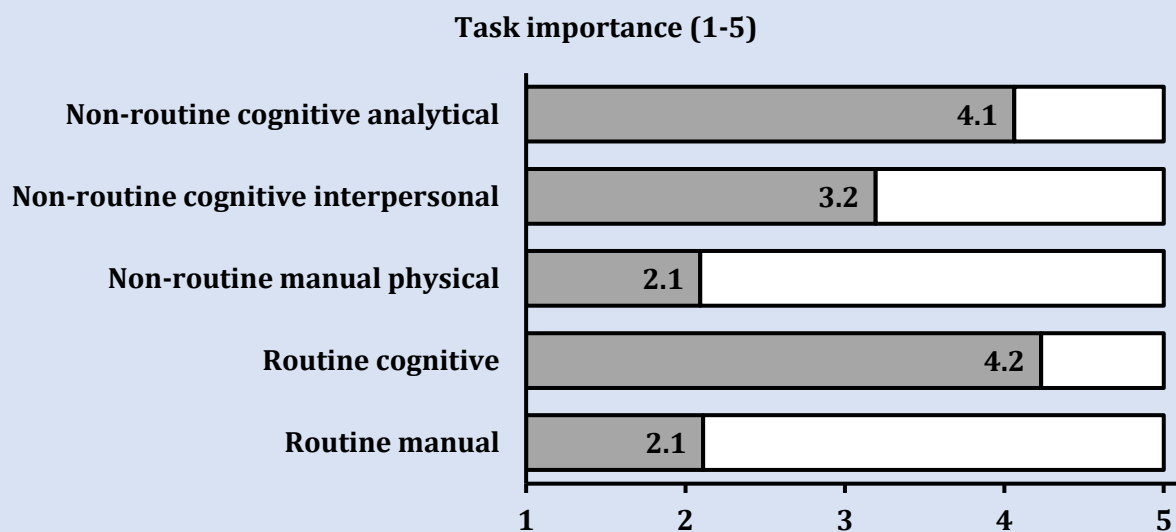
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for IT business analysts, IT security analysts, IT specialists (SAP) and cyber security analysts.

- ii. The majority of the companies have reported that vacancies within this occupation group are for junior to middle level positions with median time to fill reported is between 3 to 6 months. In addition, companies reported that this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. Most respondents require candidates with at least a bachelor's degree, preferably in related fields such as Computer Science, Information Technology, Information System or equivalent. Some companies would also prioritise applicants who had acquired the SAP or Oracle certifications. The skills deemed to be important include IT, technical and analytical skills.
- iv. The Association of Banks Malaysia (ABM) nominated IT security analysts and cyber security analysts as critical. Both jobs required Cisco Certified Network Professional (CCNP) and Cisco Certified Internetwork Expert certifications to support banking system, manage firewall and network security issues. The advancement of digital solutions has provided the banks a new platform to pursue higher innovation and growth, boost their digital capabilities, increased demands for sophisticated banking needs and seen increasingly aggressive financial crimes. This has increased the demand for candidates with niche IT and computer science skillsets as well as cognitive skillsets.
- v. Based on the consultation with Life Insurance Association of Malaysia (LIAM), the insurance industry is affected by several trends in general, and is growing and focusing on digitalisation, data and analytics. LIAM nominated application specialist supports (Navision), IT specialists and consultants (SAP), and IT security and cyber security analysts as critical. LIAM has also emphasised that it takes more than 3 months to get suitable candidates for security and cyber security analysts due to not enough applicants and expectation of compensation is beyond the market rate.
- vi. Malaysia Digital Economy Corporation (MDEC) echoed the scarcity of IT security and cyber security analysts for the industry. Plus, those who have qualified skills opted to better career opportunities outside Malaysia. To mitigate this issue, MDEC works with companies to upskilling and reskilling their employees, depending on their needs in addressing those shortcomings. For example, MDEC has engaged in a partnership to provide training to graduates and students following the launch of Asia Cybersecurity Exchange (AsiaCyberX) in 2018. Further, MDEC Digital Talent Report identified consultants with .Net, Java, Peoplesoft and Oracle software skills, Enterprise Resource Planning (ERP) programmer analysts (ABAP), IT system analysts (JDE) and security analysts as trending jobs in digital industry.
- vii. According to Waste Management Association of Malaysia (WMAM), the waste management industry is facing a difficulty in hiring high skilled workers. Jobs such as Structured Query Language (SQL) database specialists and analysts with minimum of 5 years of experience are critical in the industry. In terms of strategies to overcome the shortage, WMAM has opted to upskill existing staffs, collaborate with local universities and industrial apprenticeship programmes, hire retirees for routine work, as well as conduct knowledge transfer from industrial experts.



- viii. The Federation of Malaysian Manufacturers (FMM) nominated IT business analysts as critical for the industry. This job requires ability to analyse complex business problems by using automated systems. Apart from the common education fields required, candidates with knowledge in Enterprise Resource Planning (ERP) or supply chain IT systems are highly preferred. This position requires experienced candidates, thus for short term mitigation, FMM extends services for retirees by engaging 6 months contract to transfer knowledge to the current employees.
- ix. In addition, Malaysian Organisation of Pharmaceutical Industries (MOPI) also indicated IT business analysts with 2 to 3 years of business experience as critical for their industry. They have emphasised that Work in Progress (WIP) and Bill of Materials (BOM) are compulsory skillsets and currently are lacking in Malaysia.
- x. Last but not least, Machinery & Engineering Industries Federation (MEIF) noted that computer-aided engineering (CAE) engineers with relevant professional degree or past experiences are critical in the machinery and equipment industry.
- xi. This occupation passes the number of vacancies and vacancy rate threshold. Plus, with high nominations of bottom-up evidence and inputs from various industries, this occupation is included in the COL.

Occupation: Software Developer

MASCO 2013 (4-Digit Code): 2512

MASCO 2013 (6-Digit Code): 2512-01; 2512-02; 2512-03; 2512-04; 2512-06; 2512-07; 2512-08; 2512-09; 2512-10; 2512-11; 2512-13; 2512-14; 2512-16; 2512-19; 2512-22; 2512-23; 2512-25; 2512-26; 2512-28; 2512-29; 2512-30; 2512-34; 2512-35; 2512-36; 2512-37; 2512-38; 2512-39; 2512-40; 2512-41

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Software Developer; Multi-Media Software Developer; Software Designer; Design Engineer; Application Developer (.Net); Application Engineer (.Net); Software Engineer (.Net); C/C++ Developer; C/C++ Software Engineer; Cobol Developer; Java Application Developer; Java Developer; Web Programmer (PHP); System Architect (IT); Net Sharepoint Developer (IT); Software Engineer (Sharepoint) (IT); Software Analyst; Software Design Engineers; SAP IT and Finance Applications Developers; SAP Application Developer; Network Security; Debug Software Engineer; Computer Engineer; Software; iOS Developer; Android Developer; Mobile Application Developer; System Application Engineer; Blockchain Developer ; Linux Software Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 4 indicators
Bottom-up CfE survey	59 nominations
Consultation	11 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	Yes	Yes

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Software Engineering
2. Software Development
3. SQL

Top Sectors:

1. Information and Communication
2. Manufacturing
3. Financial and Insurance/Takaful Activities

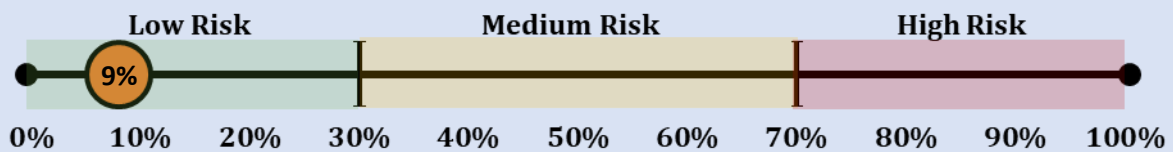
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Too few applicants or no applicant at all
3. Applicants lack relevant job experience

Top Strategies to Meet Shortages:

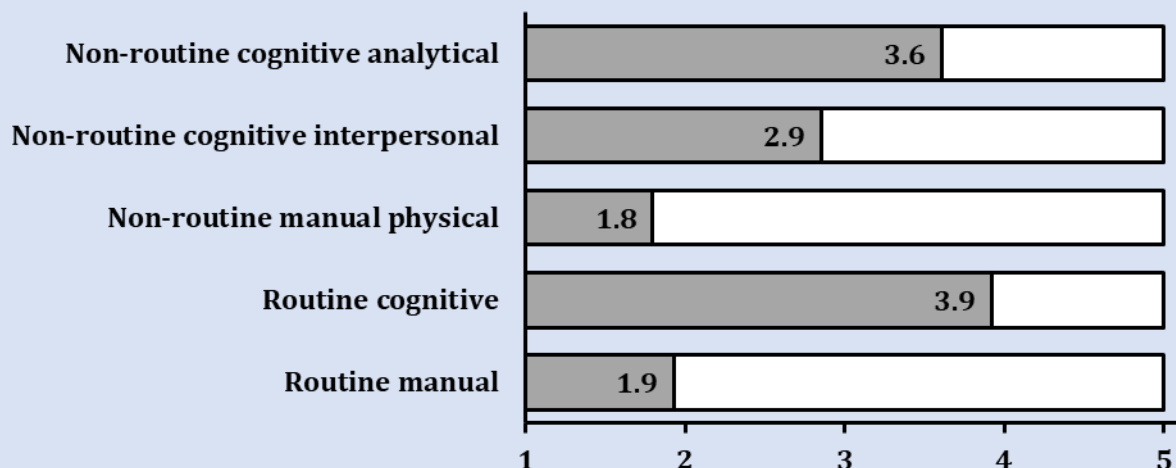
1. Expanding local recruitment efforts
2. Increasing worker training
3. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for software developers, design engineers and software engineers (.Net) mainly in information and communication and manufacturing sector.
- ii. Companies have reported that vacancies within this occupation group are between junior and middle level positions. The most common time to fill for this occupation is reported to be 2 to 6 months.
- iii. The general acceptance education qualification is a bachelor's degree. Some companies have mentioned the requirement of bachelor's degree in Electrical and Computer Engineering as well as Computer Programming (i.e Java based applications). There is also evidence on the requirement of specialised certifications, depending on companies and industries. For example, some companies require the applicants to have Java certification while some require to have Structured Query Language (SQL) certification. The top skills identified by companies are software engineering, software development and SQL.
- iv. From our Call-for-Evidence (CfE) survey, most companies state that lack of technical skills and too few applicants are the main reasons this occupation is hard to fill. Hence, companies have resorted to expanding local recruitment effort, increasing the workers' training and establishing partnership with local education institutions to curb the shortages.
- v. In a consultation with the Association of Banks in Malaysia (ABM), they have highlighted the need for application developers (.Net) and java application developers with more than 15 years of experience in the market. Talents would need to master Java, usage of Java 2 Platform Enterprise Edition (J2EE) and SQL scripting. They have also pointed out the criticality of cobol developers with more than 15 years of experience. For cobol developers, talents are required to have skills in Application System/400 (AS/400), IBM mainframes and Cobol. In addition, according to ABM, blockchain developers with 2 years of experience or more are also very much in demand. This is due to limited number of talents experienced with blockchain in the market. To qualify, talents would need to have skills in C++, Ruby, Python, Java and JavaScript programming language. The shortage of talent is a result from stiff competition from other industry to get the skilful and right talent, hence causing the delay in the project delivery. ABM has attended to this by creating a special conquest to understand and nurture the younger workforce generation to attract them to work in this industry. The severity of the shortage also causes them to hire foreign experts at certain positions which hinder the roadmap development of local talent.
- vi. One of the key players in communication industry have also pointed out the need for application developers (.Net) and mobile application developers. Talents who qualify to become application developers (.Net) would need to have skills in HTML, Java, JavaScript, PHP and MySQL. Meanwhile, talents for mobile application developers should be able to implement industry best practices such as agile software development, DevOps, coding standards, design pattern

and test automation. They also shared that certain qualified candidates prefer to work as freelancer and some demand for salary that is beyond the market rate.

- vii. From our consultation with the Free Trade Industrial Zone, Penang, Companies' Association (FREPENCA), they echoed the same concern over not being able to find qualified and experienced candidates. Furthermore, location is another hindrance to locate talent since most of the applicants prefer to work in bigger city centres (Selangor and Kuala Lumpur) as compared to Penang. They have nominated for design engineers, computer software engineers, software engineers (.Net) and mobile application developers. To qualify for computer software engineers and software engineers (.Net), talents should be skilled in embedded software or software system in design environment. Meanwhile, talents in demand for design engineers are those who have experience in machine design with at least 5 to 8 years of experience, and a bachelor's degree in Mechanical Engineering.
- viii. The Federation of Malaysian Manufacturers (FMM), on the other hand, indicated that linux software engineers with 2 to 3 years of experience are in demand and there is hiring difficulty due to lack of graduates with hands-on experience with the technology. To qualify, candidates should have a bachelor's or master's degree in Computer Science or Computer Software. In addition, candidates should master Linux distributions such as CentOS, Red Hat, Red Hat Satellite, the Katello systems, the Kernel-based Virtual Machine (KVM) and the OpenStack software. To mitigate the current shortages, companies resort to hiring less well qualified candidates as well as taking in fresh graduates and providing them with training and development. Companies are also expanding international recruitment efforts.
- ix. The MDEC Digital Talent Report have listed system architects (IT), software developers, software engineers (.Net) and C/C++ software engineers to be amongst the top trending job titles in the digital industry.
- x. Top-down data shows that this occupation passes the threshold for vacancies and this is supported by strong bottom-up evidences from high nominations from the CfE survey, echoed by multiple stakeholders via consultations. Thus, this occupation is included in the COL.



Occupation: Applications Programmer

MASCO 2013 (4-Digit Code): 2514

MASCO 2013 (6-Digit Code): 2514-01; 2514-02; 2514-03; 2514-04; 2514-07; 2514-08; 2514-09; 2514-12; 2514-15; 2514-18; 2514-19; 2514-20; 2514-22; 2514-26; 2514-28; 2514-32; 2514-35; 2514-36; 2514-37; 2514-38; 2514-39

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Computer Programmer; Software Programmer; Technical Programmer; Information Technology Programmer; Systems Programmer; Analyst Programmer; Applications Programmer; Software Programmer (.Net); C/C++ Programmer; JavaScript Programmer; Hypertext Preprocessor (PHP) Programmer; Database Application Specialist; PLC Engineer (Programmable Logic Controllers); Tools Programmer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	23 nominations
Consultation	15 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	Yes	Yes

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Structured Query Language (SQL)
2. JavaScript
3. Communication Skill

Top Sectors:

1. Information and Communication
2. Manufacturing
3. Professional, Scientific and Technical Activities

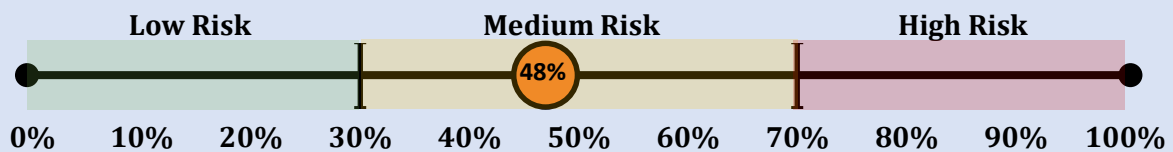
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Too few applicants or no applicant at all
3. Applicants lack relevant job experience

Top Strategies to Meet Shortages:

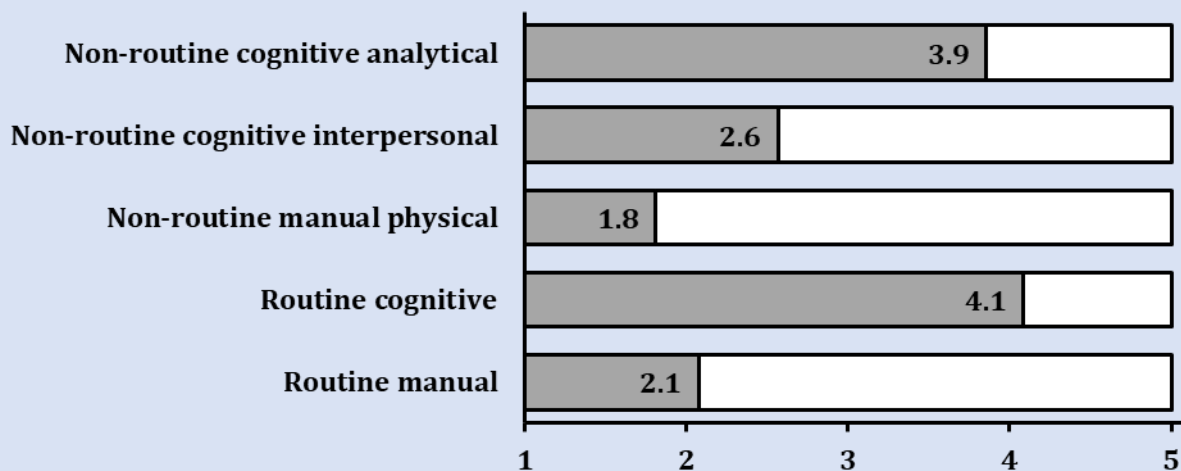
1. Increasing worker training
2. Expanding local recruitment efforts
3. Hiring temporary or contract workers

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for software programmers, system programmers, and analyst programmers.
- ii. The majority of companies have reported that vacancies within this occupation group are for all staff level with median time to fill of 2 to 3 months. There is also a significant amount of companies who reported at least 5 to 6 months in filling this occupation. The minimum education requirement for this occupation is a bachelor's degree in related fields.
- iii. Most of respondents reported applicants lack of required technical skills and relevant job experience as among the significant factors contributing to shortage on top of receiving too few or no applicant at all. In mitigating these problems, respondents have resorted to increasing worker training, expanding local recruitment efforts, and hiring less well qualified applicants.
- iv. The Waste Management Association of Malaysia (WMAM) has highlighted during a consultation session that the lack of talents in the market for this occupation had caused inability to develop internal software developer. Employment is also affected by new technologies and processes, further increasing demand for this occupation to be filled. WMAM specified the following degrees as important for this occupation;
 - a) Bachelor's degree in Computer Science
 - b) Bachelor's degree in Information Technology
 - c) Bachelor's degree in Information System
- v. Another input was gathered from a consultation conducted with one of the key players in the communication industry in which they highlighted the difficulty the right talent with the required skills. Most applicants also prefer to work as freelancers. Among the niche skills required by the key player are;
 - a) PeopleCode
 - b) Structured Query Language (SQL) / Procedural Language for SQL (PLSQL)
 - c) Java / VB Script
 - d) BI Publisher
- vi. Additionally, the input received from the consultation with the Machinery & Engineering Industries Federation (MEIF) mentioned the gap between applicants' skills and the practicality of the skills they possess. In most time, hands-on experience is hard to pick-up by companies and requires companies to provide on-the-job trainings. However, the tendency of fresh graduates to switch companies after a year or two have also demotivated companies to provide training over concern on cost efficiency.



- vii. The Life Insurance Association of Malaysia (LIAM) mentioned in their consultation that this occupation, particularly the role of database application specialist, is crucial as automation begets companies to rethink how work is organised and how skills in the future should be accounted for.
- viii. Further input was gathered from the Malaysia Digital Economy Corporation (MDEC). As one of the fastest growing industries in Southeast Asia, the creative industry has now provided ample opportunity for the Malaysians in both animation and gaming areas. For gaming, the market is big where tech giants like Google, Facebook and Apple are taking on the industry as a driver of consumer spending. Most of the time, talent scarcity in this occupation is due to talent migration for better salary outside of Malaysia. Commenting on automation, MDEC highlighted that animation programming is growing where animation programmers specialized in advanced secondary motion technology are sought after. Whereas for animation in games, technology companies are coming out with their own game streaming service, investing in virtual reality (VR) and venturing into mixed reality (MR). As a result, this new trend has created more job opportunities for this occupation. Among the strategies undertook by MDEC to mitigate the issue of shortage are;
 - a) Providing creativity trainings and workshops
 - b) Short-term classroom courses
 - c) Collaboration with companies for reskilling
 - d) Collaboration with HRDF to provide training for retrenched workers
- ix. On top of the overwhelming bottom-up nominations, the top-down result also shows increase in vacancies rate and decrease in required experience, which indicate companies high demand for this occupation. Considering all of the above evidence, the occupation is included in the COL.



Occupation: Software and Applications Developer and Analyst Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 2519

MASCO 2013 (6-Digit Code): 2519-01; 2519-02; 2519-03; 2519-07; 2519-08; 2519-10; 2519-11; 2519-12; 2519-14; 2519-16; 2519-17

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Software Tester; Systems Tester; Product Quality Assurance Engineer (IT); Test Engineer (IT); Solution Architect (IT); Application Security Engineer (IT); Software QA Engineer (IT); Siebel Solution Architect; Application Consultant; Information Technology Auditor; Tester (Selenium and Cucumber)

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 4 indicators
Bottom-up CfE survey	16 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

- Quality Assurance and Control
- Communication Skills
- English

Top Sectors:

- Information and Communication
- Administrative and Support Service Activities
- Financial and Insurance/Takaful Activities

Top Reasons of Hard-to-Fill:

- Too few applicants or no applicant at all

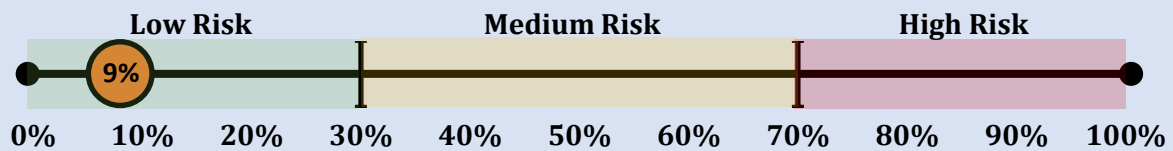
Top Strategies to Meet Shortages:

- Increasing worker training

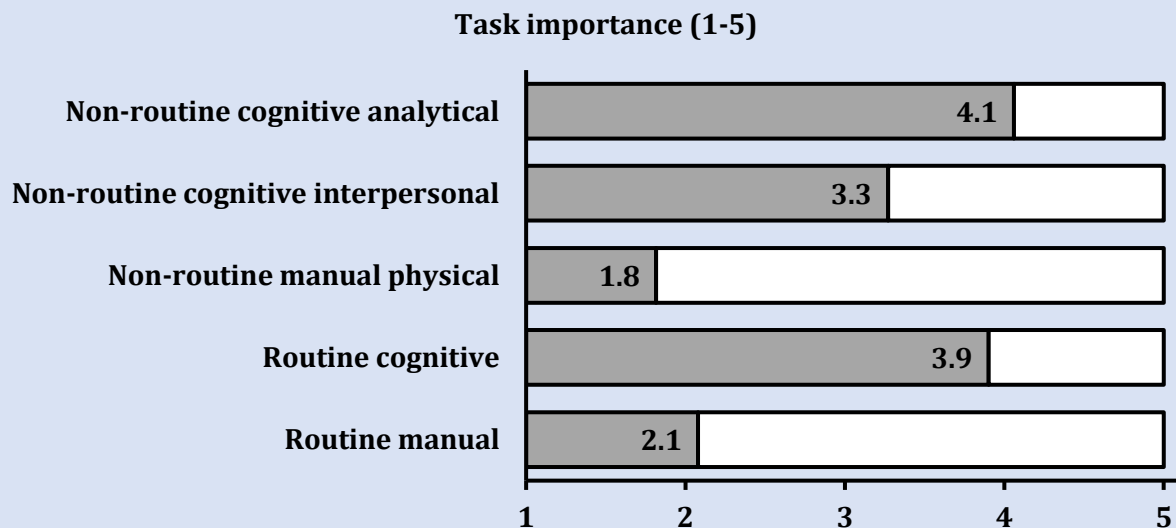
2. Applicants lack the required technical skills
3. Applicants lack relevant job experience

2. Expanding international recruitment efforts
3. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for software testers, solution architects (IT), application security engineers (IT) and testers (Selenium and Cucumber).
- ii. The majority of companies have reported that vacancies within this occupation group are for both junior and middle level positions with a minimum of bachelor's degree, though one-third are looking for entry level candidates as well. The time to fill for this occupation varies, some respondents reported they take about 2 to 3 months, some take 4 to 6 months and a few extreme cases take more than 6 months. Furthermore, half of respondents found this occupation to be harder to fill while the other half remains to believe that this occupation is neither more nor less hard to fill as compared to a year ago.



- iii. Based on our Call-for-Evidence (CfE) survey, companies also mentioned that talents should possess strong IT and analytical skills as well as soft skills such as communication skills, problems solving abilities and able to work well with others. In addition to this, one company reported that they are seeking for test engineers (IT) who are experienced in setting up automation framework and have in-depth knowledge in C++ programming language.
- iv. The Association of Banks Malaysia (ABM) nominated positions for automation testers with Selenium and Cucumber skills as critical. Candidates with more than 5 years of working experience are preferred by the companies. Consistent with evidence received from our survey where respondents resorted to increase workers training to mitigate the shortage, ABM also highlighted that companies did provide training to manual testers to move into the regression or automation testing mode than solely relying on one specific testing.
- v. Malaysia Digital Economy Corporation (MDEC) provided further input, indicating that this occupation, e.g. software testers and application security engineer (IT) are hard to fill and sought-after in the industry. This is because of the limited pool of talent with relevant technical skills and job experience, where those who have qualified skillsets tend to work to overseas mainly due to the higher pay and benefits. Their report, MDEC Digital Talent Report, also mentioned that there is critical need for software QA engineers (IT), solution architects (IT) and application assurance engineers.
- vi. Other than strategies listed above taken by companies, one company have also reported that they are taking initiative in organising annual testing competition to find talented testers.
- vii. This occupation did pass the top-down shortage overall threshold, despite limited evidence available. Plus, with 19 nominations from various sectors, which is relatively high and additional input from associations, we believe that this does point to a widespread shortage. Thus, this occupation is included in the COL.



Occupation: Database Designer and Administrator

MASCO 2013 (4-Digit Code): 2521

MASCO 2013 (6-Digit Code): 2521-03; 2521-07; 2521-10; 2521-14; 2521-17

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Database Administrator; Oracle Database Engineer; Structured Query Language (SQL) Database Engineer; Business Database Analysts; Machine Learning engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Passes 3 out of 4 indicators
Bottom-up CfE survey	3 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

- SQL
- English Language
- Database Administration

Top Sectors:

- Manufacturing
- Water Supply, Sewerage, Waste Management and Remediation Activities
- Information and Communication

Top Reasons of Hard-to-Fill:

- Too few applicants or no applicant at all
- Applicants lack the required technical skills

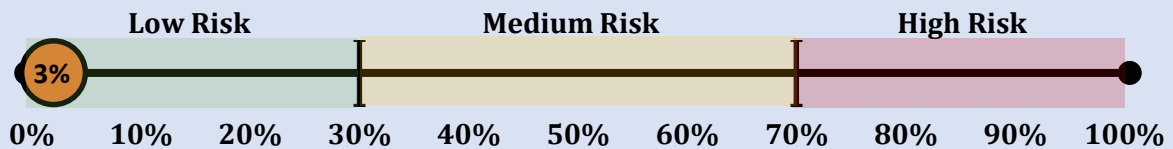
Top Strategies to Meet Shortages:

- Expanding local recruitment efforts (e.g. wider distribution of job openings, increased

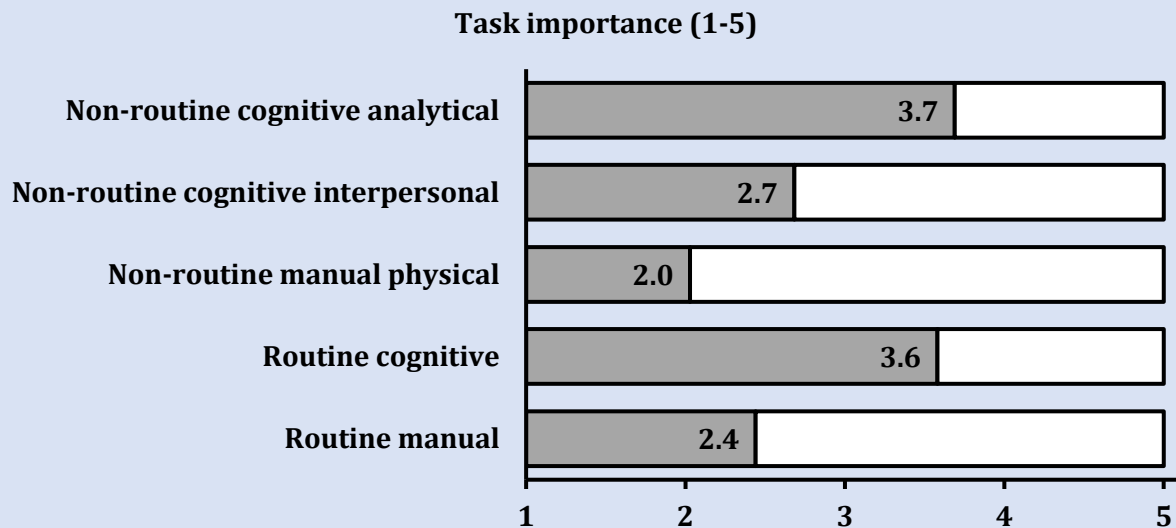
3. Applicants' expected compensation is beyond the market rate

- presence at career fairs, increased use of recruitment firms, etc.)
2. Increasing worker training
 3. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for database engineers.
- ii. Most companies have reported that vacancies within this occupation group are for middle level positions, with the most common time to fill of 4 to 5 months. The minimum qualification requirement that is most commonly reported for this occupation is a bachelor's degree. Some companies have also reported on the preference for graduates in software engineering, computer programming, information technology or computer science.
- iii. The MDEC Digital Talent Report 2017 has highlighted database architects as one of the trending job titles in the industry. It was also foreseen in this report that database architects could be



one of the jobs that is hard to fill in the e-commerce sub-sector. Amongst the database skills shortage highlighted in this report include Microsoft SQL, MySQL and Oracle.

- iv. Further consultation with Malaysia Digital Economy Corporation (MDEC) have also indicated the shortage of machine learning engineers. Companies are resorting to hiring freelancers to fill the gaps.
- v. On the other hand, our consultation with Waste Management Association of Malaysia (WMAM) indicated that structured query language (SQL) database engineers are in shortage in the waste management industry. The industry is looking for candidates with a minimum of 5 years of experience to be able to develop their own pipeline of software developers.
- vi. On the note of automation, only one of the survey respondents has reported the probability of automating the tasks within this occupation in the coming year. MDEC has highlighted that talents would need to keep themselves updated with the changes of the software of their expertise, as there is always something new to learn. Keeping up with the fast pace of the evolvement of skills in digital role has become somewhat essential to stay relevant in the industry. Therefore, it is strongly suggested that this occupation is included in the COL.



Occupation: Systems Administrator

MASCO 2013 (4-Digit Code): 2522

MASCO 2013 (6-Digit Code): 2522-12; 2522-13; 2522-15; 2522-16; 2522-17; 2522-19; 2522-20; 2522-30; 2522-31; 2522-32; 2522-33; 2522-36; 2522-43; 2522-45; 2522-47; 2522-48; 2522-51; 2522-53; 2522-58; 2522-60; 2522-61

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Information Technology Support Officer; Systems Administrator; Information Technology Executive; Project Coordinator (IT); Project Administrator (IT); System Engineer (IT); Technical Specialist (IT); System Support Specialist; Information Systems Maintenance Engineer; Cloud Computing Solution Architect; Web and Mobility Developer; IT Architects; Technical Support Engineer (IT); Integration Technology Specialist; Infrastructure Specialists (IT); Technical Information (Information Scientist); Hardware Design Engineer; IP logic Design Engineer; Information Technology Engineer; Technical System Administrator; BIM Coordinator (Building Information Modelling)

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	28 nominations
Consultation	6 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Troubleshooting
2. Communication Skills
3. English Language

Top Sector:

1. Information and Communication

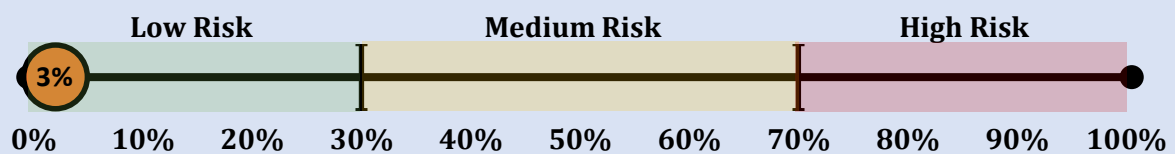
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience
3. Applicants lack the required technical skills

Top Strategies to Meet Shortages:

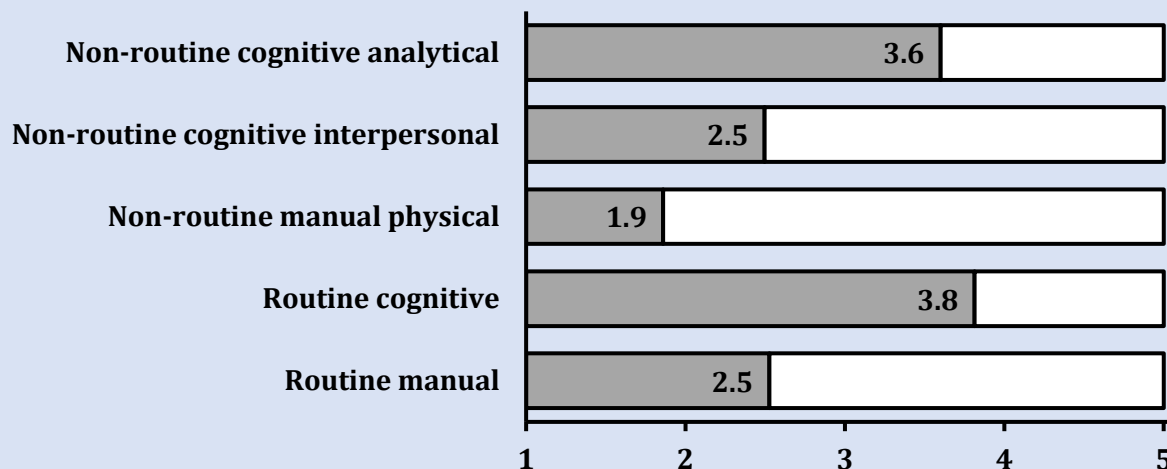
1. Expanding local recruitment efforts
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for system administrators, IT executives and project coordinators.
- The majority of the companies have reported that vacancies within this occupation group are for junior to middle level staffs. The median time to fill reported is between 3 to 6 months.



Companies reported that this occupation has become neither more nor less hard to fill as compared to a year ago.

- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey with background in Electrical Engineering and Computer Engineering majoring in Software Applications. The skills deemed to be important include IT, technical and analytical skills with specific focus on network engineering.
- iv. The Association of Banks Malaysia (ABM) nominated system support specialists and IT architects as critical. For IT architects, skills required include virtualisation, The Open Group Architecture Framework (TOGAF) and Zachman architectural modelling techniques. One of the key players in communication industry emphasised on the need for cloud computing solution architects with technical experience in design, implementation and/or support of Azure or Cloud technologies with strong architectural skills.
- v. The Federation of Malaysian Manufacturers (FMM) stated that there are not enough IP logic design engineers in Malaysia. Thus, companies take longer time to recruit new workers to fill in the position. Additionally, Malaysian Organisation of Pharmaceutical Industries (MOPI) highlighted that integration technology specialists with Tibco software integration skills are critical for the pharmaceutical industry.
- vi. Further, MDEC Digital Talent Report identified project coordinators (IT) and technical support engineers as trending jobs in digital industry.
- vii. This occupation passes the employment growth threshold. Thus, with high nominations of bottom-up evidence and inputs from various industries, we strongly recommend this occupation to be included in the COL.



Occupation: Computer Network Professional

MASCO 2013 (4-Digit Code): 2523

MASCO 2013 (6-Digit Code): 2523-03; 2523-04; 2523-05; 2523-08; 2523-10

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Network Administrator; Network Infrastructure Administrator; Network Engineer; Radio Network Planning Consultant; IT Network System Engineer

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	6 nominations
Consultation	1 nomination
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

- Troubleshooting
- Communication Skills
- Teamwork / Collaboration

Top Sectors:

- Information and Communication
- Human Health and Social Work Activities

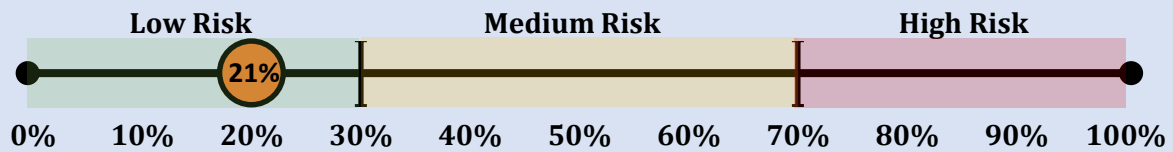
Top Reasons of Hard-to-Fill:

- Applicants lack relevant job experience
- Applicants' expected compensation is beyond the market rate
- Too few applicants or no applicant at all

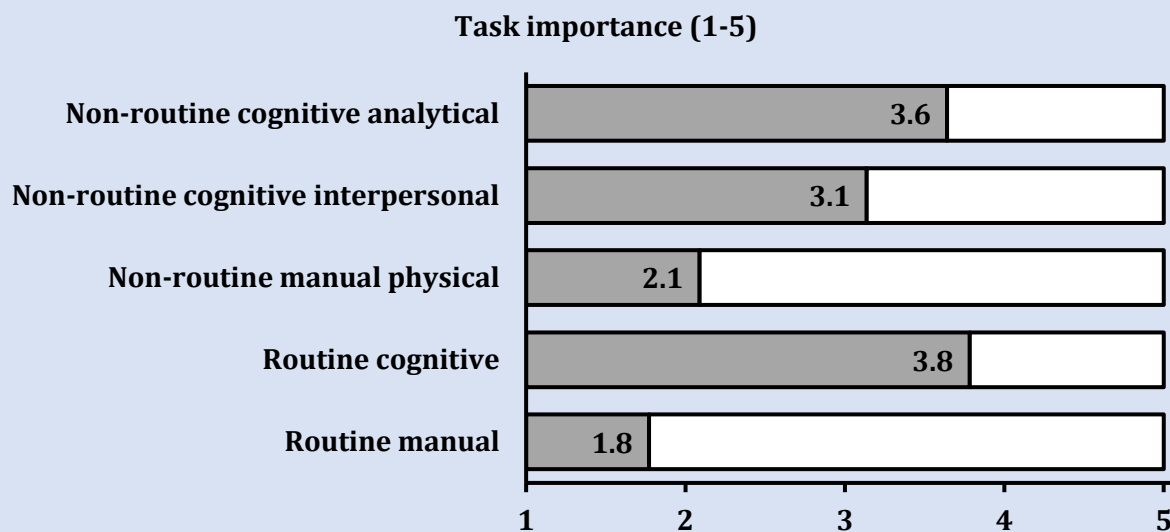
Top Strategies to Meet Shortages:

- Increasing worker training
- Expanding local recruitment efforts
- Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for network engineers and network infrastructure administrators in information and communication sector.
- ii. Most companies have reported that vacancies within this occupation are for junior and middle level positions with a median time to fill of 2 to 3 months. Half of the respondents stated that this occupation is harder to fill while the other half stated that it is less hard to fill as compared to a year ago.
- iii. This occupation requires diploma as the minimum qualification. In addition, CISCO Certified Network Professional (CCNP) certification is preferable for network engineers to qualify for this occupation.
- iv. Companies have cited that the reasons of this occupation being hard to fill are that applicants lack job experience, demand higher salary and that there is an insufficient supply of talent. To this, companies have resorted to increasing the workers' trainings, expanding local recruitment efforts and raising wages as a way of curbing shortages.



- v. The consultation with Malaysia Digital Economy Corporation (MDEC) reiterates the need for network administrators for the digital sub-industry. Talent scarcity is severe since most local talent prefers to work overseas due to attractive salary packages. As a result, there are some difficulties to fill specialised roles. As an alternative, most companies opt to hire freelancers to mitigate the talent shortage. MDEC also shared that majority of the jobs in the industry are software-driven where talent needs to adapt to software changes continuously. Furthermore, MDEC Digital Talent Report stated that this occupation is among the top trending jobs in digital industry.
- vi. The vacancy rate in the top down data shows positive growth for this occupation. Plus, the evidence received from the bottom up findings as well as the report concluded that this occupation is critical and included in the COL.

Occupation: Database and Network Professional Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 2529

MASCO 2013 (6-Digit Code): 2529-01; 2529-02; 2529-03; 2529-04; 2529-06; 2529-07; 2529-09

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Information and Communication Technology Security Executive; Cyber Security Executive; Digital Forensic Specialist; Security Specialist (IT); IT Security Architect; Application Security Specialist; Network Penetration Tester

This occupation appears on COL:

2015	Yes	2017	No
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	5 nominations
Consultation	10 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. Information Security
3. English Language

Top Sectors:

1. Information and Communication
2. Financial and Insurance/Takaful Activities
3. Transportation and Storage

Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all

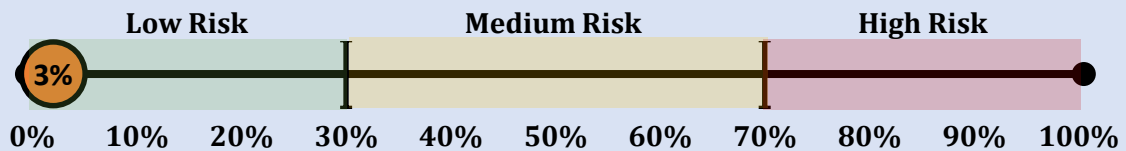
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Hiring temporary or contract workers

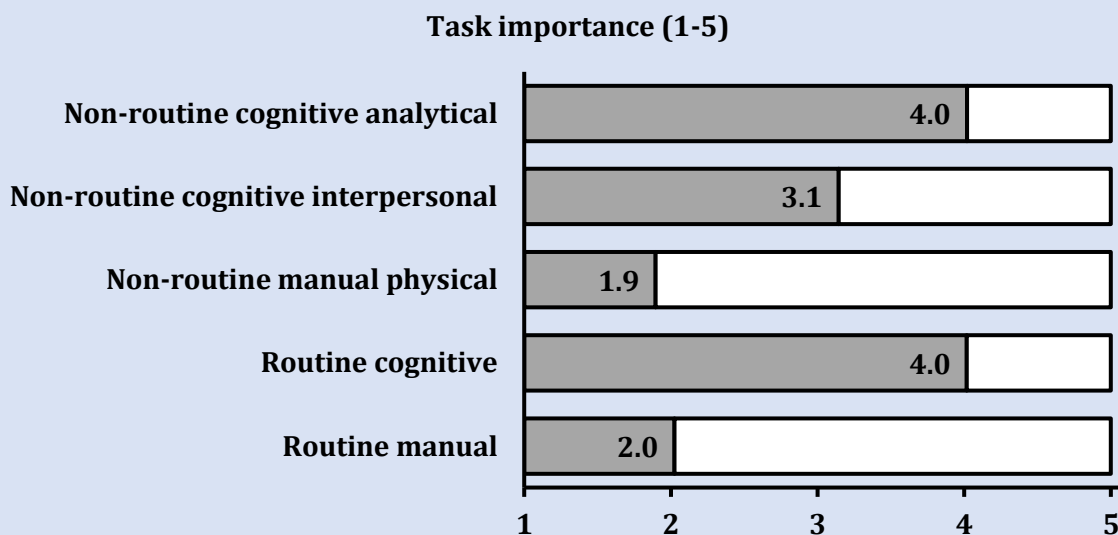
- 2. We cannot afford to pay the market rate for the applicants
- 3. Applicants' expected compensation is beyond the market rate

3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for security specialists (IT).
- ii. Companies have reported that vacancies within this occupation group are from junior to senior level positions. Companies have also stated that the main reasons this occupation is hard-to-fill are that there are too few or no applicants, companies cannot afford to pay market rate for applicants and that applicants' expected compensation is beyond the market rate. The most common time to fill for this occupation is within 2 to 3 months. In addition, most companies have reported that this occupation has become neither more nor less hard to fill as compared to a year ago.



- iii. A minimum of a bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. To address the current shortage of this occupation, none of the respondents have reported hiring less well qualified workers. Instead, companies have resorted to increasing workers' training, hiring temporary contract workers and expanding local recruitment efforts.
- iv. The MDEC Digital Talent Report has highlighted security specialists (IT) as one of the top digital jobs in the industry as well as one of the jobs that might be difficult to fill in 2020. Security specialists (IT) are expected to be needed especially in cloud or datacentre focus areas.
- v. The Association of Banks Malaysia (ABM) shares the concern over the need for security specialists (IT) and also IT security architects. They have pointed out that there are less candidates with Cisco Certified Internetwork Expert (CCIE) certification which is crucial to the bank support system to manage firewall and network security issues. Talents with CCIE certification are needed with 2 years or more of experience, while talents with Cisco Certified Network Professional (CCNP) certification are needed with 5 years or more of experience. To cope with current shortages, banks are having more in-house learnings and getting candidates to take up the abovementioned certifications to improve their skills.
- vi. From our consultation with the Life Insurance Association of Malaysia (LIAM), they have nominated for security specialists (IT) and digital forensic specialists to be critical. Both occupations are in need of talents at managerial level. For security specialists (IT), there are not enough applicants and compensation for this talent is beyond market rate due to high market demand. The need for digital forensic specialists with new skillsets is high. The compensation for such talents, according to LIAM, has increased significantly due to demand from other sectors as well. Talents are required to have experience in digital areas. To curb current shortages, companies are engaging with head-hunters and are upskilling employees from different business units to take on these digital roles.
- vii. From another consultation with Malaysia Digital Economy Corporation (MDEC), they have indicated the need for IT security architects, security specialists (IT), network penetration testers, digital forensic specialists, information and communication technology security executives and cyber security executives. MDEC has highlighted that there is scarcity of talents while the ones with qualified skills usually prefer to work overseas for better salary. MDEC has also named other job titles that are deemed to be critical, such as ethical hackers and cyber threat investigators. They have also reported that freelancing has become an alternative for the companies to fill the gaps of those talents.
- viii. Top-down evidence shows that there is increase in number of vacancies and vacancy rate. Despite low number of nominations from our Call-for-Evidence (CfE) survey, there are strong additional inputs through consultations and the criticality of this occupation is further supported by a talent report within the digital industry. Hence, this occupation is included in the COL.



Occupation: Civil Engineering Technician

MASCO 2013 (4-Digit Code): 3112

MASCO 2013 (6-Digit Code): 3112-04; 3112-05; 3112-08; 3112-09; 3112-12; 3112-15; 3112-17; 3112-21; 3112-22; 3112-35

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Industrial Instrument Technician; Civil Engineering Technician; Clerk-Of-Work; Technician; Engineering Designer; Building Inspector; Fire Inspector; Process Instrument Technician; Test Technician; Assistant Engineer
---	---

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	22 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

- Troubleshooting
- English Language
- Communication Skills

Top Sectors:

- Manufacturing
- Construction
- Other Service Activities

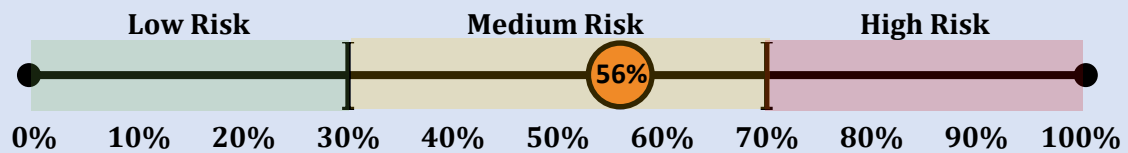
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Too few applicants or no applicant at all
3. Applicants' expected compensation is beyond the market rate

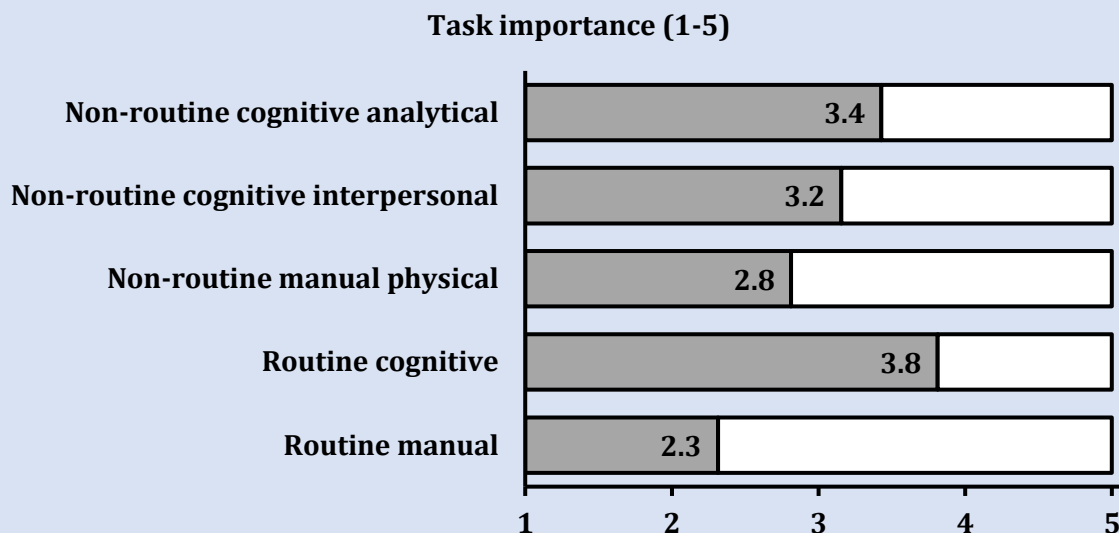
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Expanding local recruitment efforts
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for technicians.
- The majority of companies have reported that vacancies within this occupation group are for entry to middle level positions. In addition, applicants lack relevant technical skills, too few or no applicants and applicants' expected compensation is beyond market rate are the most-cited reasons behind the occupation being hard-to-fill. The most common time to fill for this occupation is reported to be 2 to 3 months. In addition, half of the respondents cited this occupation has become harder to fill while another half cited neither more nor less hard to fill as compared to a year ago.



- iii. A minimum of a diploma in Mechanical or Civil Engineering is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Some respondents have also cited candidates with Sijil Kemahiran Malaysia (SKM) is desired to fit for this occupation.
- iv. Further input from the consultation with Machinery & Engineering Industries Federation (MEIF) highlighted that assistant engineers are critical in the machinery and equipment industry. Currently, the industry does not have suitable experienced candidates to fill in the job. The members of the MEIF also emphasised that there is a need to educate fresh TVET graduates to follow the path that they have learned during the training institutions.
- v. Meanwhile Malaysia Retail Chain Association (MRCA) highlighted that the candidates for this occupation is in shortage due to the lack of required skills, which is in line with the responses of most companies in the CfE survey. To address the shortage, MRCA has resorted to increase salary, certify supervisors, multitask roles for employees, encourage overtime and collaborate with other industry players to craft relevant syllabus and training modules. They also cited that automation is seen in the food and beverages (F&B) manufacturing, which would impact technicians' role.
- vi. Based on the consultation with member companies of the Free Industrial Zone, Penang, Companies' Association (FREPENCA), the industry is lacking engineering designers with at least 5 to 8 years of experience in machine design. This would cause delay in the manufacturing process.
- vii. Machinery Equipment and Advanced Engineering (Phase 2) and Professional Services Activities Environmental Scan indicated that this occupation is critical to the respective sub-sectors. The top factors influencing hiring difficulties for the positions highlighted in this report are the lack of technical skills and competencies among the talent pool, followed by the lack of specialised knowledge required by position and low salaries.
- viii. This occupation passes the employment growth, wage premium growth and number of vacancies threshold in the top-down data. With the strong bottom-up evidence from 2 environmental scan reports, we believe that this does point to a shortage, therefore this occupation is included in the COL.



Occupation: Electrical Engineering Technician

MASCO 2013 (4-Digit Code): 3113

MASCO 2013 (6-Digit Code): 3113-02; 3113-04; 3113-05; 3113-06; 3113-07; 3113-14; 3113-15; 3113-17

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Electrical Engineering Technician; High Voltage Electrical Engineering Technician; Electrical Engineering Assistant; Electrical Technical Assistant; Electrical Supervisor; Electrical Technician; Electrical High Voltage Technician; Assistant Electrical Engineer
---	--

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	12 nominations
Consultation	7 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Electrical and Electronics Environmental Scan Medical Devices Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Preventive Maintenance
3. Wiring

Top Sectors:

1. Manufacturing
2. Information and Communication
3. Administrative and Support Service Activities

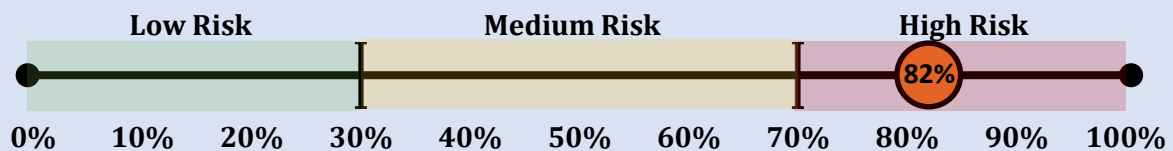
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical or occupational skills
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

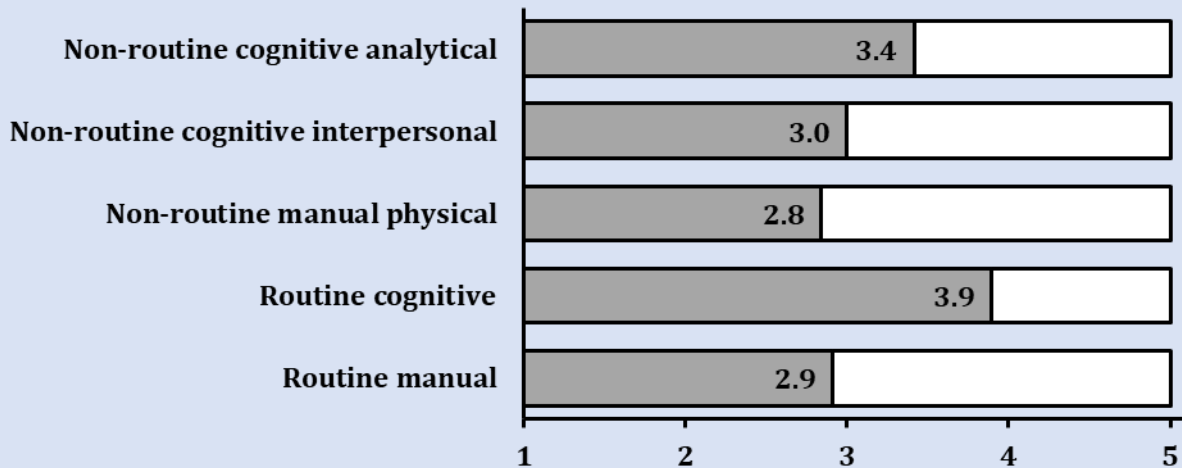
1. Increasing worker training
2. Increasing worker hours or overtime
3. Automating tasks performed in this occupation

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for electrical technicians and electrical engineering technicians.

- ii. The majority of companies have reported that vacancies within this occupation group are for all staff level with median time to fill of 2 to 3 months. The minimum qualification needed for this occupation is a diploma, preferably in Electrical, Electronic, Mechanical, Mechatronic as well as Electrical & Electronic Engineering fields.
- iii. The Call-for-Evidence (CfE) survey shows that many companies are experiencing shortage for this occupation mostly due to applicants' lack of relevant job experience, lack of required technical skills, and lack the required credentials. For these very reasons, companies have resorted to increasing worker training and initiating partnerships with education or training providers. Input from Electrical and Electronics Environmental Scan indicated that this occupation is critical to the light-emitting diode (LED) sub-sector. According to the report, most companies reported that minimum qualification required for electrical engineering technicians is Sijil Kemahiran Malaysia (SKM) 1 to 2. Additionally, Medical Devices Environmental Scan have also noted that this occupation is highly sought-after and hard-to-fill in the surgical/medical gloves sub-sector.
- iv. From the consultation conducted with the Machinery & Engineering Industries Federation (MEIF), their main concern is to get candidate with sufficient required skills and experience for this occupation. This in turn has forced some companies to adopt skill shifting whereby technicians are required to take up engineers' tasks to compensate the shortage. This is however unsustainable as technicians grow to become pressured, feeling overworked, underpaid, and eventually decide to leave. In this regard, MEIF is in the opinion that upskilling courses need to be made available by the government and for talent to expose themselves more to the upskilling route. The impact of automation according to MEIF varies depending on the nature of sectors. Traditional roles might be replaced but automation is expected to create new jobs such as artificial intelligence (AI) technicians, AI engineers, and robotic engineers.
- v. Further inputs were gathered from the Malaysian Association of Amusement Themepark & Family Attractions (MAATFA). As Malaysia gears up to become the theme park capital of ASEAN, Malaysia is expected to have more than 20 theme parks and water parks, combined, by 2020. In correlation to this development, park operators would adapt to new trends and advancement of technologies, further increasing the demand for this occupation along the way. For MAATFA, the issue of shortage in this occupation relates mostly to the inability to get talent that could adapt to the unique and specific task required for theme parks' equipment. On automation, MAATFA highlighted that the increase in Virtual Reality (VR) incorporated attractions have increase the demand for this occupation to handle this new development.
- vi. Another input was gathered through a consultation with the Free Industrial Zone, Penang, Companies' Association (FREPENCA). The association highlighted that there is not enough candidate with related design background to fill in this occupation. In result of this, on of the member companies of FREPENCA specified Electrical – Field Programmable Gate Array (FGPA) in design environment as niche skill needed for this occupation. Consistent with the evidence gathered, this occupation is included in the COL.

Occupation: Mechanical Engineering Technician

MASCO 2013 (4-Digit Code): 3115

MASCO 2013 (6-Digit Code): 3115-06; 3115-07; 3115-08; 3115-10; 3115-16; 3115-17; 3115-20; 3115-23; 3115-24; 3115-26; 3115-27; 3115-29; 3115-30; 3115-34; 3115-35; 3115-39; 3115-40; 3115-42; 3115-46; 3115-49

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Mechanical Engineering Technician; Mechanical Engineering Technician (Industrial Machinery and Tools); Mechanical Engineering Technician (Motors and Engines); Mechanical Engineering Technician (Instruments); Mechanical Engineering Assistant; Mechanical Engineering Estimator; Marine Engineering Technician; Hydraulic Hose Technician; Test Technician (Mechanical); Mechatronics Technician; Machine Technician; CNC Technician; Welding Technician; Mechanical Technician; CNC Supervisor; Assistant Mechatronic Engineer; CAD/CAM Technician; Rope Access Technician; Autocad Drafter; Pneumatic Supervisor

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	34 nominations
Consultation	13 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Maritime (Shipbuilding and Ship Repair) Environmental Scan Electrical and Electronics Environmental Scan Medical Devices Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No

Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	Yes	NA	NA	

Occupation Overview:

Top Skills:

1. Troubleshooting
2. Preventive Maintenance
3. English Language

Top Sectors:

1. Manufacturing
2. Construction
3. Professional, Scientific and Technical Activities

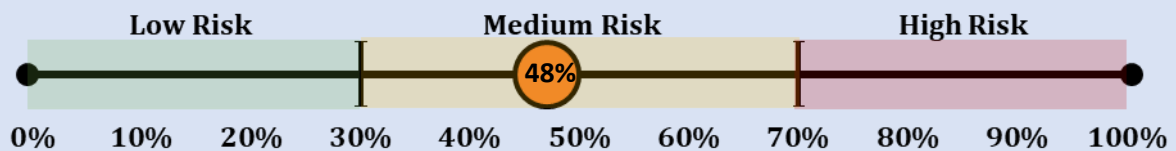
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants lack relevant job experience
3. Too few applicants or no applicant at all

Top Strategies to Meet Shortages:

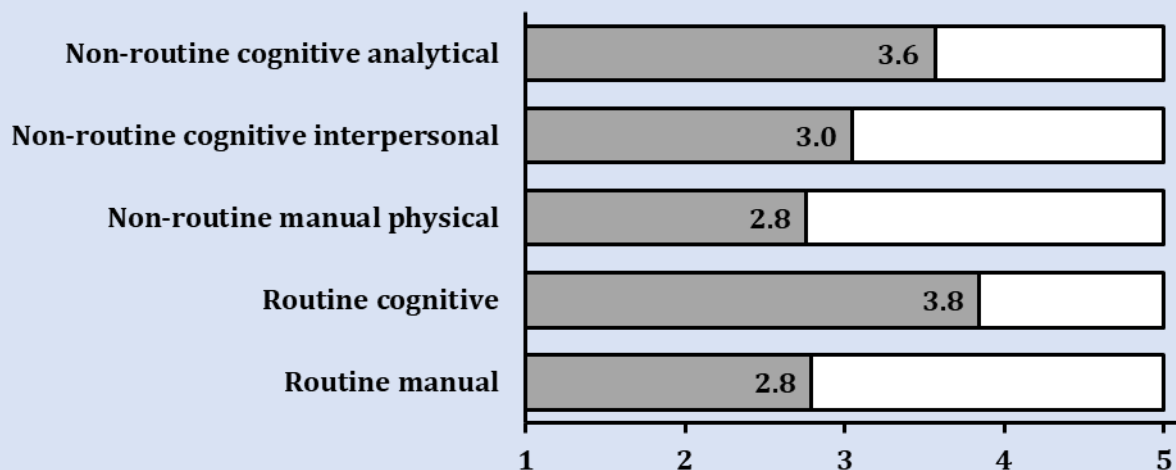
1. Increasing worker training
2. Increasing worker hours or overtime
3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for machine technicians and mechanical engineering technicians.
- ii. Most companies have reported that vacancies within this occupation group are for junior to middle level positions. Given so, the minimum qualification requirement is mostly reported to be a diploma. The most common time taken to fill positions for this occupation is reported to be 2 to 3 months. Majority of the companies have also found this occupation to be harder to fill as compared to a year ago. Some respondents also require certain certificates such as Sijil Kemahiran Malaysia (SKM) 3 or other certifications related to metal.
- iii. The Maritime (Shipbuilding and Ship Repair) Environmental Scan has listed marine engineering technicians as one of the top hard-to-fill positions in the ship repair sub-sector. On the other hand, mechanical engineering technicians was listed in the Electrical and Electronics Environmental Scan, for industrial electronics sub-sector, and in the Medical Devices Environmental Scan, for surgical/medical gloves as well as non-consumables sub-sectors.
- iv. From a focus group discussion with Machinery & Engineering Industries Federation (MEIF), they have nominated a number of occupations to be hard-to-fill in the industry. They include CNC supervisors, CNC technicians, hydraulic hose technicians, pneumatic supervisors, mechanical engineering assistants, mechanical technicians, assistant mechatronic engineers and mechatronic technicians. Some of the main issues highlighted for jobs such as CNC supervisors, hydraulic hose technicians and pneumatic supervisors are that there are not enough trainings. There is also, still, the stigma of these jobs being 'dirty, dangerous and demeaning' or more widely known as 3D jobs. Some companies also face difficulties in bearing training costs for these jobs. As a result, the job scope cannot evolve much and existing talents do not have enough skills to handle machines. The rest of the occupations nominated by MEIF are hard-to-fill as candidates lack the relevant combined skillsets. Even when they are hired, time and costs need to be invested in retraining them.
- v. In a consultation with the Malaysian Association of Amusement Themepark & Family Attractions (MAATFA), they have mentioned on the difficulty of finding mechanical technicians with a minimum of one-year relevant experience that is related to the role. The Institute of Engineers Malaysia (IEM), in addition, has nominated for mechanical engineering technicians to be critical. Diploma or Degree in Engineering (Civil), Engineering (Mechanical), Engineering (Mechatronic/Electromechanical) were cited as the preferred minimum qualification for this role. The difficulty in hiring mechanical engineering technicians is also affected by the factor of skill gap. Apart from technical skills and knowledge, weak communication skills is also an issue.



- vi. One of the member companies of the Free Industrial Zone, Penang, Companies' Association (FREPENCA) has highlighted the difficulty in hiring CAD/CAM technicians who has the knowledge on the software used by the company, firm grasp in mathematics, engineering and industry information as well as has relevant work experience. Candidates would need a minimum of a bachelor's degree in Engineering Computer Aided Design & Computer Aided Manufacturing (CAD/CAM). Master Builders Association Malaysia (MBAM), on the other hand, has nominated for autoCAD drafters to be critical. Even with a minimum qualification requirement of a Sijil Pelajaran Malaysia (SPM), companies find it difficult to attract local talents into the industry.
- vii. On the matter of automation, only a quarter of respondents mentioned a likelihood to automate tasks within this occupation in the coming year. And this is mostly for job titles such as machine technicians. MEIF has highlighted that disruption in the industry depends on job roles and subsector natures. Sectors that are labour intensive such as construction, would highly unlikely be adopting automation. However, talents would still need to keep upskilling themselves with new skillsets that will be in demand with the rise of technological advancements such as the Artificial Intelligence (AI).
- viii. Therefore, on the basis of combined strength of evidences from top-down data that suggests an increase in vacancy and wage for this occupation and elaborate bottom-up evidences, this occupation is included in the COL.



Occupation: Physical and Engineering Science Technicians Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 3119

MASCO 2013 (6-Digit Code): 3119-08; 3119-20; 3119-24; 3119-27; 3119-31; 3119-34; 3119-36; 3119-56; 3119-58; 3119-60; 3119-61

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Methods Engineering Technician; Robotics Technician; Maintenance Technician; Quality Control Technician; Industrial Technician; Production Technician; Moulding Technician; Waste Water Technician; Painting Technician; PLC Assistant Engineer; Tooling Technician

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 12 indicators
Bottom-up CfE survey	29 nominations
Consultation	5 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2)

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

- Troubleshooting
- Quality Assurance and Control
- English Language

Top Sectors:

- Manufacturing
- Agriculture, Forestry and Fishing
- Mining and Quarrying

Top Reasons of Hard-to-Fill:

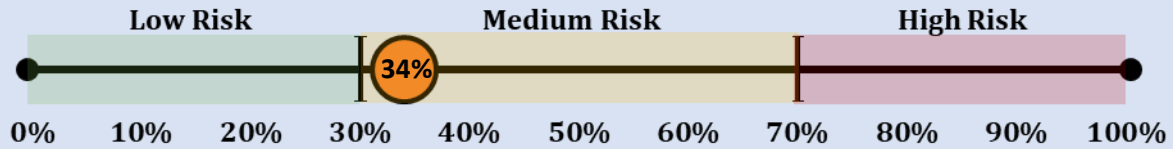
- Applicants lack the required technical skills

Top Strategies to Meet Shortages:

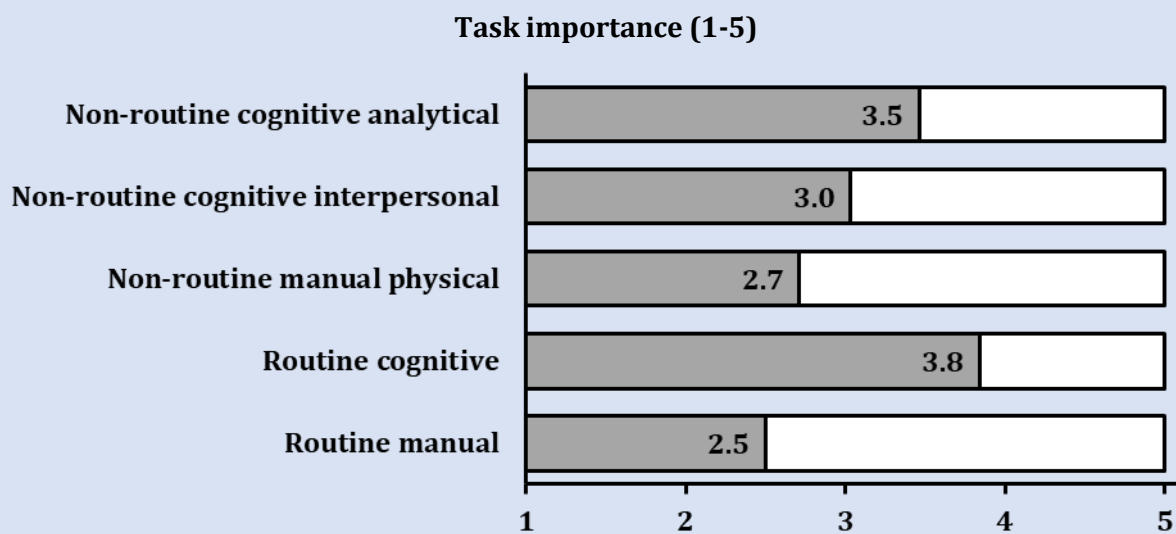
- Raising wages

- | | |
|--|--|
| 2. Applicants lack relevant job experience | 2. Increasing worker training |
| 3. Too few applicants or no applicant at all | 3. Hiring less well qualified applicants |

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for maintenance and moulding technicians.
- ii. The majority of companies have reported that vacancies within this occupation group are diversified between entry, junior and middle level positions with a median time to fill of 2 to 3 months. Most of the companies reported that this occupation is neither more nor less hard to fill as compared to a year ago.
- iii. Most respondents reported that applicants do not need any particular certifications to qualify for this occupation. However, a diploma is set as favourable requirement. Some of the respondents require special course in Engineering while some prefer candidates who have relevant working experience.



- iv. Consultation with Machinery & Engineering Industries Federation (MEIF) suggests that this occupation is crucial for the business operation of the heavy machine industries due to inevitable technological change as part of industry natural progression. MEIF stated that this occupation requires practical learning and to some extent experienced workers, however, the curriculums in the education and training centres are mostly theoretical, hence causing misalignments with practical and hands-on tasks. MEIF also stated that this occupation is not favourable by local applicants and is perceived as dirty and difficult work.
- v. Malaysian Plastic Manufacturers Associations (MPMA) stated during consultation that technicians are highly demanded in the plastic industry but the local supply of talent especially ones who are experienced, possess creative and innovative skills are not enough to cater the demand by companies. Hence, some companies resorted to either hiring foreign workers or hiring fresh graduates or less qualified applicants. MPMA also stated that most technicians are hired from Industrial Training Institutes (ILPs), however, most of the graduates are not well equipped in practical knowledge of the plastics industry due to the strict regulations of ILPs 5 year-cycle of curriculum revision and outdated machines. To some extent, MPMA has engaged with certain relevant representatives from industry, PETRONAS and Human Resources Development Fund (HRDF) to create and certify courses relevant to plastics industry which these courses mainly adapted from German training module.
- vi. Consistent with the claim from two consultations above, analysis from Call-for-Evidence (CfE) survey showed that applicants lack the required technical skills and job experience as well as too few applicants are the main reasons this occupation is hard to fill. Thus, companies have resorted to raising wage, increasing the workers' training and hiring less well qualified applicants to tackle shortage.
- vii. The top down indicators - growth in premium wage and high job vacancies posts - combined with strong nominations from bottom up evidence and stakeholders' consultations suggest a very strong evidence that this occupation is significant to be included in the COL.



Occupation: Manufacturing Supervisor

MASCO 2013 (4-Digit Code): 3122

MASCO 2013 (6-Digit Code): 3122-01; 3122-02; 3122-04; 3122-07; 3122-09; 3122-11; 3122-15; 3122-16; 3122-21; 3122-22

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Manufacturing Supervisor; Production Supervisor; Packaging Supervisor; Cutting Supervisor; Plywood Inspection Supervisor; Chief Hookman Supervisor; Quality Control Supervisor; Quality Controller; Technical Supervisor; Non-Destructive Testing (NDT) Inspector
---	---

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	28 nominations
Consultation	1 nomination
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan Medical Devices Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Technical and analytical skills
2. Problem solving
3. Communication skills

Top Sectors:

1. Manufacturing
2. Agriculture, Forestry and Fishing
3. Construction

Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience

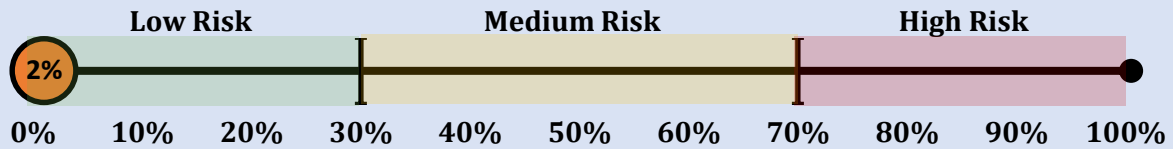
Top Strategies to Meet Shortages:

1. Raising wages

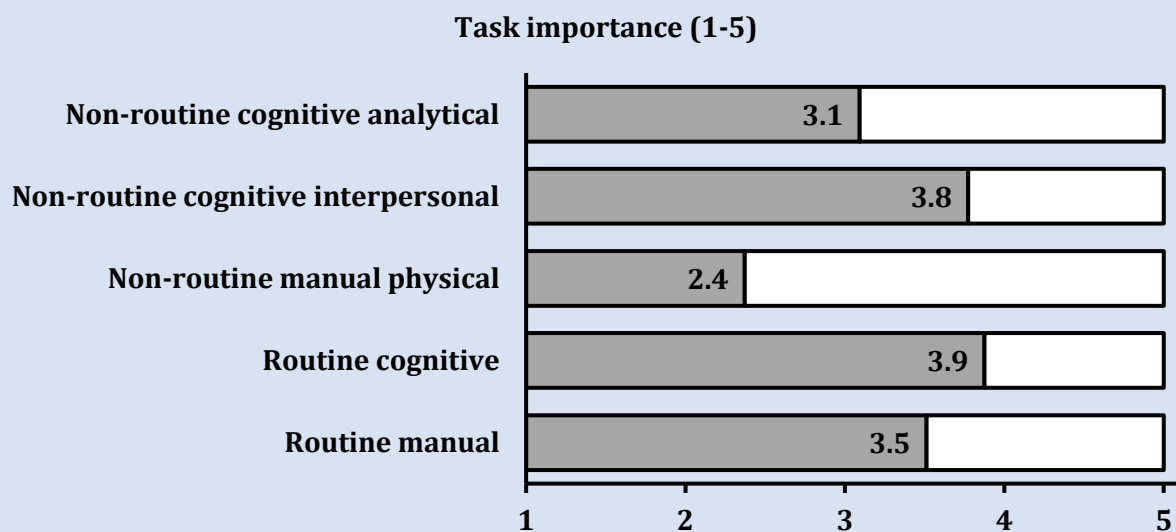
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

2. Hiring less well qualified applicants
3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for production supervisors, manufacturing supervisors and non-destructive testing (NDT) inspectors.
- ii. Companies have reported that vacancies within this occupation group are for junior or middle level candidates with at least 5 years of working experience. The median time to fill for this occupation is reported to be 2 to 3 months. In addition, more than half of respondents found this occupation has become neither more nor less and harder to fill compared to last year, as there are extreme cases of companies taking 5 to 6 and more than 6 months to fill up vacancies.
- iii. A minimum of diploma is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Applicants with advanced diploma or bachelor's degree or who have strong relevant industrial experience with a minimum of Sijil Pelajaran Malaysia (SPM) are also preferred. This is also supported by the top-down evidence where there is reduction in employer requirements for education.

- iv. Additionally, some relevant job experience, qualifications or skills are needed for the particular occupations by respective industries. For example, companies highlighted a need for:
 - a) Quality control supervisor with bachelor's degree in quantity surveying
 - b) Manufacturing supervisor who well equipped with plastic injection moulding knowledge
 - c) Production supervisor with a minimum of diploma in food technology or pharmacy
 - d) Production supervisor who have solid sewing skill experience
 - e) Sawmill supervisor with strong sawmilling operation experience
- v. Moreover, the soft skills believed to be important by companies include leadership, teamwork, communication skills and problem-solving aptitudes.
- vi. The Medical Devices Environmental Scan reported that employers in medical non-consumables segment faced difficulties in hiring manufacturing supervisors and indicates this occupation as critical for their operation and business growth.
- vii. The Chemical and Petrochemical Environmental Scan also cited that manufacturing supervisors are in high demand at plastic products and rubber products sub-industry. The average time taken to fill the vacancies varies between 4 to 24 months.
- viii. Consultation with Master Builders Association Malaysia (MBAM) provided additional evidence, indicating that experienced non-destructive testing (NDT) inspectors are hard to fill and highly sought-after, even if they only have a minimum of qualification of SPM. This is due to the lack of local talents willing to work in this industry and not many want to pick up this occupation as a profession. The shortage was initially filled mainly by migrant workers especially from India, Bangladesh, Bhutan, Nepal and Indonesia. Thus, MBAM opined that Government should recognize certain category of vocational professions and skills required to enter the workforce. Furthermore, Government also must formulate practical and yet holistic policy to handle the workforce within this occupation for the benefit of the industry.
- ix. Besides that, MBAM have collaborated with polytechnics through some programs to give hands-on exposure to students before they graduate. MBAM also suggested that universities should also be pro-active in engaging industry so they can prepare graduates with the skills and knowledge needed for the job market. This is because collaboration between companies and education institutions is a key to supply skilled workers in the market.
- x. Top-Down evidence indicates there are growth in employment and wage premium, in which implies that there is a demand to hire skilled and experience workers for this occupation. This is relatively consistent with respondents' strategy to address this shortage via raising wages and expanding local recruitment efforts respectively. Even so, some companies have resorted to hiring less well qualified workers. Plus, considering high number of nominations from the bottom-up evidence as well as significant additional input from consultation and 2 environmental scan studies that points to a shortage, it provides strong justification for the inclusion of this occupation in the COL.



Occupation: Construction Supervisor

MASCO 2013 (4-Digit Code): 3123

MASCO 2013 (6-Digit Code): 3123-01; 3123-03; 3123-04; 3123-05; 3123-06

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Operation Supervisor; Construction Supervisor; Site Supervisor; Site Coordinator; Site Safety Supervisor

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 1 out of 12 indicators
Bottom-up CfE survey	19 nominations
Consultation	-
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

- Supervisory Skills
- Communication Skills
- Leadership Skills

Top Sectors:

- Construction
- Professional, Scientific and Technical Activities
- Administrative and Support Service Activities

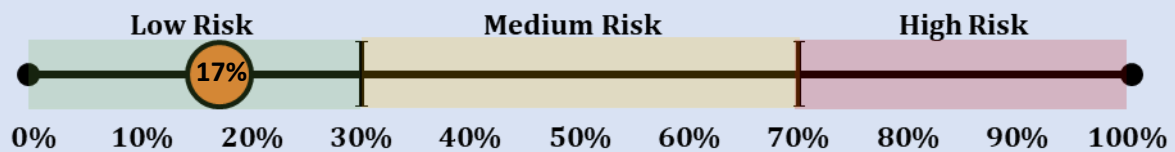
Top Reasons of Hard-to-Fill:

- Applicants lack relevant job experience
- Applicants lack the required technical skills
- Applicants lack other required skills

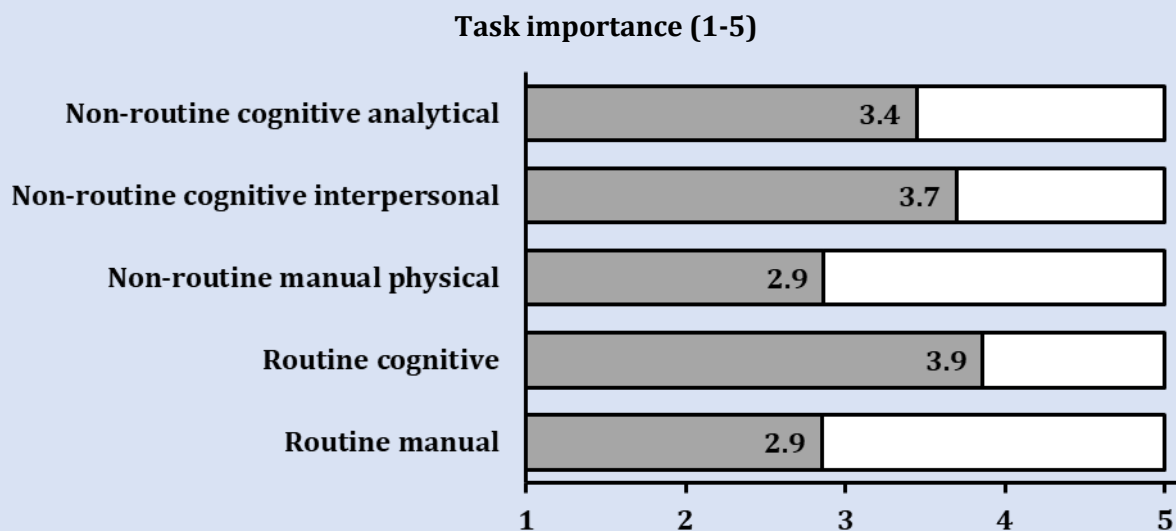
Top Strategies to Meet Shortages:

- Raising wages
- Increasing worker training
- Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for site supervisors.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior level positions with the most common time to fill of 2 to 3 months. Most companies require a minimum of diploma. Job such as site safety supervisors requires candidates who have attended the Site Safety Supervisor course.
- iii. According to the Department of Occupational Safety and Health (DOSH), there is only 5,478 site safety supervisors registered, which is not at par with the 28,292 registered projects in Malaysia. Construction Industry Development Board (CIDB) Malaysia, on the other hand, has highlighted that construction supervisors are also in demand within the building, civil engineering, electric and mechanical subsectors.



- iv. As some of the top reasons that contributes to the hiring difficulty for this occupation is that applicants lack relevant job experience and required technical skills, it is fitting that most companies choose to increase workers' training. Moreover, top-down evidence shows that there is wage premium growth which is in line with respondents' top strategy, raising wages.
- v. A validation with Master Builders Association Malaysia (MBAM) was done and it was highlighted that it is a requirement by law for all construction site supervisors to be accredited under the Clause 33A of the CIDB Act 520 (Amendment 2011). They have to go through certain methods for certification namely training, assessment or interview based on their years of experience. In view of this requirement by law, some companies would probably prefer to hire those who are already certified by CIDB to fill in the vacancies.
- vi. On the matter of automation, most respondents have mentioned that it is unlikely that they will be automating tasks within this occupation in the next year. Considering strong bottom-up evidences, this occupation is included in the COL.



Occupation: Other Supervisor Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 3129

MASCO 2013 (6-Digit Code): 3129-04; 3129-05; 3129-06; 3129-07; 3129-13; 3129-16

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Supervisor; Logistics Supervisor; Store Supervisor; Shift Supervisor; Assistant Supervisor; Delivery Supervisor

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 5 out of 12 indicators
Bottom-up CfE survey	9 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2)

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills and English Language
2. Microsoft Office

Top Sector:

1. Manufacturing

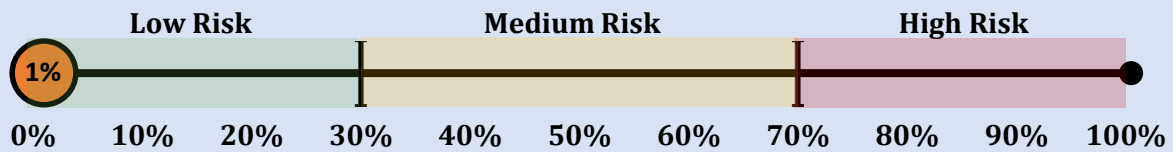
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience
3. Applicants' expected compensation is beyond the market rate

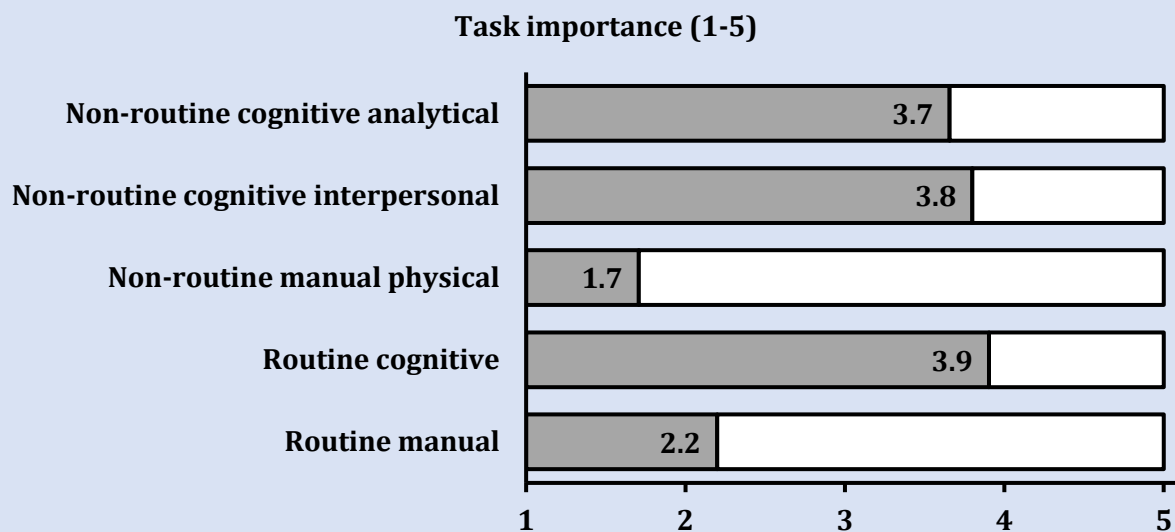
Top Strategies to Meet Shortages:

1. Raising wages
2. Hiring less well qualified applicants
3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for supervisors.
- ii. Most of the companies have reported that vacancies within this occupation group are for junior level. The median time to fill reported is between 3 to 6 months. In addition, companies reported that this occupation has become harder to fill as compared to a year ago.
- iii. A minimum of Sijil Pelajaran Malaysia (SPM) and below with relevant working experiences is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey.
- iv. Based on the consultation with Federation of Malaysian Freight Forwarders (FMFF), the industry is facing difficulties to find candidates with relevant exposure and knowledge to meet the job requirements. Additionally, there is a misperception of the working hours in the industry which has hindered applicants to apply for the job. As a result, logistics industry serves as the last resort for job applications. In the context of automation, processes such as clearance, shipping, booking as well as delivery are being conducted through an online system. Thus, this occupation is also suggested to be equipped with related IT skills.



- v. The Malaysian Retail Chain Association (MRCA) has also shared that there is difficulty in hiring store supervisors in the industry. With technology disruption trends in the industry such as big data, E-payment and analytics, this occupation is also expected to be prepared with suitable skills to improve supervision role.
- vi. The Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) have cited few occupations such as fabrication supervisors, fabrication supervisors (pressurised equipment), senior welding inspectors and welding coordinators to be critical in both machinery and equipment (M&E) and engineering supporting industry (ESI).
- vii. Based on the evidences above, this occupation is deemed to be critical in different industries. Plus, it passes the employment growth threshold in the top-down evidence. Therefore, this occupation is included in the COL.



Occupation: Commercial Sales Agent

MASCO 2013 (4-Digit Code): 3322

MASCO 2013 (6-Digit Code): 3322-01; 3322-04; 3322-05; 3322-07; 3322-09; 3322-11; 3322-13; 3322-14; 3322-15; 3322-20; 3322-22; 3322-23; 3322-28; 3322-30; 3322-34; 3322-35

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Salesperson; Sales Representative; Salesperson (Travel); Engineering Sales Agent; Technical Adviser; Salesperson (Business Services Advertising); Sales Executive; Marketing Executive; Business Development Executive; Pre-Sales Support; Salesperson (Car); Salesperson (Motor Vehicle); Sales Engineer; Technical Sales Engineer; Assistant Marketing Officer; Digital Marketing Executive

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	36 nominations
Consultation	5 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Sales Goals
2. English and Communication Skills
3. Building Effective Relationships

Top Sectors:

1. Manufacturing
2. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
3. Administrative and Support Service Activities

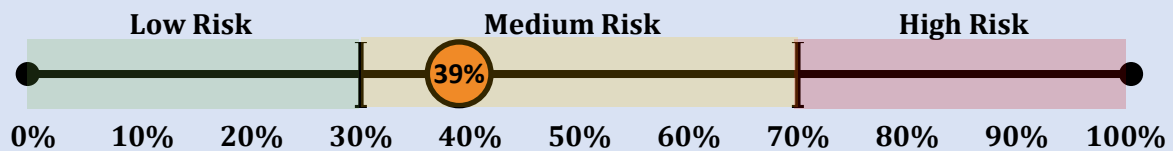
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Too few applicants or no applicant at all
3. Applicants lack the required technical skills

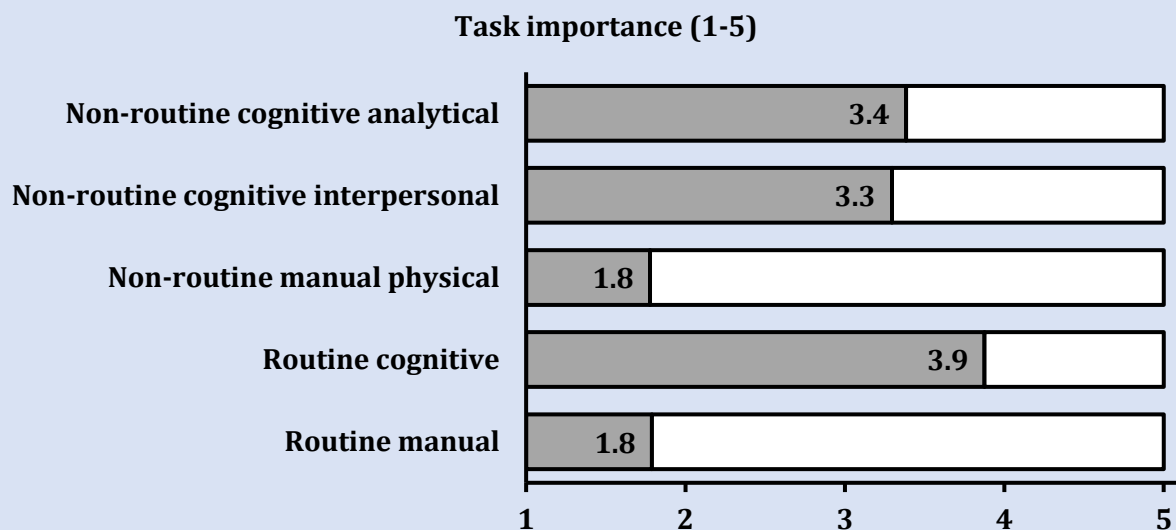
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Increasing worker training
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for salespersons, sales executives, digital marketing executives and technical sales engineers.
- ii. Companies have reported that vacancies within this occupation group are for entry-level to senior positions, but the highest number of companies report for roles at junior levels of 2 to 5 years of working experience. The most common time to fill for this occupation is reported to be 2 to 3 months, although some companies also reported longer time to fill, such as 4 to 6 months and more than 6 months. In addition to this, respondents are split in their assessment of this occupation is neither more nor less hard or harder to fill than a year ago.

- iii. Most positions require a bachelor's degree, however a significant number of companies reported open positions requiring a diploma or below. Two companies also reported that they prefer candidates who are software certified and from mechanical engineering majoring in sales management background for digital marketing executives and engineering sales agents respectively.
- iv. The skills deemed by companies to be most important are soft skills such as communication skills, teamwork and problem-solving abilities. Additionally, some of the specific skills cited include good presentation skills, design, strategic planning to secure tender, marketing skills as well as have an excellent knowledge in the nature of the respective businesses. Not to mention, talents with strong technical, analytical and IT skills are also preferred, especially for the digital and technical positions.
- v. Through our consultation with Malaysia Retail Chain Association (MRCA), they highlighted that sales representatives and sales executives are highly in demand in the retail industry, where small and medium enterprises (SMEs) are always facing employment challenges. Besides that, Malaysian Association of Amusement Theme Park & Family Attractions (MAATFA) also stated that experienced sales & promotion assistants are sought after, specifically talents with good language and sales skills. These occupations are essential for the sustainable business development in that particular industry.
- vi. Further input from Life Insurance Association of Malaysia (LIAM) mentioned there is a shortage of experienced and high performing candidates for business development executives with the right skillsets in the market, e.g. perseverance, target driven, strong business acumen, persuasion and influencing skills as well as willing to travel for work. Furthermore, digital marketing executives are also sought after in the insurance activities sector. This is a new skillset that is of high demand and compensation for such talents has increased significantly due to the demands from various sectors.
- vii. Therefore, with the high number of nominations across a wide array of job titles under this occupation from 12 sectors and supported by strong evidence from industry associations points to a widespread of shortage, it provides strong justification of the inclusion of this occupation in the COL.



Occupation: Buyer

MASCO 2013 (4-Digit Code): 3323

MASCO 2013 (6-Digit Code): 3323-02; 3323-04; 3323-06; 3323-07; 3323-08; 3323-10

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Purchasing Executive; Buyer; Production Purchasing; Procurement Executive; Purchasing Agent; Procurement Officer; Purchasing Merchandiser

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 7 out of 10 indicators
Bottom-up CfE survey	11 nominations
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	Yes	Yes	Yes	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	Yes	Yes	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Communication Skills
3. Planning

Top Sectors:

1. Manufacturing
2. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
3. Mining and Quarrying

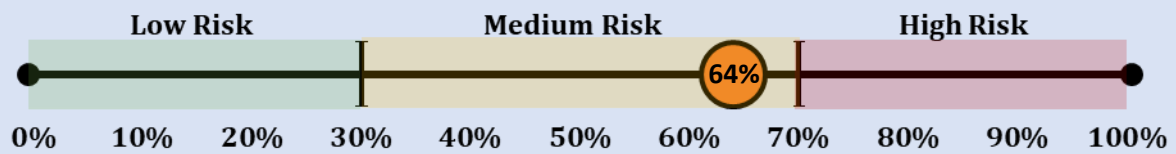
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants lack relevant job experience
3. Too few applicants or no applicant at all

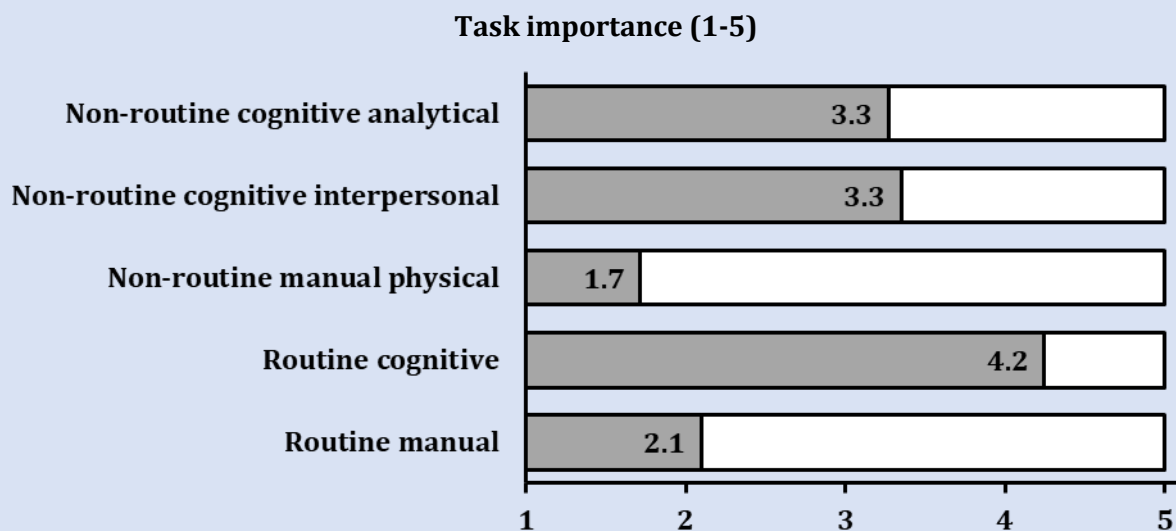
Top Strategies to Meet Shortages:

1. Hiring less well qualified applicants
2. Expanding local recruitment efforts
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for purchasing merchandisers and purchasing executives.
- ii. The majority of companies have reported that vacancies within this occupation group are for entry to junior level positions with the most common time to fill of 2 to 3 months. Most respondents have also reported to require a minimum qualification of a diploma and a bachelor's degree for this occupation.
- iii. Despite applicants lacking the required technical skills being one of the top reasons this occupation is hard to fill, companies have also highlighted soft skills such as communication and problem-solving abilities as some of the top skills for this occupation. The technical skills include analytical skills.



- iv. The Malaysian Retail Chain Association (MRCA) have also cited purchasing managers to be critical. According to MRCA, there is an expectation gap between employers and applicants in terms of salary and wages. Hence employers are adopting various methods to meet the demand such as increasing salary, workers' training as well as the current workers' working hours. Most respondents from our survey has implied that the occupation is not likely to be automated in the coming year. However, MRCA has highlighted that automation is usually seen in manufacturing of food and beverages and not so much in the front line. They have also described the technological disruption trends that are happening within the retail industry, for example, the adoption of big data, usage of e-payment services and analytics, especially for online businesses.
- v. In addition, Malaysian Knitting Manufacturers Association (MKMA) has highlighted that the difficulty to get suitable talent depends on the position. For some positions it is still possible to find talents amongst fresh graduates and give them on the job training. However, jobs such as purchasing merchandisers are considered critical as candidates would need some industrial knowledge and skills to fulfil customers' need.
- vi. Malaysian Association of Hotels (MAH), has added that buyers are specialised positions that are not produced directly through tertiary education process. In the hotel industry, the requirement is often a mixture of hospitality background with familiarity in finance or accounting. They have highlighted that this position is critical due to lack of supply in the market. The Malaysian Textile and Apparel Centre (MATAC) and Malaysian Textile Manufacturers Association (MTMA) further added that positions such as buyers and purchasing merchandisers are considered critical as it is difficult to find candidates with experience.
- vii. On another consultation with one of the large companies in the information and communication sector, they have cited that procurement officers with more than 3 years working experience are most sought-after. There is also an increased demand for talents with digital skills.
- viii. Top-down evidence points towards shortage as there is increase in working hour, vacancies and employment. Hence, on the basis of strong bottom up evidences supported by top-down evidences, this occupation is included in the COL.



Occupation: Metal Moulder and Coremaker

MASCO 2013 (4-Digit Code): 7211

MASCO 2013 (6-Digit Code): 7211-02; 7211-05; 7211-10

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Mould Maker; Moulder (Metal); Moulder

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	6 nominations
Consultation	3 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Troubleshooting
2. Microsoft Excel
3. Communication skills

Top Sector:

1. Manufacturing

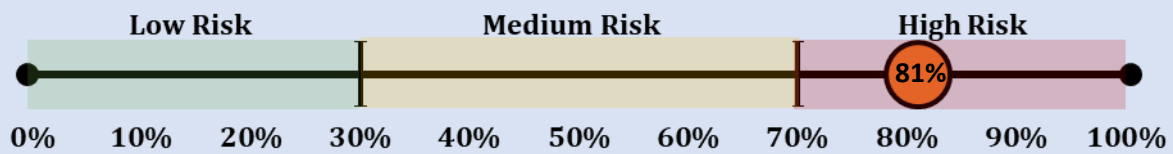
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills
2. Applicants lack relevant job experience
3. Too few applicants or no applicant at all

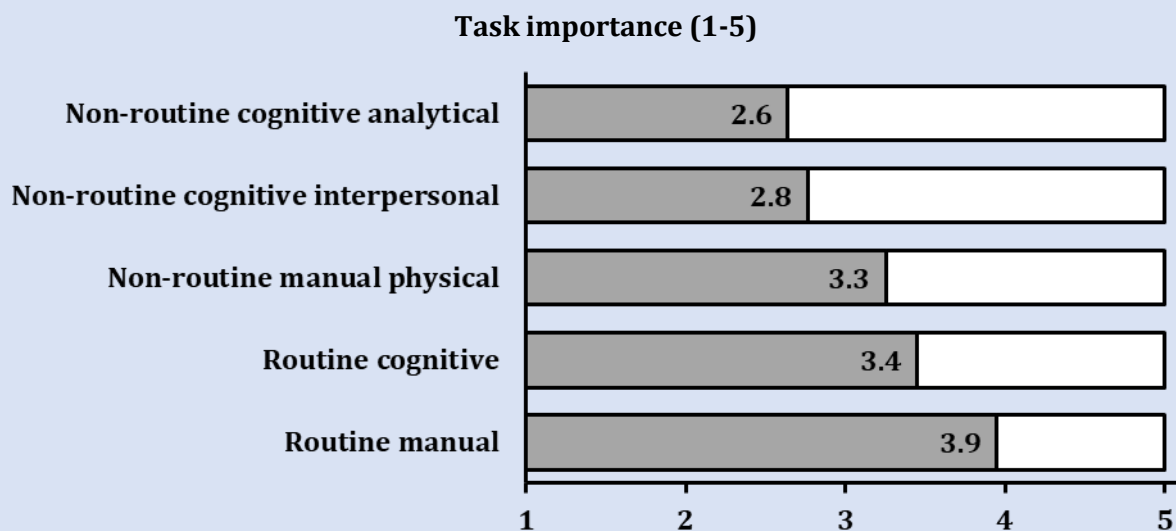
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Raising wages
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for moulders, mould makers and metal moulders.
- ii. The majority of companies have reported that vacancies within this occupation group are for mid-level to senior staff with a median time to fill of 2 to 3 months. Some cases take even up to 6 months to fill vacancies. Most respondents also found this occupation to be harder to fill as compared to a year ago.
- iii. Majority of respondents have reported that a minimum of diploma is required for this occupation. Some also require talents to have specific certificate in moulding and tooling. Other than technical skills such as analytical skills, soft skills such as team work and problem-solving abilities were also identified by companies in our survey.



- iv. Through a focus group discussion that we had with the Machinery & Engineering Industries Federation (MEIF); it is understood that special tooling (mould) maker is sought-after. The issue with finding this talent revolves around the lack of interest within candidates. There is also the factor of time where talents would need to go through a long journey of on the job or hands-on training to master or pick up relevant skills. For this reason, MEIF has suggested for TVET career paths to be made more widely known amongst talents so as to set the right expectation when joining the industry. Most respondents in our survey has claimed that this occupation is not highly likely to be automated in the coming year. To this MEIF has added that despite automation taking places in very specific roles, the industry as a whole is definitely gearing up for adoption of technological advancements such as Artificial Intelligence (AI).
- v. Further validation with Machinery and Equipment Manufacturers Association (MEMA) suggests that this occupation is critical to the industry because it is not easy to find successors in the field. As the sector moves towards advanced manufacturing technologies, candidates are required to perform tasks more accurately. Many firms within the industry stated that positions related to mould & die are critical as not many people have the relevant skills required. Federation of Malaysian Manufacturers (FMM) has also highlighted that this occupation is critical and has suggested that more students should be encouraged to take up vocational courses and be trained for these professions.
- vi. Malaysian Special Tooling and Machining Association (MSTMA), in addition, has highlighted that demand is exceeding supply, causing acute shortage in the market. TVET graduates are yet to match labour market requirement. Shortage of qualified personnel that have high skill sets and experience is also a common problem faced by the industry. On top of that, there is still the stigma of this occupation being one of the '3D' jobs because of low wages as well as no interest amongst talents, making it difficult to find talented candidate to work in the industry.
- vii. Despite insufficient top-down data, strong bottom-up evidences point toward a widespread shortage throughout the industry. Thus, this gives strong justification for the inclusion of this occupation in the COL.



Occupation: Toolmaker and Related Worker

MASCO 2013 (4-Digit Code): 7222

MASCO 2013 (6-Digit Code): 7222-03; 7222-04

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Tool and Die Maker; Pattern-Maker (Metal Foundry)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	5 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2)

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	Yes	No	

Occupation Overview:

Top Skills:

- Troubleshooting
- Machining
- Metal Manufacturing

Top Sectors:

- Manufacturing

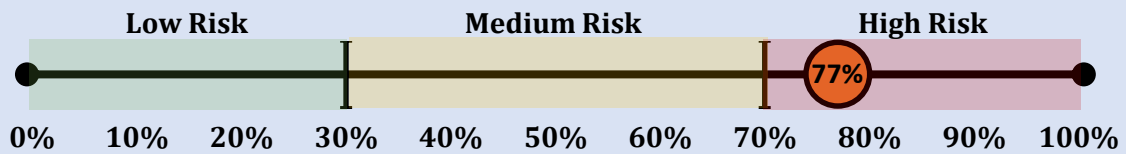
Top Reasons of Hard-to-Fill:

- Applicants lack the required technical skills
- Too few applicants or no applicant at all
- Applicants lack relevant job experience

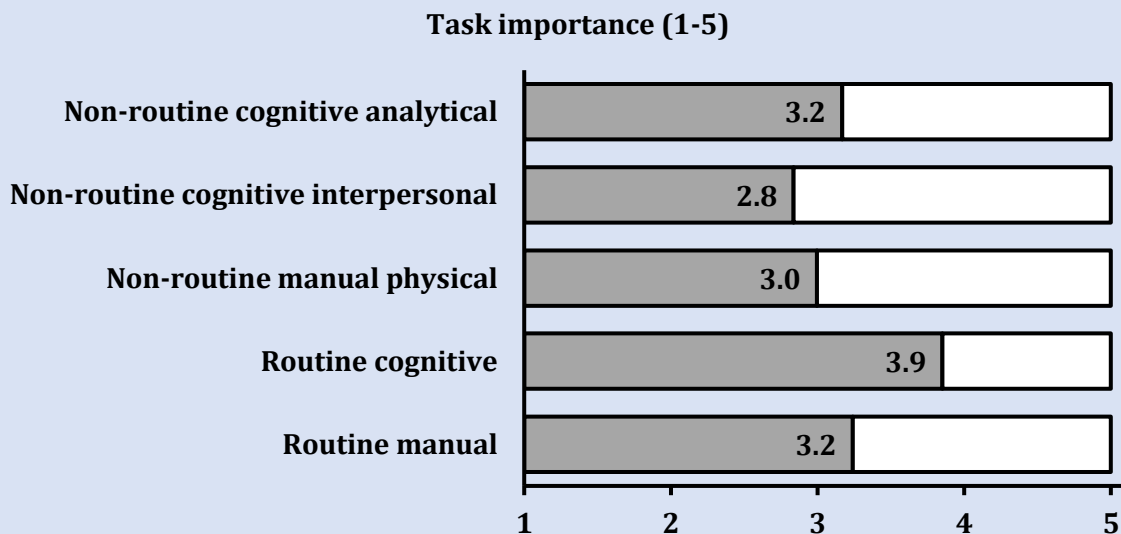
Top Strategies to Meet Shortages:

- Raising wages
- Automating tasks
- Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for tool and die makers.
- ii. The majority of companies have reported that vacancies within this occupation are across all levels from entry to senior level of working experience. In addition, applicants lack the required technical skills and relevant job experience as well as too few or no applicants are the most-cited reasons behind the occupation being hard-to-fill. The most common time taken to fill for this occupation has been reported to be within 2 to 3 months. Companies have also reported that this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. A minimum of a diploma is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. In addition to this, Machinery & Engineering Industries Federation (MEIF) highlighted the need for Malaysian Skills Certification (SKM) Level 2 for this job.



- iv. To address shortage for this occupation, most respondents have reported automating tasks performed in this occupation. The companies have also resorted to hiring less well qualified applicants, raising wages, and increasing workers' training.
- v. The Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) cited tool and die maker as a critical occupation for engineering supporting industry (ESI). The report also highlights that key challenges faced by companies in recruitment are the lack of technical skills/competencies among the talent pool, the small supply pool of talent and the highly specialised knowledge for both M&E and ESI sectors.
- vi. Consultation with Machinery & Engineering Industries Federation (MEIF) indicated that candidates' lack of interests and the long journey to pick up all the relevant skills have consequently led to this occupation to be harder to fill within this industry.
- vii. Meanwhile, the Free Industrial Zone, Penang, Companies' Association (FREPENCA) highlighted that there is scarcity of candidates with extensive hands-on experience in high quality plastic tooling, and with people management and leadership skills. FREPENCA also highlighted that at least 7 years of working experience in injection moulding, including validation (Installation Qualification, Operational Qualification and Performance Qualification) are preferred. In addressing the shortage in the long run, FREPENCA proposes the inclusion of plastic injection moulding module into the academic curriculum of technical schools.
- viii. From the top down results, this occupation passes the overall shortage threshold. This occupation is included in the COL because it has sufficient bottom-up evidence along with supporting input from environmental scan and industrial associations which does point a widespread shortage.



Occupation: Agricultural and Industrial Machinery Mechanics and Repairer

MASCO 2013 (4-Digit Code): 7233

MASCO 2013 (6-Digit Code): 7233-01; 7233-02; 7233-03; 7233-04; 7233-05; 7233-14; 7233-15

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Machinery Mechanic; Mining Machinery Mechanic; Mechanic (Machine-Tool); Mechanic (Industrial Machinery); Mechanic (Plant Maintenance); Industrial Machinist; CNC Machinist

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	20 nominations
Consultation	1 nomination
Talent/Skills studies	<ul style="list-style-type: none"> Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2)

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Technical Skills
2. Numeracy Skills
3. Teamwork

Top Sector:

1. Manufacturing

Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills

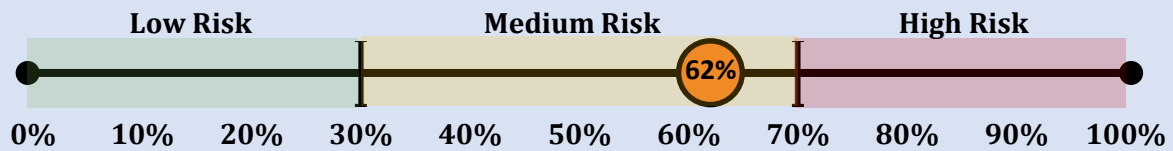
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Increasing worker training

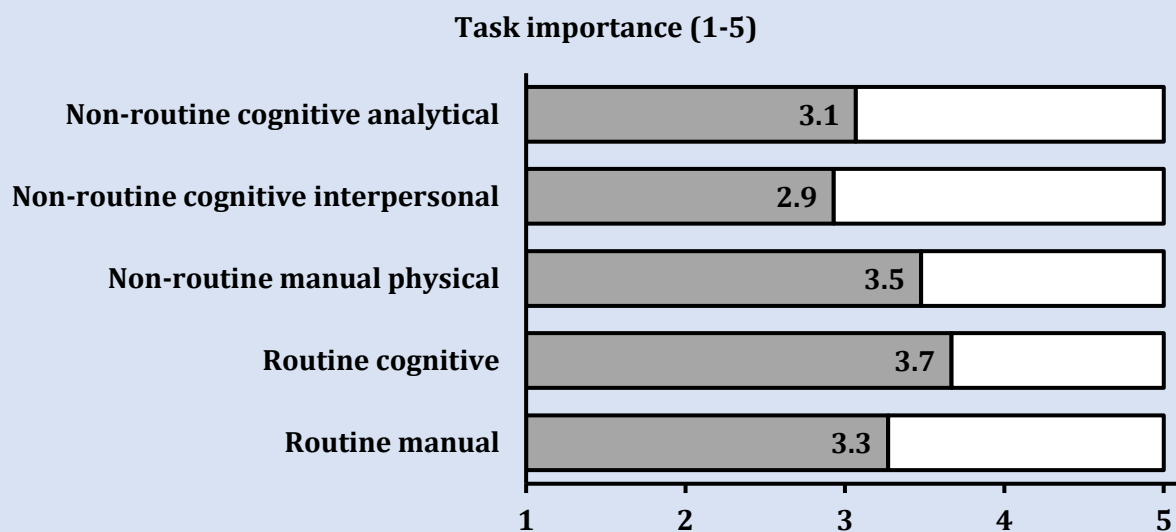
3. Applicants lack relevant job experience

3. Increasing worker hours or overtime

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for CNC machinists.
- ii. Most of the companies have reported that vacancies within this occupation group are for junior level positions with most common time to fill between 2 to 3 months, though there are also some cases take up to 6 months to fill. Companies reported that this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. A minimum of a diploma or Sijil Pelajaran Malaysia (SPM) is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. In addition to this, Sijil Kemahiran Malaysia (SKM) with specific module on technical drawing and machine operating is required to qualify as industrial machinists.



- iv. The Machinery & Engineering Industries Federation (MEIF) highlighted that CNC machinists are critical for the industry. According to some members of the MEIF, current TVET fresh graduates related to this field are not well hands on with the CNC machines used in the industry. Thus, it is suggested for the candidates to possess at least SKM level 2 to fit for this occupation.
- v. The Machinery Equipment and Advanced Engineering Environmental Scan (Phase 2) have cited that this occupation (e.g. CNC machinists, CNC technicians) is highly sought-after and hard-to-fill in the machinery and equipment sub-sector.
- vi. Although there is insufficient data in the top-down evidence, strong nominations of bottom-up evidence with input from the key stakeholder as well as environmental scan study signify the criticality of this occupation. Therefore, we recommend for this occupation to be included in the COL.



Occupation: Electrical Mechanic and Fitter

MASCO 2013 (4-Digit Code): 7412

MASCO 2013 (6-Digit Code): 7412-04; 7412-05; 7412-07; 7412-09; 7412-10; 7412-14; 7412-16; 7412-23; 7412-25; 7412-26; 7412-27

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

High Voltage Restriction Chargeman; Electrical Fitter; Wireman; Foreman (Electrical), Foreman (Maintenance); Maintenance Fitter; Vehicle (Electrician); Chargeman; AO Chargeman; BO Chargeman; Electrical Wireman

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	36 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Maritime (Shipbuilding and Ship Repair) Environmental Scan Chemical and Petrochemical Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	NA	NA	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	Yes	No	

Occupation Overview:

Top Skills:

- Troubleshooting
- English Language
- Wiring

Top Sector:

- Manufacturing

Top Reasons of Hard-to-Fill:

- Too few applicants or no applicant at all

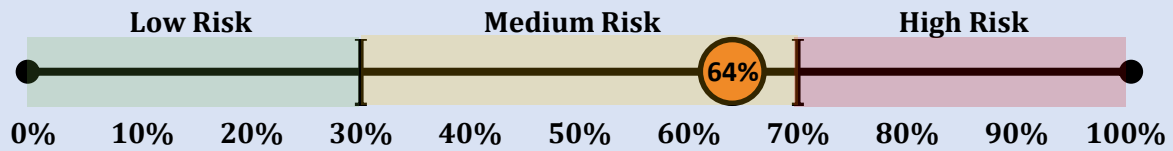
Top Strategies to Meet Shortages:

- Expanding local recruitment efforts

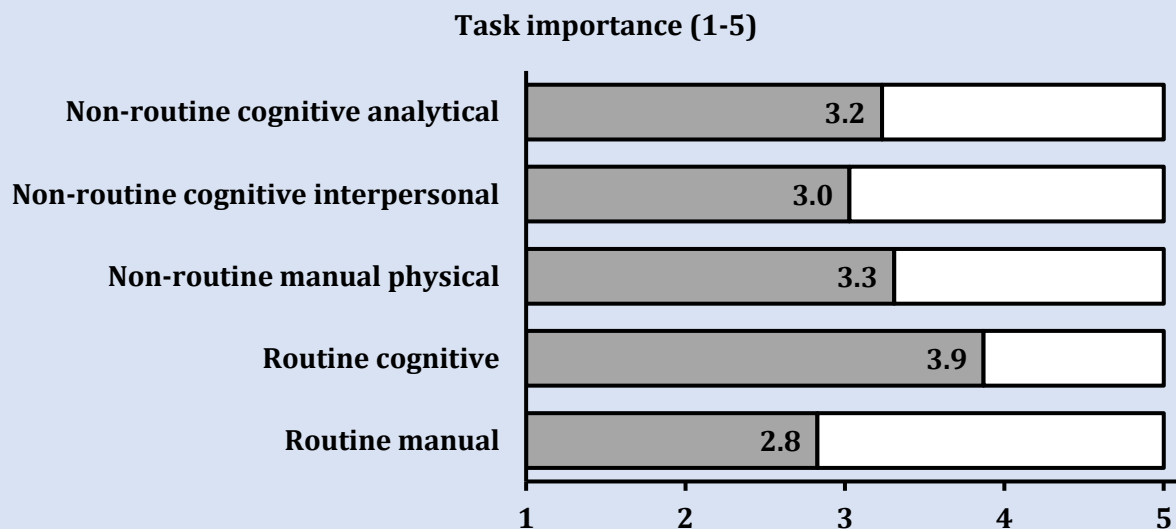
2. Applicants lack the required technical skills
3. Applicants lack the required credentials or certification

2. Raising wages
3. Hiring temporary or contract workers

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for chagemen and wiremen.
- ii. Majority of the companies have reported that vacancies within this occupation group are for entry to junior level staffs with median time to fill reported is between 2 to 3 months, though there are some cases take up more than 6 months to fill. Some companies reported that this occupation has become neither more nor less hard to fill, while a significant number of companies have also reported that this occupation has become harder to fill as compared to a year ago.
- iii. A minimum of a diploma is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Apart from that, most companies have emphasised the need for experienced certified chagemen with certification from the Energy Commission such as:



- a) PJ1, PJ2, PJ32, PJ3 and PJ4 certificates for low voltage system chargemen (Categories AO, A1, A4-2, A4-1 and A4)
 - b) PJ52, PJ5, PJ6, PJ7, PJ8 certificates for high voltage system chargemen (Categories BO-2, BO-1, BO, B1 and B4)
- iv. According to Master Builders Association Malaysia (MBAM), the local workforce in this occupation is not willing to enter the industry due to the nature of the work environment. Furthermore, Department of Occupational Safety and Health (DOSH) also highlighted that there is not enough competent workforce with the right skills and experiences to fit for this occupation.
- v. The Maritime (Shipbuilding and Ship Repair) Environmental Scan has cited that ship electricians are critical in the ship building sub-sector. In addition, high voltage restriction chargemen are critical in the chemical, petrochemical, oleochemical, and plastic products sub-industries as highlighted in the Chemical and Petrochemical Environmental Scan.
- vi. With strong nominations of bottom-up evidence at 39, and inputs from the environmental scan studies as well as key stakeholders from various industries, there is a widespread of shortage for this occupation. Therefore, this occupation is included in the COL.



Occupation: Steam Engine and Boiler Operator

MASCO 2013 (4-Digit Code): 8182

MASCO 2013 (6-Digit Code): 8182-01; 8182-02; 8182-08; 8182-09

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Plant Operator Grade H11; Boilerman; Boilerman Grade K2; Engine Driver

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 10 indicators
Bottom-up CfE survey	18 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	Yes	

Occupation Overview:

Top Skills:

1. English Language
2. Preventive Maintenance
3. Water Treatment

Top Sectors:

1. Manufacturing
2. Electricity, Gas, Steam and Air Conditioning Supply
3. Construction

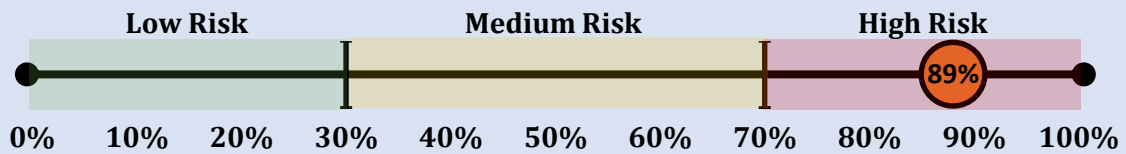
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills
3. Applicants lack relevant job experience

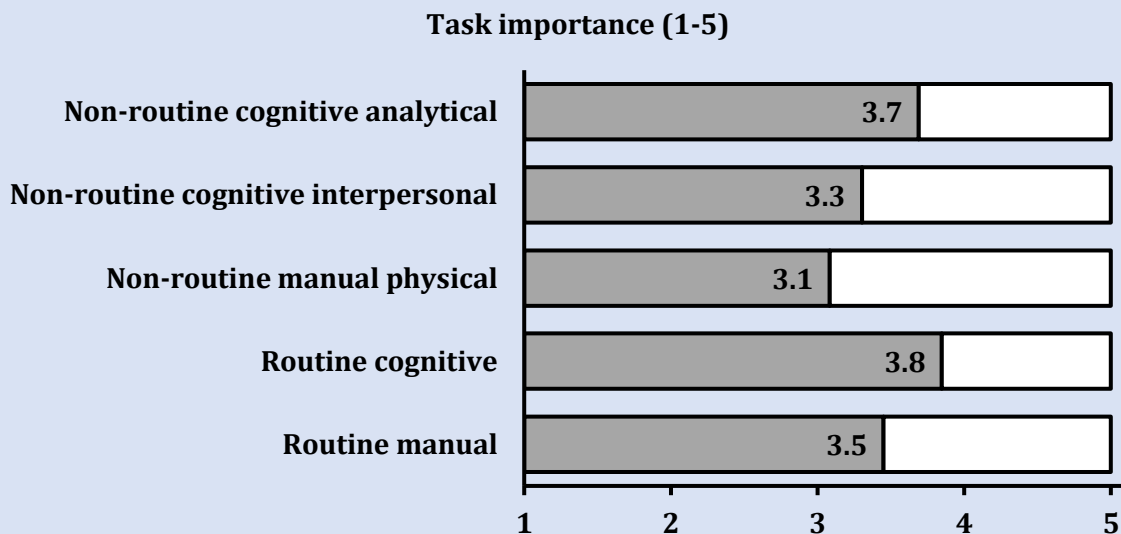
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Raising wages
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for boilermen.
- ii. Companies have reported that most vacancies within this occupation group are for junior to middle level positions. The most common time to fill for this occupation is 2 to 3 months and majority of companies found this occupation to be harder to fill as compared to a year ago. Lack of applicants, applicants lack required technical skills and relevant job experience are the most-cited reasons behind the occupation being hard-to-fill.
- iii. A minimum qualification of Sijil Pelajaran Malaysia (SPM) is required for most vacancies listed by respondents in our Call-for-Evidence (CfE) survey. In addition to this, respondents have highlighted that applicants would need certain particular certifications to qualify for this occupation, such as Boilerman Grade 1 and Steam Engine Driver Grade 1 certifications from Department of Occupational Safety and Health (DOSH).



- iv. Companies have resorted to expanding local recruitment efforts, raising wages, hiring less qualified applicants and increasing workers training to address the shortage of this occupation.
- v. Federation of Malaysian Manufacturers (FMM) have pointed out that this occupation is critical. They suggest that more encouragement should be given to SPM school leavers to pursue vocational studies in these areas or have more vocational schools/institutions to collaborate with vocational stakeholders from Japan and European countries to train these students to address this shortage.
- vi. Malaysian Palm Oil Board (MPOB) cited that the industry is facing employment issues mostly due to the salary offered being too low despite the fact that the nature of this job is harsh and dangerous. This caused labour shortage in the industry and companies resorted to employ foreign workers. They have also highlighted that applicants need to have at least a diploma and get certified as boilerman from the Department of Occupational Safety and Health (DOSH).
- vii. This occupation did not pass the top-down shortage overall threshold. However, with high nominations and additional input from associations, we believe that this does point to a widespread shortage. Thus, this occupation is included in the COL.



Occupation: Stationary Plant and Machine Operator Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 8189

MASCO 2013 (6-Digit Code): 8189-01; 8189-02; 8189-03; 8189-04; 8189-10

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Machine Operator; Production Operator; Equipment & Machine Operator; Heavy Machinery Operator; Line Leader

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 5 out of 12 indicators
Bottom-up CfE survey	33 nominations
Consultation	2 nominations
Talent/Skills studies	-

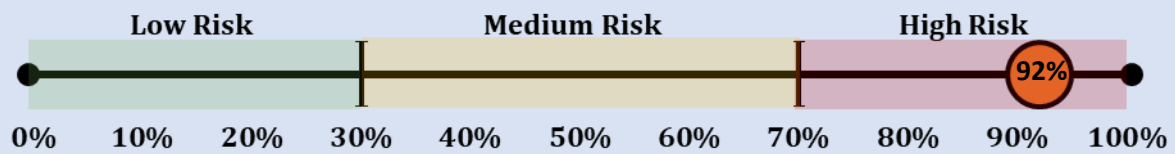
Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	No	

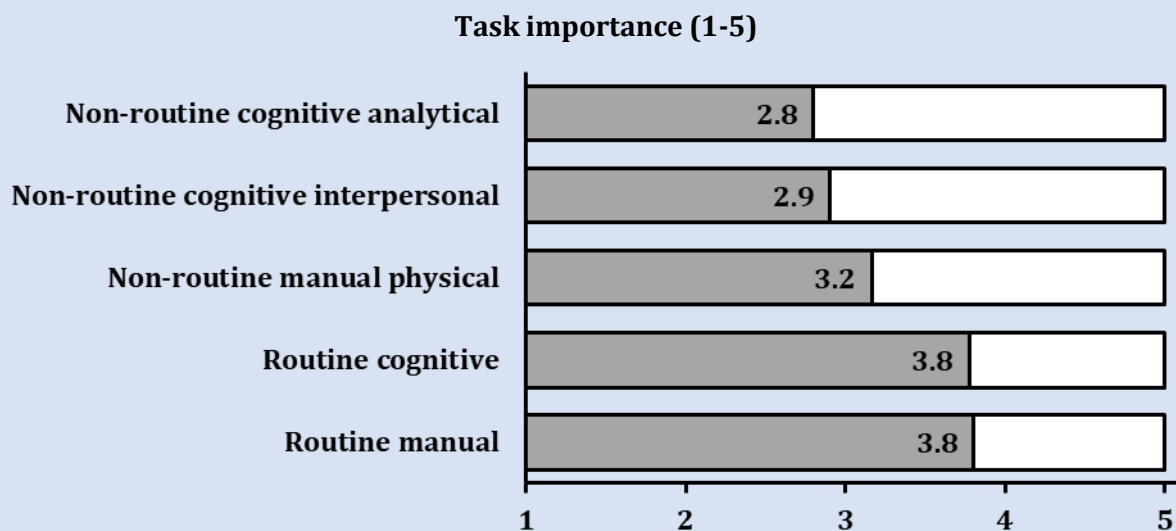
Occupation Overview:

<p>Top Skills:</p> <ol style="list-style-type: none"> English Language Communication Skills Teamwork 	<p>Top Sector:</p> <ol style="list-style-type: none"> Manufacturing
<p>Top Reasons of Hard-to-Fill:</p> <ol style="list-style-type: none"> Too few applicants or no applicant at all Applicants lack relevant job experience Unappealing environment and location 	<p>Top Strategies to Meet Shortages:</p> <ol style="list-style-type: none"> Expanding local recruitment efforts Raising wages Increasing worker hours or overtime

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for production operators and machine operators mainly in manufacturing sector.
- ii. The majority of companies have reported that vacancies within this occupation group are for entry and junior level positions with a median time to fill of 2 to 3 months. In addition, most companies reported that this occupation is harder to fill as compared to a year ago.
- iii. There is no gap in education as minimum level of education required is a Sijil Pelajaran Malaysia (SPM) or equivalent. However, candidates who have knowledge in rubber technology and food products processing are also preferable by some companies. Based on our Call-for-Evidence (CfE) survey, companies have identified that the skills required for this occupation are technical skills such as welding skills for production operator to handle air conditioner parts and sewing skills for line leader. Not to mention, problem solving abilities and communication skills are essential for this occupation as well.



- iv. Further input from Malaysian Chamber of Mines (MCOM) claimed that there is no specific qualification needed for this work. They also highlighted that equipment and machine operators as well as production operators are sought after in mining industry because there are no successors once senior staffs are retired. Thus, companies have to provide training to new employees and they will undergo 1 to 2 weeks orientation before employment. Besides that, companies also tend to hire foreign workers to compensate the shortages. In terms of automation, MCOM shared that mining is still prominently a labour intensive sector and automation adoption for this type of work in Malaysia is assumed to be slower compared to other industries.
- v. Through the CfE survey, it also shows that this occupation is being hard to fill due to too few applicants, applicants lack relevant job experience and local candidates find the work environment to be unattractive. Hence, companies have extensively expanding the local recruitment effort, raising wages and increasing the current workers' overtime to mitigate the shortage.
- vi. Given the high number of nominations with additional evidence from industry association, the evidence indicates that there is a strong demand for this occupation. This is also reflected by increase in number of vacancies as well as employment and wage premium growth from top down indicator. Therefore, this occupation to be included in the COL.



Occupation: Heavy Truck and Lorry Driver

MASCO 2013 (4-Digit Code): 8332

MASCO 2013 (6-Digit Code): 8332-01; 8332-02; 8332-04; 8332-05; 8332-06; 8332-11

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Lorry Driver; Assistant Lorry Driver; Dumper Driver; Truck Driver; Tanker Driver; Driver (Halal Logistics)

This occupation appears on COL:

2015	No	2017	Yes
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	9 nominations
Consultation	5 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	Yes	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	No	

Occupation Overview:

Top Skills:

1. English and Communication Skills
2. Logistics
3. Time Management

Top Sectors:

1. Transportation and Storage
2. Agriculture, Forestry and Fishing
3. Manufacturing

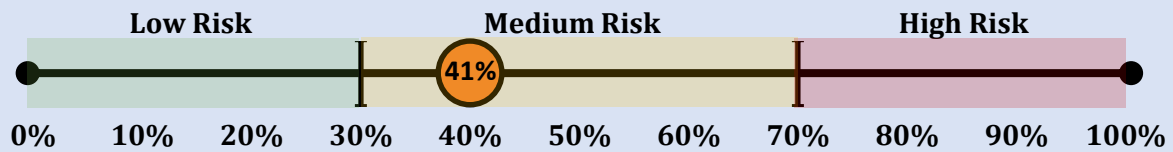
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills

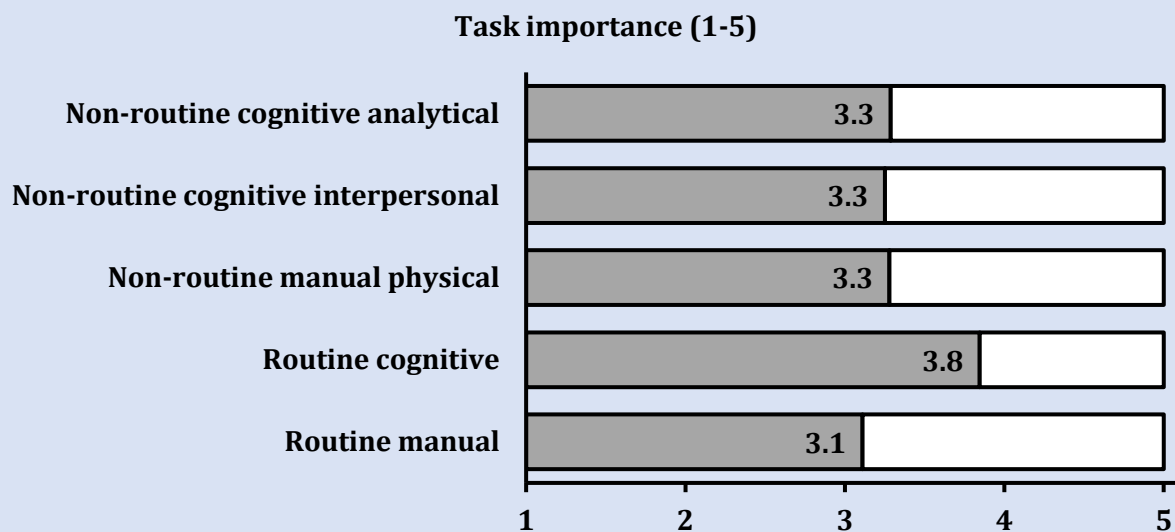
Top Strategies to Meet Shortages:

1. Raising wages
2. Expanding local recruitment efforts
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for lorry drivers and truck drivers.
- ii. Companies have reported that vacancies within this occupation group are for entry and junior level candidates with a minimum qualification of Sijil Pelajaran Malaysia (SPM). Besides that, companies also noted that applicants need particular license to qualify for this occupation such as goods driver's license (GDL). The median time to fill up the vacancies is reported to be 2 to 3 months.
- iii. Consultation with Federation of Malaysian Freight Forwarders (FMFF) indicates drivers are always in shortage in the logistics industry. The demand for lorry and truck drivers are rising each year, however the number of drivers who managed to get driving license for commercial vehicles are not keeping pace with the demand. Other reason that also contributes to the shortage is a lot of local licensed drivers for commercial vehicles favour to work in Singapore. Plus, in Malaysia, there are not many driving schools and training centres being provided to the communities, especially in the rural areas which basically have deprived them of the chances to learn to become a driver.



- iv. Further insight from Malaysia Chamber of Mines (MCOM) also highlighted that truck drivers are sought after in mining industry. They must undergo 2 to 3 weeks orientation before employment.
- v. In terms of automation, FMFF shared that some other countries have seen autonomous driving like in Germany and Japan. However, that is restricted to only controlled environment where certain criterion is met such as types of roads and possibility of problems arise are known beforehand. On top of that, autonomous driving is subject to different laws of different countries. In Malaysia, our laws state that there must be drivers to steer the vehicles. This is also supported by input from MCOM who mentioned that this occupation is hardly possible to be automated and respondents in our Call-for-Evidence (CfE) survey reported that they are not likely to automate the tasks of this occupation in the coming year as well.
- vi. Moreover, to address the shortage, none of the respondents reported hiring foreign workers. Instead, the companies have resorted to expanding local recruitment efforts, increasing worker training and raising wages. This is consistent with the top down result that provides some evidence of growth in wage premiums, in which implies that there is a high demand for this occupation. In addition, considering the bottom-up evidence that does point to a shortage, therefore this occupation is included in the COL.



Occupation: Mobile Farm and Forestry Plant Operator

MASCO 2013 (4-Digit Code): 8341

MASCO 2013 (6-Digit Code): 8341-01; 8341-02; 8341-05

Only the following job titles within this occupation are included in the Critical Occupations List (COL):

Operator (Motorized Farm Equipment); Driver (Farm Tractor); Operator (Harvester)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	37 nominations
Consultation	4 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Computer Skills
3. Microsoft Excel

Top Sectors:

1. Agriculture, Forestry and Fishing
2. Real Estate Activities

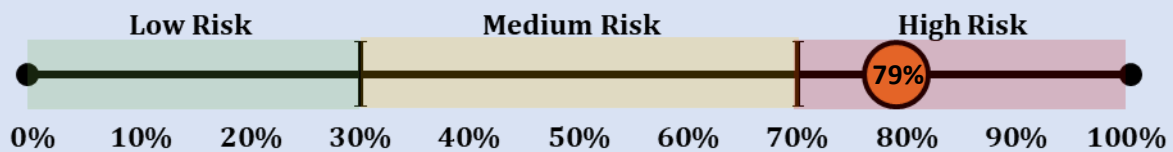
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills
3. Applicants lack relevant job experience

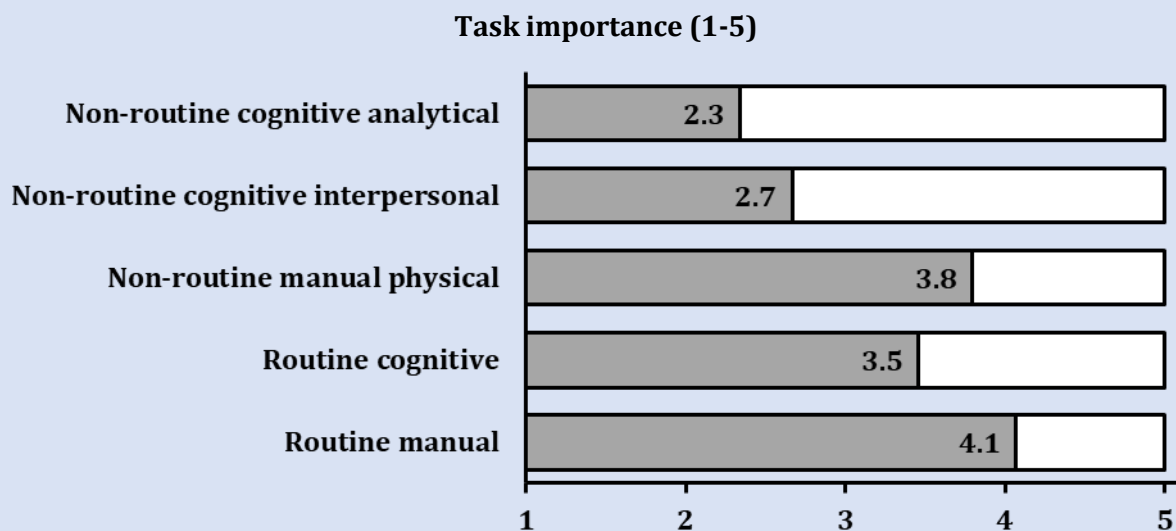
Top Strategies to Meet Shortages:

1. Expanding international recruitment efforts
2. Raising wages
3. Hiring temporary or contract workers

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for harvester operators in the agriculture sector.
- ii. Most companies have reported that vacancies within this occupation group are for entry level positions with a most common time to fill of 5 to 6 months. The companies have also reported that this occupation has become harder to fill as compared to a year ago.
- iii. The minimum qualification requirement reported by most of the companies is a Sijil Pelajaran Malaysia (SPM) or below with the most cited top skills for this occupation in the Call-for-Evidence (CfE) Survey being harvesting skills, teamwork and physical abilities.
- iv. Based on the survey, the main reasons this occupation is hard to fill are that most applicants lack the required technical skills and that there are very few applicants. To mitigate current shortages, companies have resorted to expanding international recruitment efforts, raising wages and hiring temporary workers.



- v. A consultation with Malaysian Agricultural Producers Association (MAPA) has indicated the need for harvester operators, motorised farm equipment operators and farm tractor drivers. For harvester operators, there is a need for middle to expert level talents for tall oil palm harvesting. The latter two occupations, on the other hand, require entry level candidates. The stigma of this occupation being 3D (dirty, difficult and dangerous) in nature and a mismatch of salary expectations are the main cause for hiring difficulties for this occupation. Severe labour shortage has caused companies to be impacted on production (i.e. overgrown crops and field grown with noxious weeds) and increasing the current worker workload. MAPA suggests for sustainable oil palm practices to be adopted in the industry, ease the recruitment process by standardising the recruitment of foreign workers for all source countries, more research on mechanisation, high yielding oil palm seedlings and revising the wage promoting the industry to be more attractive for the local.
- vi. On the other hand, the Malaysia Palm Oil Board (MPOB) has echoed the concern over the need for harvester operators due to the difficulty of finding suitable applicants as young generations are not interested to work in the estate. On top of that, there are no successors to replace experienced workers once they leave the workforce. The minimum qualification requirement for this occupation is a Sijil Pelajaran Malaysia (SPM) along with relevant working experience. The short-term solution for talent shortages adopted by companies is hiring foreign workers. However, these workers, who have been trained, usually leave after their permit ends and new intakes would usually show a drop in productivity. This imposes higher costs for the companies to bear. MPOB suggests that the introduction of high technology mechanisms would possibly be the new attraction for local especially youths to be in this industry. MPOB is also working together with public university to make these mechanisms available in the near future. Local companies are also carrying out research to establish new mechanism for the digitalisation of the industry.
- vii. Although there is insufficient top-down data for this occupation, high nominations in the (CfE) survey supported by inputs from stakeholders suggests the need to include this occupation in the COL.



DOVETAILING REPORTS OF OCCUPATIONS EXCLUDED FROM THE 2019/2020 CRITICAL OCCUPATIONS LIST

The following occupation reports are based from evidence provided by companies. However, after further review, these occupations were not included for the following reasons:

- i. Insufficient/inconclusive evidence
- ii. Evidence against shortages
- iii. Contradictory evidence

The CSC produces these reports for the following respective reasons:

- i. To encourage the participation of companies or industry associations through our survey or consultation sessions.
- ii. To ensure a transparent process whereby all evidence is taken into account for consideration.
- iii. To recommend companies or industry participation to provide us with additional insights or reasons in order to consider the inclusion of the occupation.

CSC continues to update the Critical Occupations List annually to keep it relevant. Therefore, we welcome constructive comments and feedback throughout the year.



Occupation: Advertising and Public Relations Manager

MASCO 2013 (4-Digit Code): 1222

MASCO 2013 (6-Digit Code): 1222-01; 1222-03; 1222-04; 1222-06; 1222-12

Only the following job titles within this occupation are nominated:

Advertising Manager; Communications Manager; Public Relations Manager; Customer Service Manager; Customer Relationship Manager

This occupation appears on COL:

2015	No	2017	No
2016	Yes	2018	Yes

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	5 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> MDEC Digital Talent Report 2017

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

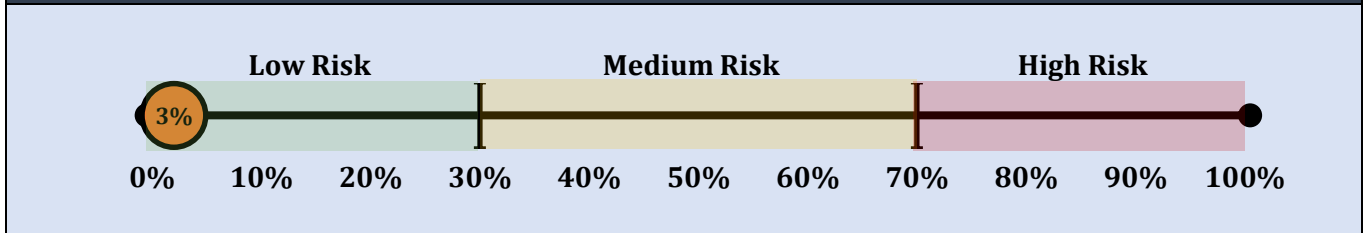
1. Communication Skills
2. English Language
3. Social Media Skills

Top Sectors:

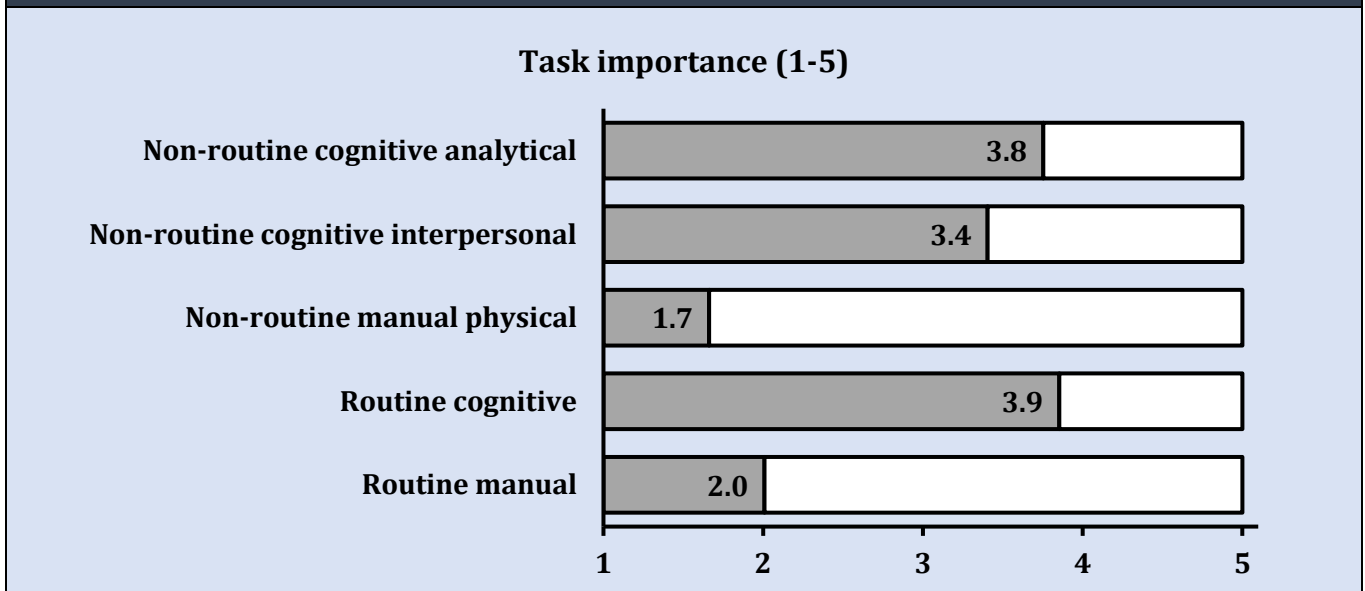
1. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
2. Information and Communication

<p>Top Reasons of Hard-to-Fill:</p> <ol style="list-style-type: none"> 1. Applicants lack the required technical or occupational skills 2. Applicants lack the required credentials or certification 3. Applicants lack relevant job experience 	<p>3. Financial and Insurance/Takaful Activities</p> <p>Top Strategies to Meet Shortages:</p> <ol style="list-style-type: none"> 1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.) 2. Raising wages
---	---

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- The job titles nominated reflect mostly the need for public relations managers, communications managers, and customer relationship managers.
- The majority of companies have reported that vacancies within this occupation group are for entry to senior level staff. The minimum qualification for this occupation is a bachelor's degree, but some banking-related companies indicated the compulsory requirement for certain licenses for this occupation. The median time to fill for this occupation is reported to be 2 to 3 months.



- iii. To mitigate the shortage of talent, companies have resorted in expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.) and raising wages. Companies have also turned to increasing workers hours or overtime and outsourcing this job function to external parties.
- iv. According to the MDEC Digital Talent Report 2017, the occupation of contact centre manager in the global business service sector are amongst the job titles within this occupation that may be difficult to fill in the future.
- v. The consultation with the Malaysia Retail Chain Association (MRCA) indicated that most applicants do not possess sufficient required skill and for this reason, MRCA is working on bringing relevant matching courses to Malaysia. Additionally, MRCA is also looking at raising wages, certifying supervisors with suitable certifications, and collaboration with other industry players to craft necessary syllabus and training for the industry.
- vi. Meanwhile, one of the key players in the communication industry mentioned that the criticality lies at getting talents with the right skills as oppose to not having enough talents to fill in positions. On automation, the key player views the rapid changes in a positive light and does not foresee any significant impact as this occupation still requires substantial human touch. By being one of the pioneers in Malaysia's digital transformation, the key player highlighted that major disruption is predicted to not have significant bearing in jobs replacement, but more towards disruption in skills. This will in turn lead to employees with more diversified roles.
- vii. Further inputs were gathered from the Recording Industry of Malaysia (RIM) which confirms the shortage in finding public relations manager. Malaysia's music industry is a niche market that attracts very little talent due to the lack of early exposure to the business side of the industry. Although anyone with Sijil Pelajaran Malaysia (SPM) qualification is eligible to hold the public relations manager position in this industry, those with a bachelor's degree in Public Relations would be prioritised. However, RIM stressed that relevant work experience and skills are much valued. Commenting on automation, RIM agrees that automation has significantly changed the way the industry moves. Social media is now an essential tool for musicians to promote their arts, thus, having a good social media strategist would be an advantage to many artists who are leveraging on the online platforms.
- viii. Through a validation conducted with the Public Relations Consultants' Association of Malaysia (PRCA), there is a mismatch of expectation between the skills (hard and soft) of the graduates and the industry. At the moment, PRCA highlighted that there is also a critical shortage of professionals who are competent in writing and languages (in English and Bahasa Malaysia) as well as other soft skills such as presentation, relationship building, among other.
- ix. The bottom-up inputs have suggested that the criticality that lies in this occupation is in skills rather than supply, which can be addressed by upskilling and reskilling interventions. Insufficient data from the top-down result has also given very little justification for this occupation to be included in the COL. Hence, this occupation is excluded from the COL.

Occupation: Mining Manager

MASCO 2013 (4-Digit Code): 1322

MASCO 2013 (6-Digit Code): 1322-02; 1322-03; 1322-04; 1322-05; 1322-06

Only the following job titles within this occupation are nominated:

Production and Operation Manager (Quarry); Production and Operation Manager (Oil and Gas Extraction); Oil and Gas Extraction Manager; Mining Manager; Quarry Manager

This occupation appears on COL:

2015	No	2017	No
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	8 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Technical Skills
2. Problem Solving
3. Analytical Skills

Top Sectors:

1. Mining and Quarrying
2. Professional, Scientific and Technical Activities
3. Electricity, Gas, Steam and Air Conditioning Supply

Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills

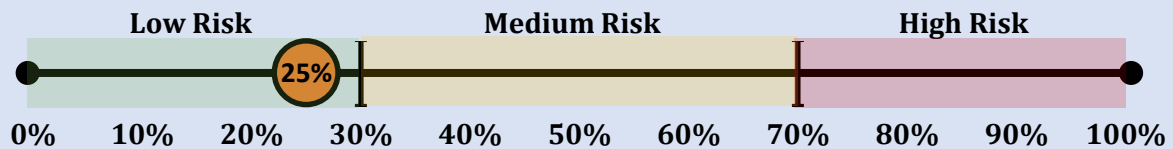
Top Strategies to Meet Shortages:

1. Expanding international recruitment efforts
2. Hiring less well qualified applicants

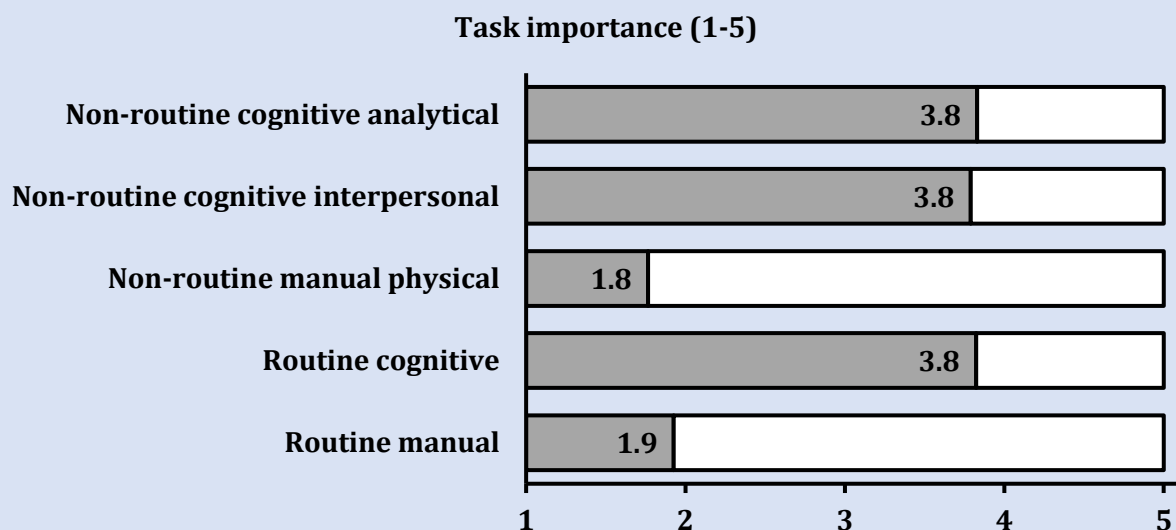
3. Too few applicants or no applicant at all

3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for mining managers and quarry managers.
- ii. The majority of companies have reported that vacancies within this occupation group are for both middle and senior positions. The time taken to fill vacancies varies between 3 to 6 months and companies found that this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. Almost all available positions listed by respondents require a bachelor's degree, although, some companies also prefer candidates who have diploma or Sijil Pelajaran Malaysia (SPM) with relevant job experience. An additional certification or license is required to practice this occupation as well, e.g. shot firer license. Input from Malaysia Chamber of Mines (MCOM) also stated that there are difficulties in employing experienced talents, especially those with the ability to run the site. Applicants with 5 to 10 years of working experience as well as have engineering and geology background are preferred.



- iv. Besides that, the skills needed for this occupation that have been cited by companies are strong technical, analytical and communication skills, problem solving abilities, as well as able to work in a team. In addition to this, companies are also seeking for candidates who have vast knowledge in oil & gas technologies.
- v. There are limited top-down and bottom-up evidences to support the indication of widespread shortage of this occupation. Hence, this occupation is not included in the COL.



Occupation: Retail and Wholesale Trade Manager

MASCO 2013 (4-Digit Code): 1421

MASCO 2013 (6-Digit Code): 1421-01; 1421-02; 1421-03; 1421-05; 1421-08; 1421-14; 1421-15

Only the following job titles within this occupation are nominated: Retail Trade Manager; Production and Operation Manager (Retail Trade); Retail Trade Manager (Store), Wholesale Trade Manager; Export Sales Manager; Dealer; Retailer

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 1 out of 10 indicators
Bottom-up CfE survey	6 nominations
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

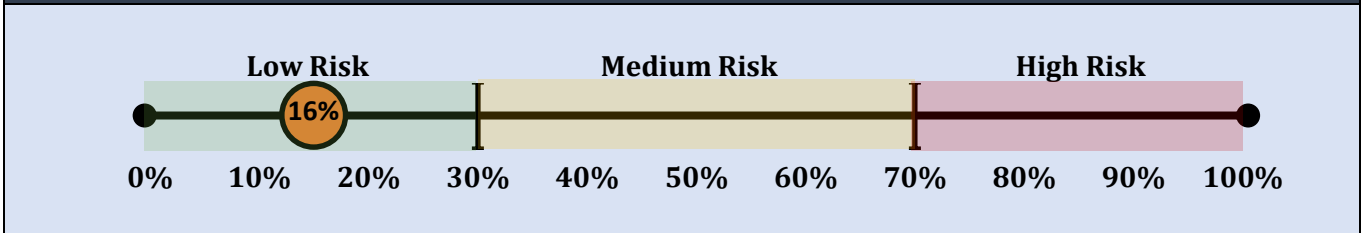
1. Store Management
2. Communication Skills

Top Sectors:

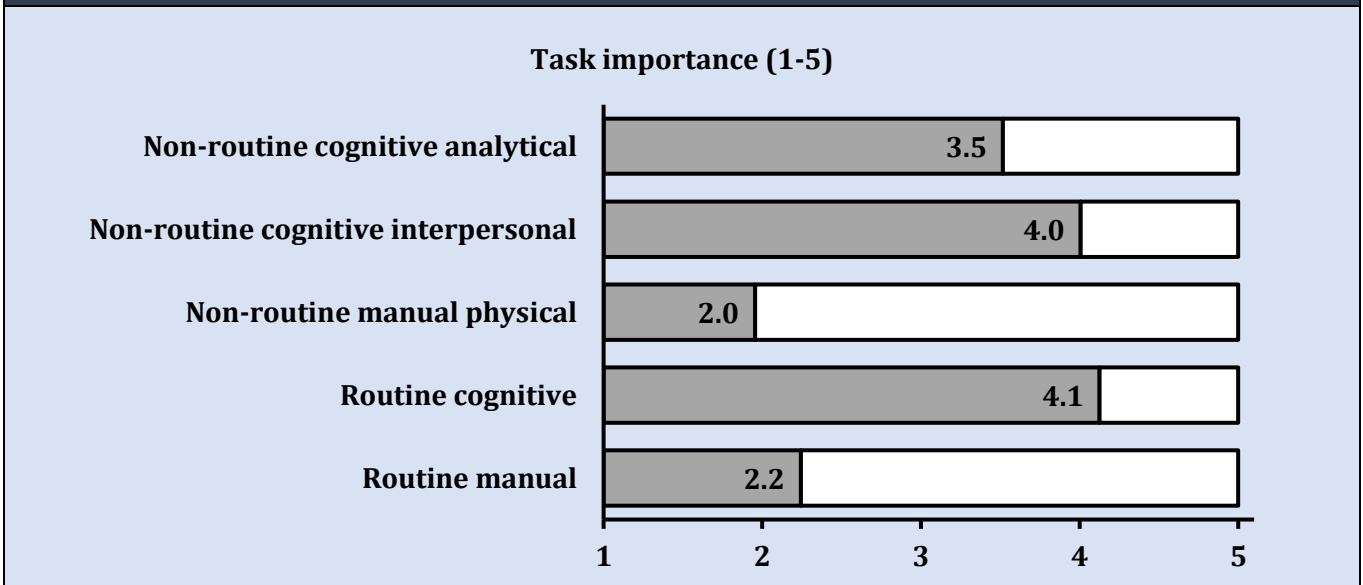
1. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles

3. Retail Management	2. Manufacturing 3. Financial and Insurance/Takaful Activities
Top Reasons of Hard-to-Fill: 1. Applicants lack the required technical or occupational skills 2. Applicants' expected compensation is beyond the market rate 3. Applicants lack the required credentials or certification	Top Strategies to Meet Shortages: 1. Raising wages 2. Increasing worker hours or overtime 3. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for production and operation managers (retail trade).
- ii. The majority of companies have reported that vacancies within this occupation group are for entry to mid-level staff with median time to fill of 2 to 3 months.



- iii. The minimum qualification needed for this occupation is a bachelor's degree and below. The shortage in this occupation is mostly due to applicants' lack of required technical skills and applicants' salary expectation that goes beyond the market rate.
- iv. In the consultation conducted with the Malaysian Retail Chain Association (MRCA), the association emphasised the issue of gaps in terms of skills and that there are available talents in market. The basic requirement for this occupation is the application of knowledge into the work, in which, is still lacking – prompting many companies to include internships to provide candidates with practical experience.
- v. Due to insufficient evidence that point out to acute shortage, this occupation is not included in the COL.



Occupation: Education Manager

MASCO 2013 (4-Digit Code): 1615

MASCO 2013 (6-Digit Code): 1615-01; 1615-02; 1615-03; 1615-05; 1615-06; 1615-07; 1615-08; 1615-09; 1615-11; 1615-12; 1615-13; 1615-15

Only the following job titles within this occupation are nominated: Education Manager; Chancellor; Principal; Education (Operation Manager); Dean; Dean of Faculty; Head Faculty; Vice Chancellor; Principal (College); Principal (School); Principal (University); Vocational Training Manager

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	20 nominations
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

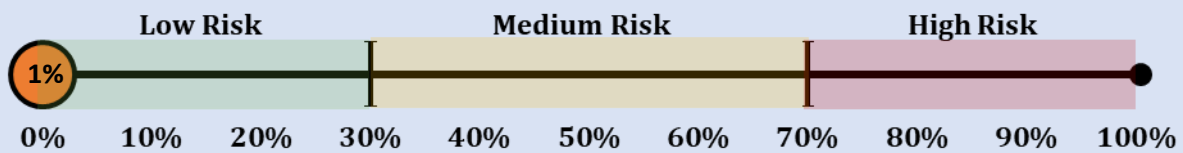
Occupation Overview:

Top Skills: 1. English Language 2. Communication Skills 3. Planning	Top Sector: 1. Education
Top Reasons of Hard-to-Fill: 1. Too few applicants or no applicant at all 2. Applicants lack relevant job experience	Top Strategies to Meet Shortages: 1. Increasing worker training 2. Expanding local recruitment efforts

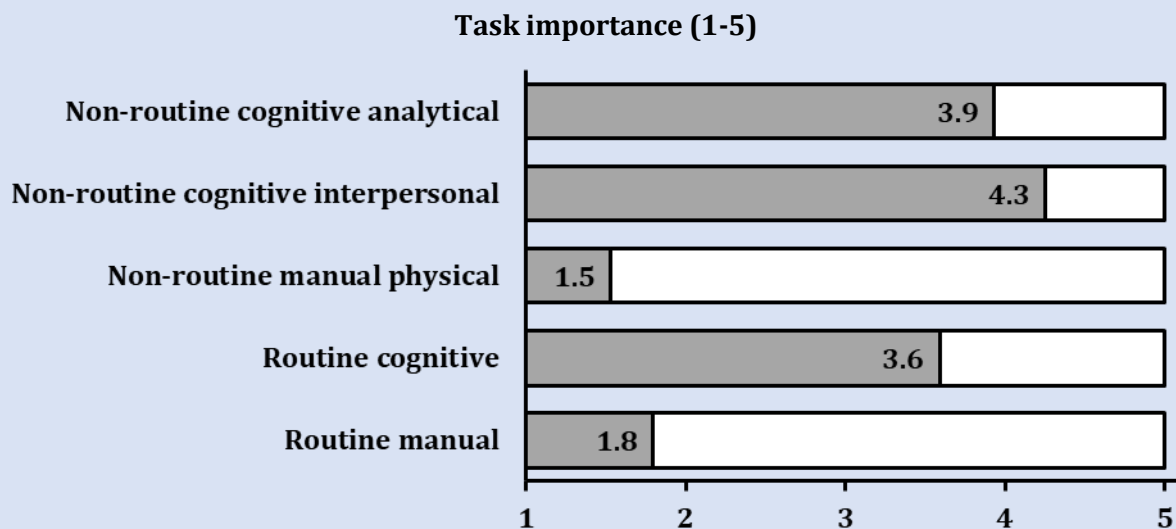
3. Applicants lack the required technical skills

3. Expanding international recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for education managers and principals in education sector.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle and senior level positions with a median time to fill of 2 to 3 months. The respondents state that this occupation is neither more nor less hard to fill compare to a year ago.
- iii. Most respondents require candidates to have a minimum of bachelor's degree with vast experience on education management. Some of the specific field of studies reported include business administration, early childhood education and aviation. Strong communication skills and English proficiency (verbal and written) are the top skills required for this occupation.



- iv. The analysis from Call-for-Evidence (CfE) survey showed that companies have very few applicants and applicants lack of job experience. Hence, companies resorted to increase workers' training as well as expand local and international recruitment efforts.
- v. Malaysian Association of Private Colleges and Universities (MAPCU) stated that they require talents who are experience in senior management with academic authority, education leadership and corporate mindset. These talents are hard to find due to global and employment opportunities, competitive market (talents leave the education sector for other sector) and shortage of labour supply which results to high demand in salary and high turnover rate. Hence, MAPCU tries to overcome the shortages by engaging the "head-hunter" and offering better remuneration with great work packages.
- vi. National Association of Private Educational Institution (NAPEI), on the other hand claimed that this occupation is not hard to fill since there is enough supply of academicians and education managers that are looking for career advancement and opportunities to serve. In addition, these positions are usually "head-hunted" as opposed to depending on job postings advertisement. NAPEI suggested that the remuneration package offered should be attractive enough to attract, retain and encourage the right talents for this occupation.
- vii. Even though there is a high nomination from our survey, it seems like the main cause of shortage is mismatch of salary expectation in the market. In addition, the top-down data does not pass the overall shortage threshold. However, one of the indicators shows there is a growth in premium wage which suggests that employers have begun to attract the talents by offering higher salary. Thus, considering the weight of both top-down data and bottom-up evidence that do not point to widespread shortage, this occupation is not included in the COL.



Occupation: Environmental Protection Professional

MASCO 2013 (4-Digit Code): 2133

MASCO 2013 (6-Digit Code): 2133-02; 2133-13; 2133-18; 2133-24

Only the following job titles within this occupation are nominated:

Agronomist; Soil Scientist; Environmental Research Scientist; Environmental Scientist

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	2 nominations
Consultation	3 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Communication Skills
3. Environmental Management

Top Sector:

1. Manufacturing

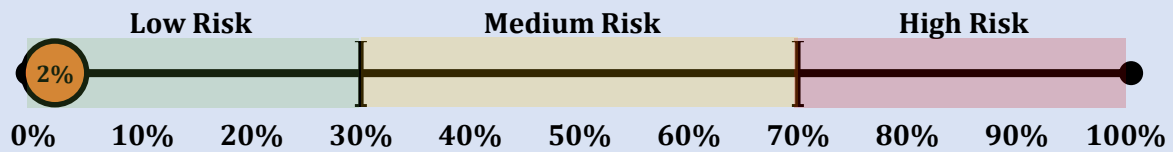
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Too few applicants or no applicant at all
3. Applicants lack the required credentials or certification

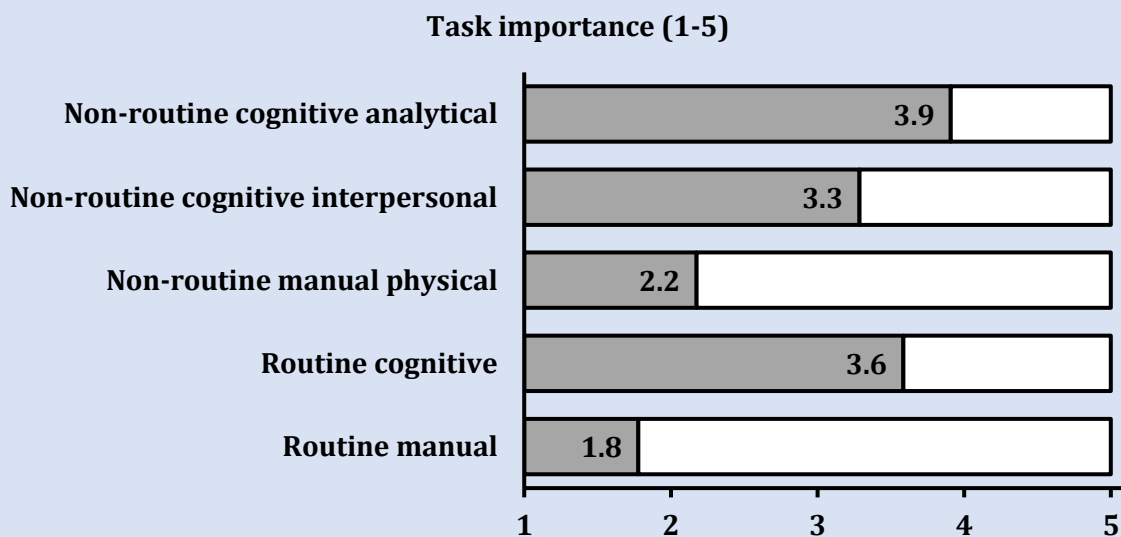
Top Strategies to Meet Shortages:

1. Hiring less well qualified applicants
2. Expanding international recruitment efforts
3. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for agronomists in the manufacturing and plantation sector.
- ii. The majority of companies have reported that vacancies within this occupation group are for entry level position with a median time to fill of 2 to 3 months. This occupation is reported to be neither more nor less hard to fill compare to a year ago.
- iii. The minimum requirement for this occupation is bachelor's degree with no specialised certifications. The companies have identified technical and analytical skills as top required skills for this occupation.
- iv. Malaysia Palm Oil Board (MPOB) claimed that the occupation requires working experience in research of biological needs of trees where most of applicants are lacking. MPOB has been working with university researchers on a research in advancing mechanisation technologies in plantation sector. They also mentioned that companies have resorted to hiring less well



qualified candidates and expanding international recruitment as a strategy to fill in the current shortage.

- v. Based on the Call-for-Evidence (CfE) survey, the reason for this occupation being hard to fill are due to applicant lack of job experience, very few candidates and lack of credentials. Hence, the common strategies to address the shortage are similar to MPOB strategies by hiring less well qualified candidate and expanding international recruitment efforts while establishing strategic partnership with local education institutions.
- vi. Due to the low nominations, limited bottom up evidence and top down data, this occupation does not have the significant evidence showing widespread shortage. Thus, could not be included in the COL.



Occupation: Pharmacologist, Pathologist and Related Professional

MASCO 2013 (4-Digit Code): 2134

MASCO 2013 (6-Digit Code): 2134-09; 2134-34; 2134-35

Only the following job titles within this occupation are nominated: Endocrinologists; Research and Development Pharmacist; Bee Cultivation Specialist

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	4 nominations
Consultation	-
Talent/Skills studies	<ul style="list-style-type: none"> Pharmaceutical Manufacturing Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Research
2. Communication Skills and English
3. Teamwork

Top Sectors:

1. Manufacturing
2. Professional, Scientific and Technical Activities
3. Human Health and Social Work Activities

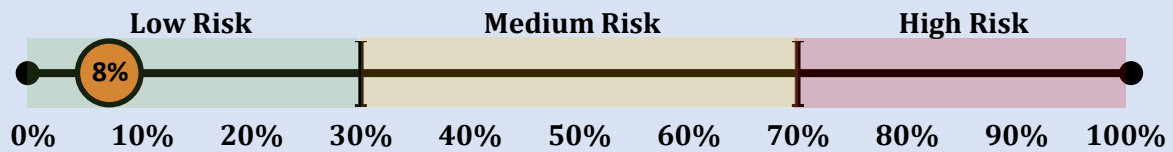
Top Reasons of Hard-to-Fill:

1. Applicants lack the required credentials or certification
2. Applicants lack the required technical skills
3. Too few applicants or no applicant at all

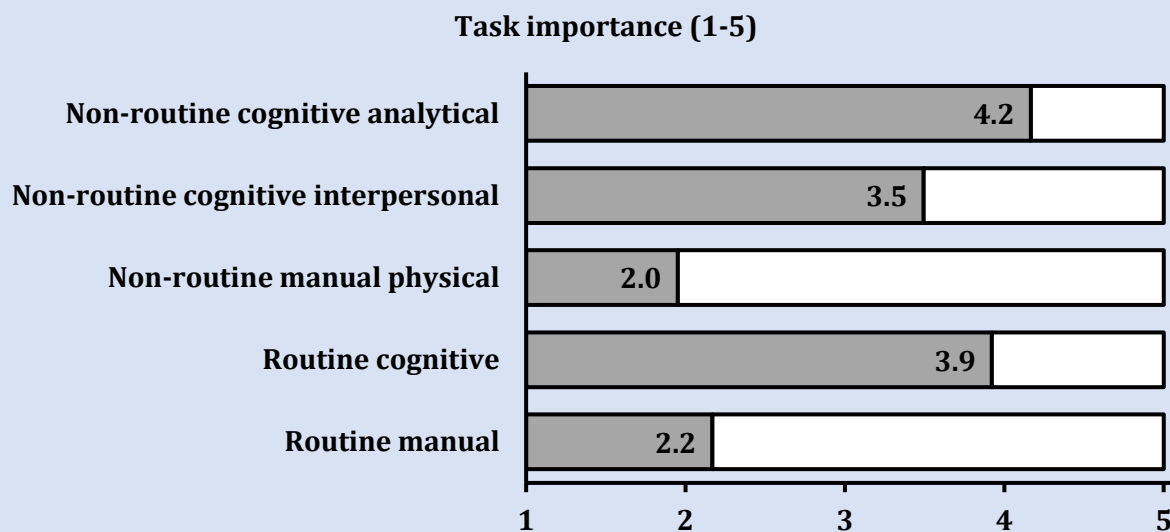
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Expanding international recruitment efforts
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect the need for endocrinologists, research and development pharmacists, as well as bee cultivation specialists.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior level, though, one company are preferring senior candidate for research and development pharmacist. The most time to fill for this occupation is reported to be more than 6 months and half of respondents found that this occupation is harder to fill, while the other half remains believe neither more nor less hard to fill as compare to a year ago.
- iii. Based on our Call-for-Evidence (CfE) survey, most positions require a bachelor's degree in product development or pharmacy with certification by Malaysian Pharmacy Board. However, one respondent report requiring a bachelor's master for endocrinologists. In addition to this, companies also highlighted the skills needed for this occupation includes both technical and soft skills such as strong analytical skills, problem solving abilities and presentation skills.



- iv. The Pharmaceutical Manufacturing Environmental Scan cited research & development pharmacists are critical. Their expertise is important in the research and development area and formulation process of product category, especially in biologics and both categories of generics which are generics (OTC) and generics (scheduled poisons). Local companies have resorted to hire expats to fill this role as there are insufficient local talents. This is also consistent with the findings from CfE survey where the reasons behind the occupation being hard-to-fill are limited pool of talent, not to mention applicants lack the required certification and technical skills. On top of that, companies have been observed to expanding international recruitment efforts as one of the strategies to mitigate the shortage.
- v. Further validation with Malaysian Organisation of Pharmaceutical Industries (MOPI) provided additional context, indicating that it is harder to hire pharmacologist that specifically specialized in the pharmaceutical industry. They opined this is because of the low number of local pharmacology graduates (bachelor's degree), while pharmacology graduates for both bachelor's master and PhD, they are generally more interested to be involved in academia or academic scientific research instead of being involved in the industry.
- vi. Besides that, Malaysian Pharmaceutical Society (MPS) also stated that this occupation is hard to fill due to several reasons:
 - a) Lack of graduates applying for these positions due to the lack of training or experience
 - b) Salaries being offered are low
 - c) Locations of available positions not ideal, e.g. rural postings and non-urban setting
 - d) Long working hours in production pharmacy setting (5.5 or 6 working days)
 - e) Lack of monetary incentives and recognition for academia and research setting
 - f) Difficult course that resulted in few expertise in the country. Not enough scholarship to study overseas
 - g) Lack of recognition for those who choose this pathway
- vii. There is insufficient top-down data. Additionally, we received a very low nomination which does not provide strong justification to indicate that this occupation faces widespread shortage. Therefore, this occupation is excluded from the COL.



Occupation: Building Architect

MASCO 2013 (4-Digit Code): 2161

MASCO 2013 (6-Digit Code): 2161-03; 2161-04; 2161-05

Only the following job titles within this occupation are nominated:

Architect; Interior Architect; Building Architect

This occupation appears on COL:

2015	No	2017	No
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Passes 1 out of 10 indicators
Bottom-up CfE survey	3 nominations
Consultation	3 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	No	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. AutoCAD
2. Communication Skills
3. Adobe Photoshop

Top Sector:

1. Professional, Scientific and Technical Activities

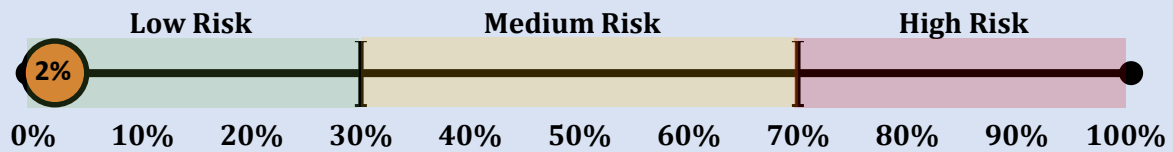
Top Reasons of Hard-to-Fill:

1. Applicants lack the required credentials or certification
2. Applicants lack the required technical skills
3. Applicants lack relevant job experience

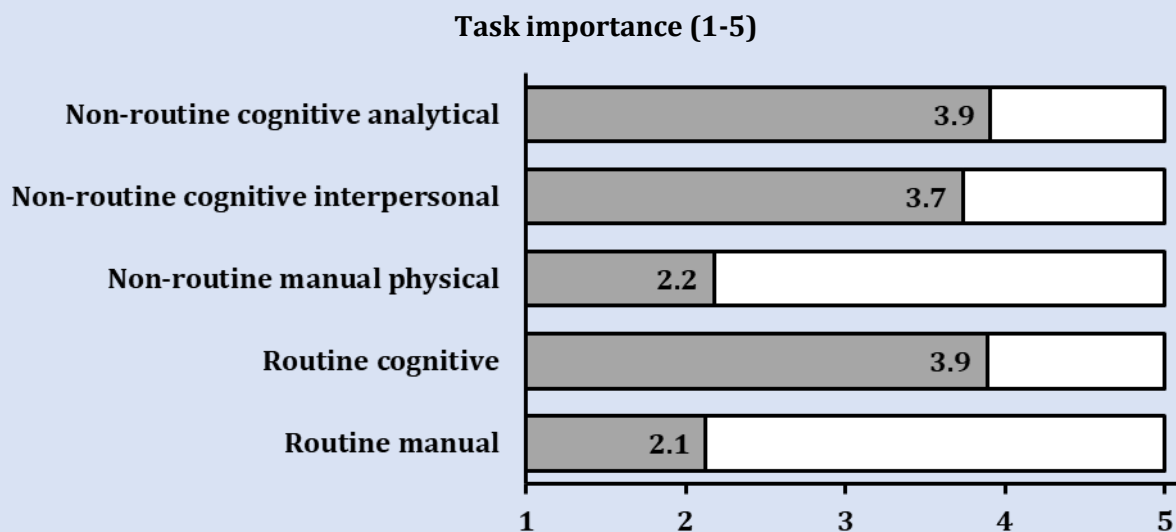
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Hiring temporary or contract workers

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for architects.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle to senior level positions, with the most common time to fill reported to be 2 to 3 months. Most companies require a minimum of a bachelor's degree, with one case that requires a master's degree.
- iii. Building architects was listed as critical in the Professional Services Activities Environmental Scan, for Architectural Professional Services. It was also highlighted that demand for architects lowers as the development sector slows down. However, with new infrastructure development, new townships, housing and construction projects, the market is expected to improve. According to industry experts, the demand for architects is predicted to continue to grow by 2020.



- iv. However, further input from our consultation with Malaysian Institute of Architects (PAM), indicates that professional architects with several years of working experience in architecture firms are the ones very much in demand. Talent shortage in the industry concerns registered Graduate Architects that currently totals up to about 2,100 professionals (with an annual admission rate of 150 to 200 students). In addition, becoming a registered graduate architect could take a long time, where candidates would need to pass the Board of Architect's Professional Examination, Part I, II and III. High attrition rate usually happens between Part I and Part II Professional Examination. It was also highlighted that job opportunities do not match the number of graduates that is entering the market every year. This could be an effect of decrease in number of projects; therefore, there is less demand. The same scenario applies to landscape architects.
- v. Both top-down data and bottom-up evidence are limited to indicate a widespread shortage across industries. Therefore, this occupation is not included in the COL.



Occupation: Ships Engineer

MASCO 2013 (4-Digit Code): 2171

MASCO 2013 (6-Digit Code): 2171-02; 2171-07; 2171-08; 2171-12

Only the following job titles within this occupation are nominated:

Marine Engineer; Flight Engineer; Aircraft Engineer; Airworthiness Review Staff

This occupation appears on COL:

2015	No	2017	Yes
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	14 nominations
Consultation	-
Talent/Skills studies	<ul style="list-style-type: none"> Maritime (Shipbuilding and Ship Repair) Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	Yes	NA	NA	

Occupation Overview:

Top Skills:

- English Language
- Vessel Maintenance
- Planning

Top Sectors:

- Transportation and Storage
- Manufacturing
- Education

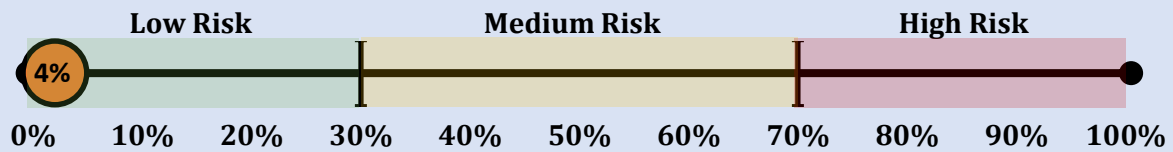
Top Reasons of Hard-to-Fill:

- Applicants lack the required credentials or certification
- Applicants lack the required technical skills
- Too few applicants or no applicant at all

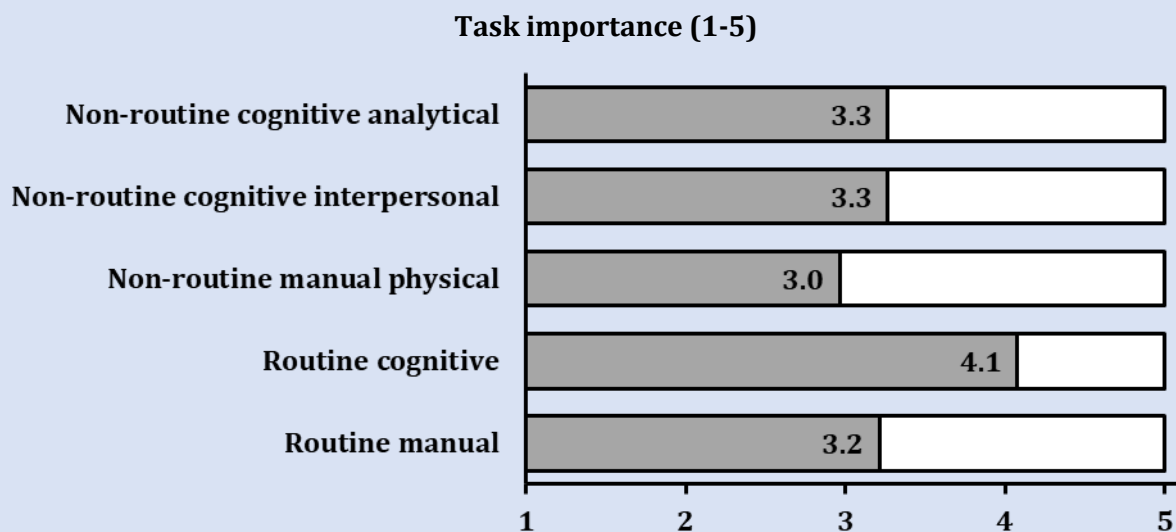
Top Strategies to Meet Shortages:

- Increasing worker training
- Expanding international recruitment efforts
- Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for marine engineers and aircraft engineers.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior staff with a median time to fill of 2 to 3 months.
- iii. Most companies cited bachelor's degree as a minimum qualification criterion for this occupation. Problem solving abilities and communication are amongst the soft skills highlighted to be needed. Respondents have also reported that applicants need license issued in compliance with Airworthiness Notice 1101 (DCAM Part-66) to qualify for airworthiness review staffs. On the other hand, aircraft engineer candidates require:
 - a) Aircraft Maintenance Engineer License (issued by Civil Aviation Authority of Malaysia)
 - b) CAAM Part 66 License Category B2
- iv. According to the Civil Aviation Authority of Malaysia (CAAM), some jobs within this occupation such as flight engineer is no longer relevant because this job is no longer required in the present operations of aircrafts in Malaysia.



- v. The Maritime (Shipbuilding and Ship Repair) Environmental Scan have cited that, in the Shipbuilding and Ship Repair (SBSR) sector, ship engineers, ship construction engineers and ship mechanics are considered to be critical due to competency gap, lack of specialised knowledge/qualifications/experience and challenging work environment. It was also highlighted that the skills gap for junior positions are mostly for soft skills which matches respondents' expectations above, with addition of the ability to work independently.
- vi. On the other hand, Ikhtisas Kelautan Malaysia (IKMAL) has highlighted that in the marine industry, the problem that arises is in finding ships to place cadet engineers to fulfil their mandatory on-board training stint for 12-months. For new entrants to be able to enter the market upon completion of their 2-years on-shore training, this issue must first be resolved so that flow of talents from learning institutions into the market is smoother and meets the market demand.
- vii. In overall rating, although the limited top-down data for this occupation passed the shortage threshold, there is insufficient bottom-up evidence to support this occupation's inclusion in the COL.



Occupation: Generalist Medical Practitioner

MASCO 2013 (4-Digit Code): 2211

MASCO 2013 (6-Digit Code): 2211-04; 2211-05; 2211-06; 2211-09; 2211-24

Only the following job titles within this occupation are nominated:

Medical Doctor; Medical Officer; Medical Practitioner; Medical Doctor (Gynaecology); Doctor (Medical Business Management)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	13 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Communication skills
2. English language
3. Health screening

Top Sectors:

1. Human Health and Social Work Activities
2. Financial and Insurance/Takaful Activities
3. Other Service Activities

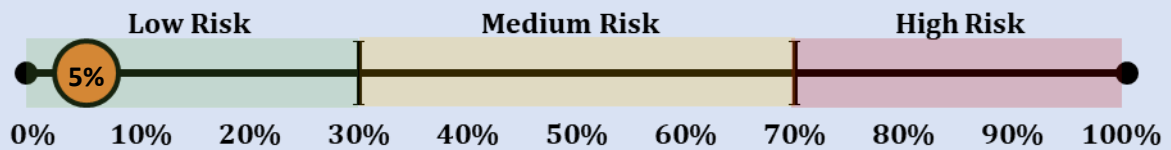
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required credentials or certification
3. Applicants lack relevant job experience

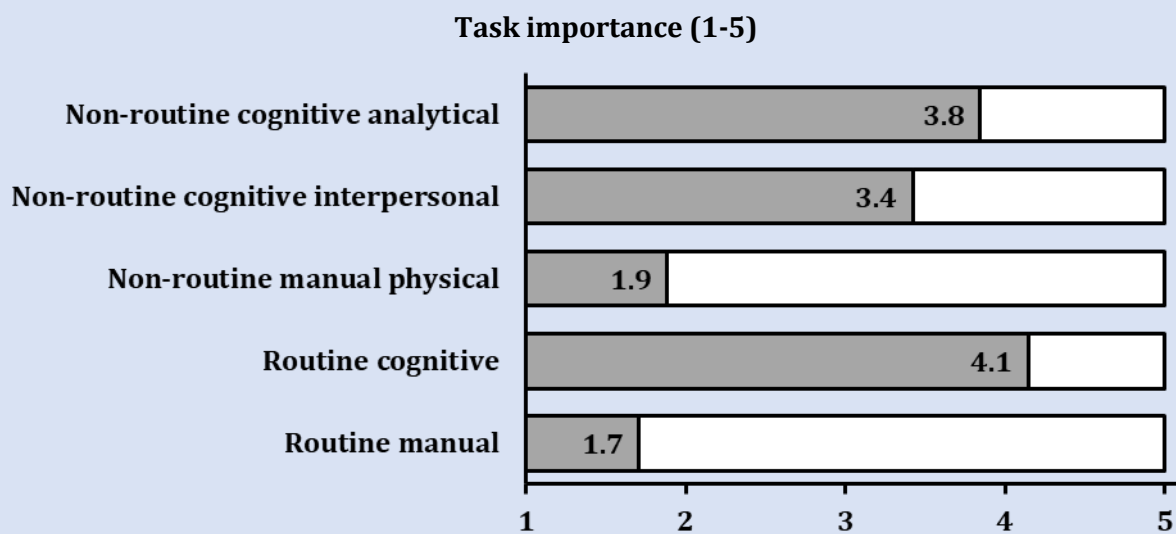
Top Strategies to Meet Shortages:

1. Hiring temporary or contract workers
2. Raising wages
3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for medical doctors and medical officers.
- ii. The majority of companies have reported that vacancies within this occupation group are for mid-level staff with a median time to fill of 5 to 6 months.
- iii. Companies have cited a minimum of a bachelor's degree to qualify for this occupation. Some, in addition, requires a master's degree.
- iv. From our consultation with Life Insurance Association of Malaysia (LIAM), doctors with an extensive knowledge on underwriting front, claims back room as well medical knowledge and expertise in risk management to help build underwriting philosophy and guidelines are needed. They are also sought after for relationship building with hospitals and to carry out dialogue sessions and negotiations.



- v. A competitive market rate has also been a factor for recruitment challenges amongst the players in healthcare industries. This is in line with the scenario where there are too few or no applicants and that companies or hospitals are raising wages to attract and retain talents.
- vi. The current arising issue with employability of medical graduates is that there are not enough placements for them to complete their housemanship. There needs to be some structural review in terms of ensuring the smooth transition of these doctors apart from the initiatives done currently (contract placements for doctors).
- vii. Overall, there is insufficient bottom-up evidence pointing towards a widespread shortage. This occupation also did not pass top-down thresholds for this occupation to be included in the COL.



Occupation: Pharmacist

MASCO 2013 (4-Digit Code): 2262

MASCO 2013 (6-Digit Code): 2262-03; 2262-04; 2262-05; 2262-11

Only the following job titles within this occupation are nominated:

Pharmacist; Industrial Pharmacist; Retail Pharmacist; Pharmacokinetic Analyst

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 3 out of 12 indicators
Bottom-up CfE survey	6 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	Yes	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Pharmacology
2. Communication Skills
3. English Language

Top Sectors:

1. Manufacturing
2. Human Health and Social Work Activities
3. Professional, Scientific and Technical Activities

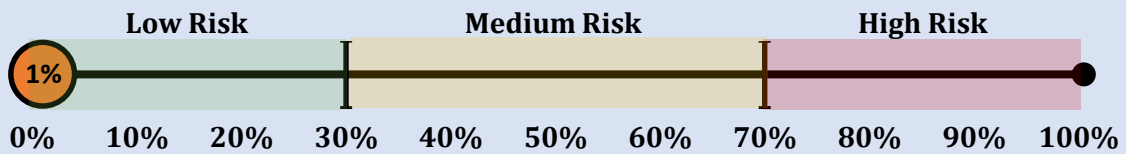
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical skills
3. Applicants' expected compensation is beyond the market rate

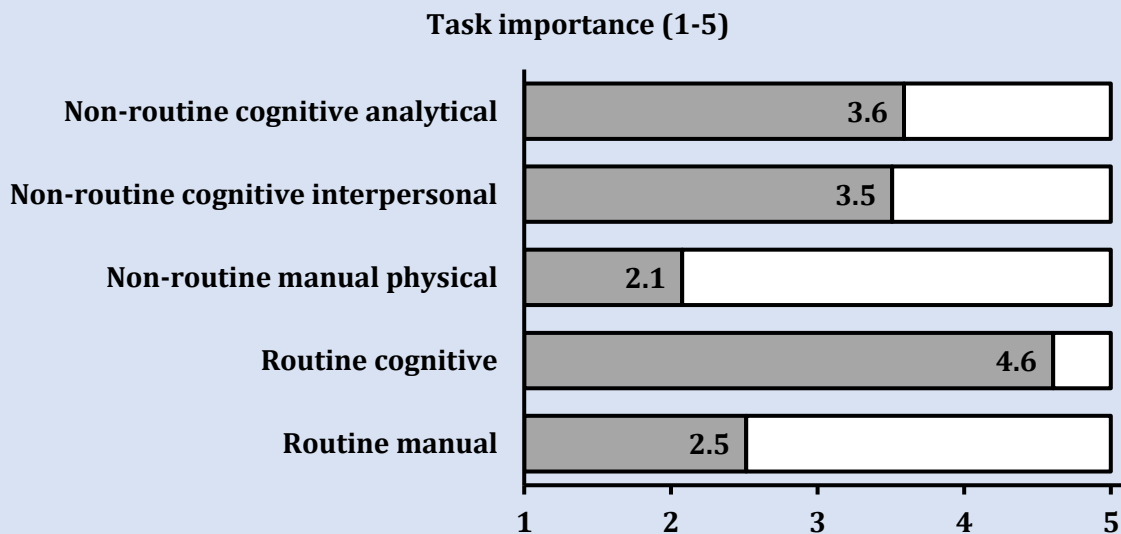
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Establishing or expanding partnerships with education or training providers
3. Raising wages

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for industrial pharmacists.
- ii. Companies have reported that vacancies within this occupation group are for junior level position, with a median time to fill of 6 months or more. However, this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. A minimum of bachelor's degree is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey. Companies also reported that this occupation requires candidates to be certified as a Fully Registered Pharmacist (FRP). As for pharmacokinetic analysts, a minimum of a master's degree in Pharmacy majoring in Lab and Bio-analytical discipline is essential to qualify for this job.
- iv. Consultation input by the Free Industrial Zone, Penang, Companies' Association (FREPENCA) highlighted that there are shortages of industrial pharmacists in the manufacturing and production areas, as most pharmacy graduates are currently attached to the hospitals, retail



or pharmacy businesses. Furthermore, graduates demand for higher compensation package to work in manufacturing and production areas.

- v. The Association of Private Hospitals Malaysia (APHM) shared that the pharmacy services industry is not facing talent shortages. Indeed, there is a surplus of pharmacists for the past 3 to 4 years and due to this, government hospitals are having difficulty to accommodate placements for this occupation. This statement is also supported by the Malaysian Pharmaceutical Society (MPS), where they mentioned that there are not enough placements for graduates to do their housemanship or Provisionally Registered Pharmacist (PRP) training. They also shared that positions for locations outside urban areas are difficult to be filled.
- vi. This occupation did not pass the overall top-down shortage threshold. Plus, with low nominations from the bottom-up evidence and the issues highlighted are not because of number of shortages, but on the job preference, thus this occupation is not included in the COL.



Occupation: Early Childhood Educator

MASCO 2013 (4-Digit Code): 2342

MASCO 2013 (6-Digit Code): 2342-01; 2342-02; 2342-03; 2342-04; 2342-05

Only the following job titles within this occupation are nominated:

Pre-Primary School Teacher; Kindergarten Teacher; Pre-school Teacher; Early Childhood Educator; Teacher (Nursery)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 4 out of 12 indicators
Bottom-up CfE survey	18 nominations
Consultation	5 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	Yes	No
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	Yes	Yes	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Early Childhood Education
2. Lesson Planning
3. Communication Skill

Top Sectors:

1. Education
2. Human Health and Social Work Activities

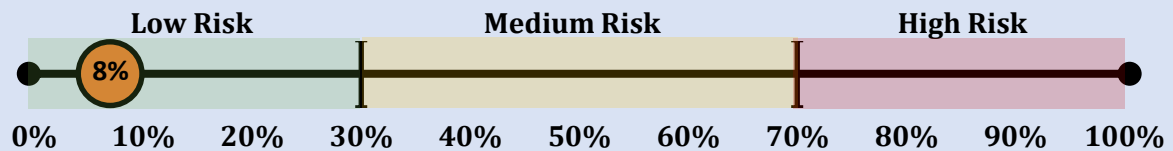
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Applicants lack the required technical or occupational skills
3. Applicants lack other required skills

Top Strategies to Meet Shortages:

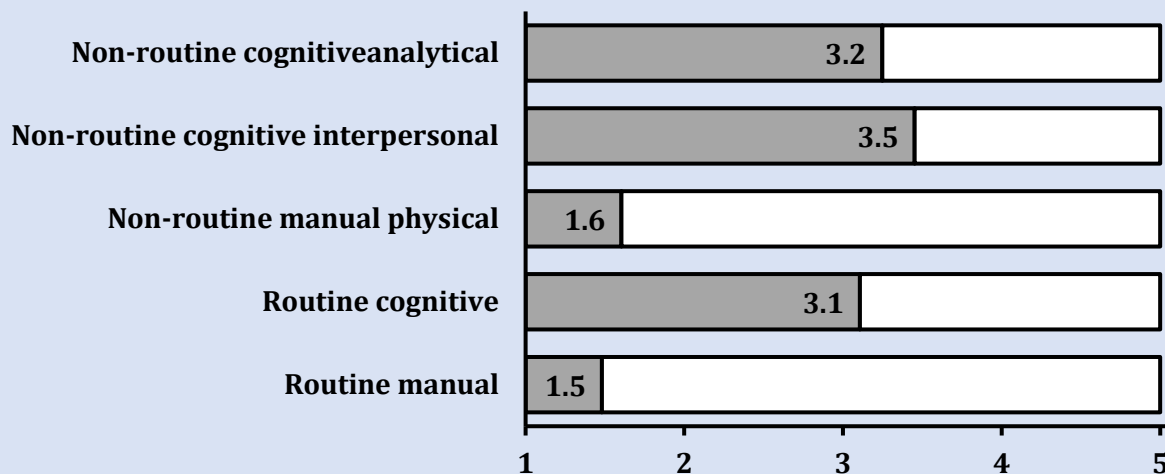
1. Increasing worker training
2. Raising wages
3. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is included in the COL.

- i. The job titles nominated reflect mostly the need for kindergarten teachers, pre-school teachers, and early childhood educators.
- ii. The majority of companies have reported that vacancies within this occupation group are from entry to middle level staff with median time to fill of 2 to 3 months. This occupation requires at least a diploma.



- iii. Through the Call-for-Evidence (CfE) survey, many early childhood centres reported that applicants lack relevant job experience, lack the required technical skills, and also lack other required skills particularly in engaging with young children. In response to the issues, centres are increasing worker training, raising wages, and increasing partnerships with education or training providers.
- iv. Input from the consultation with the Early Childhood Care and Education Council (ECCE) indicates that the main concern in this industry is to get qualified talents for this occupation. Currently there are around 200,000 pre-school teachers who are teaching without the required diploma in Early Childhood Education, despite the official government regulation that started in 2017. The government is expecting to enforce greater scrutiny for candidates to have the minimum diploma by 2020 onwards. The lack of skill in dealing with young children could be linked to talent's inadequate exposure to real psychology and behaviours of young children during their lessons in university, which might be heavy in theories. ECCE agrees that training could also be given by senior staff, but this practice is constrained by centres' reluctance to absorb higher cost of having extra staff. Commenting on automation, ECCE foresees that automation is unlikely to take over the industry entirely. The occupation requires complex human touch which cannot be imitated by machines or gadgets. Automation in this industry is expected to improve efficiencies at work rather than reducing labour. Many centres are increasingly adapting computer learning module for the 5-year-old and above, and for this reason, skilled teachers are definitely required to supervise related activities.
- v. Although the bottom-up nomination is high, the real issue points at the criticality in term of skillsets instead of headcounts/supply. Additionally, many top-down indicators for this occupation do not pass many shortage thresholds, indicating no acute shortage at the moment, hence the exclusion of this occupation from the COL.



Occupation: Hotel Professional

MASCO 2013 (4-Digit Code): 2711

MASCO 2013 (6-Digit Code): 2711-01; 2711-03; 2711-05; 2711-08

Only the following job titles within this occupation are nominated:

Guest Service Officer; Food and Beverage Guest Services Executive; Guest Service Executive; Assistant Housekeeping Executive

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	1 nomination
Consultation	3 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Technical Skills
2. Communication Skills

Top Sector:

1. Accommodation & Food Service

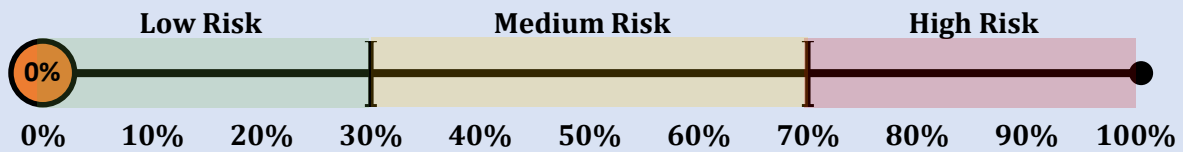
Top Reasons of Hard-to-Fill:

1. Applicants lack other required skills
2. Applicants lack relevant job experience
3. Applicants' expected compensation is beyond the market rate

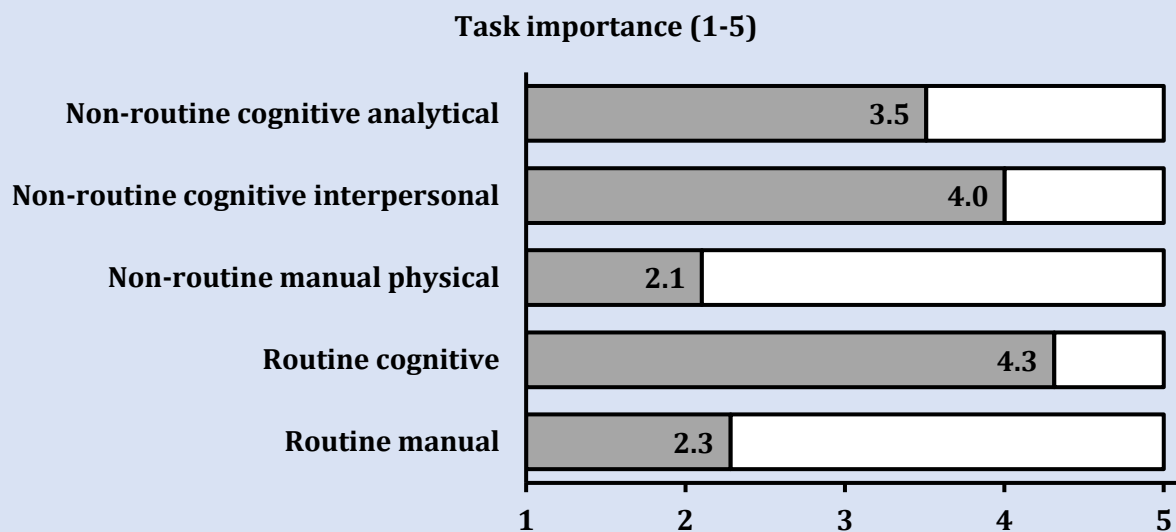
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Expanding international recruitment efforts
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for guest service executives.
- ii. A company has reported that vacancies within this occupation group are for entry to junior level positions. The median time to fill for this occupation is reported to be 2 to 3 months.
- iii. Further consultation with Malaysian Association of Hotel Owners (MAHO) indicated that relevant practical experiences as well as on-the-job training from the entry level would be ideal to fit for this occupation. This is also supported by the Malaysian Association of Hotels (MAH) where communication skills are one of the important elements for this occupation.
- iv. However, due to a very limited evidence from bottom-up and insufficient data from top-down, this occupation is not included in the COL.



Occupation: Film, Stage and Related Director and Producer

MASCO 2013 (4-Digit Code): 2844

MASCO 2013 (6-Digit Code): 2844-04; 2844-05; 2844-06; 2844-11; 2844-15

Only the following job titles within this occupation are nominated:

Multimedia Producer; Motion Picture Director; Motion Picture Photography Director; Producer (Motion Picture); Producer (Television)

This occupation appears on COL:

2015	No	2017	No
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Passes 1 out of 4 indicators
Bottom-up CfE survey	6 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	No	NA	NA	

Occupation Overview:

Top Skills:

1. Creativity
2. English Language
3. Video Editing

Top Sectors:

1. Professional, Scientific and Technical Activities
2. Arts, Entertainment and Recreation
3. Information and Communication

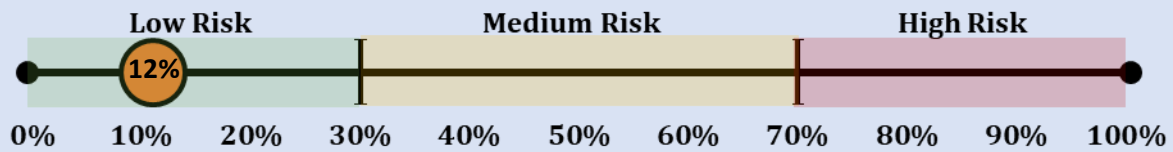
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience
3. Applicants' expected compensation is beyond the market rate

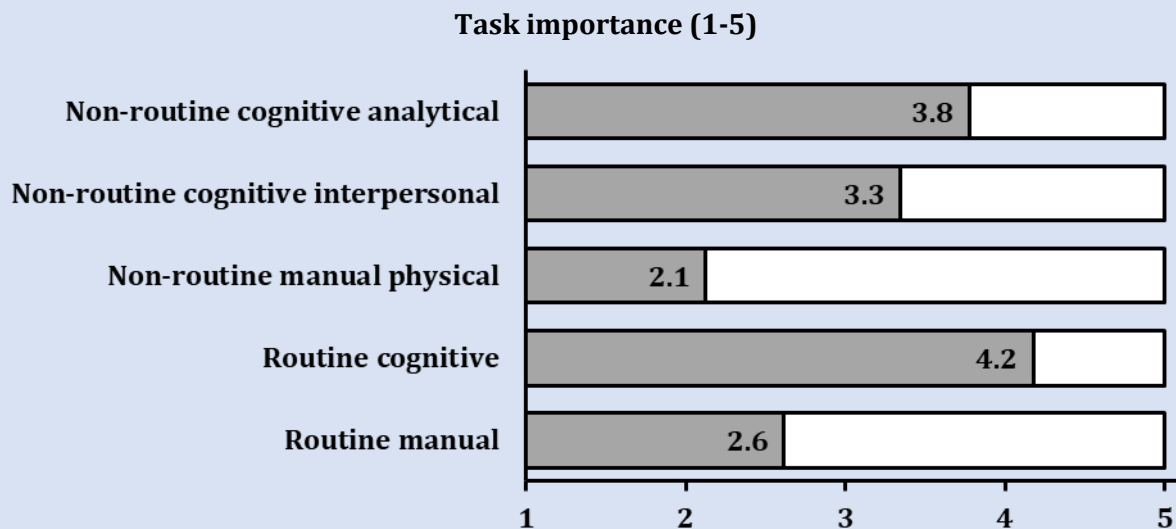
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Hiring temporary or contract workers
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for motion picture directors and television producers.
- ii. The majority of companies have reported that vacancies within this occupation group are for junior level positions with the most common time to fill of 5 to 6 months. However, most respondents have found this occupation to be neither more nor less hard to fill as compared to one year ago. To qualify for this occupation, most companies require candidates to have a minimum of an advanced diploma.
- iii. According to Malaysia Digital Economy Corporation (MDEC), multimedia producers such as game producers are amongst the digital talents in Malaysia that is in scarcity. Qualified talents usually opt to work overseas in the interest of better salary.



- iv. Les' Copaque Production Sdn Bhd, on the other hand, has highlighted that positions for this occupation are only available on project basis. Usually, the company would recruit internally, giving priority to those equipped with the required skills. One of the respondents in our survey has also highlighted that talents for this occupation usually prefer to work on freelance basis.
- v. There are limited top-down to support the indication of widespread shortage of this occupation. Additionally, bottom-up evidences suggest that hiring for this job role is seasonal and that usually companies would resort to hiring freelancers as one of their efforts to fill up positions. Hence, this occupation is not included in the COL.



Occupation: Chemical and Physical Science Technician

MASCO 2013 (4-Digit Code): 3111

MASCO 2013 (6-Digit Code): 3111-12; 3111-20; 3111-23; 3111-34

Only the following job titles within this occupation are nominated:

Chemistry Laboratory Assistant; Field Laboratory Research Conductor; Laboratory Assistant; Laboratory Technician

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	7 nominations
Consultation	-
Talent/Skills studies	<ul style="list-style-type: none"> Professional Services Activities Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Chemistry
2. Troubleshooting
3. Teamwork

Top Sectors:

1. Agriculture, Forestry and Fishing
2. Manufacturing
3. Professional, Scientific and Technical Activities

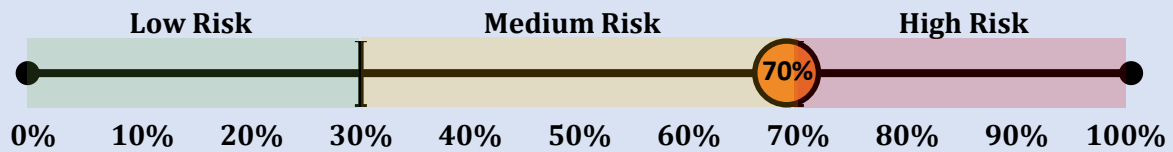
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience
3. Applicants lack the required technical skills

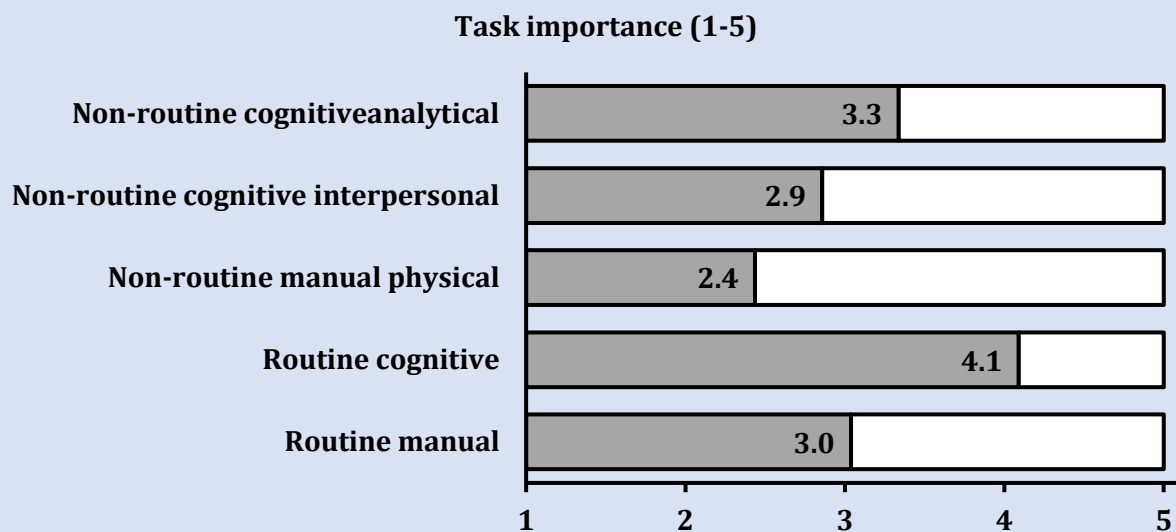
Top Strategies to Meet Shortages:

1. Raising wages
2. Hiring less well qualified applicants
3. Expanding local recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for laboratory assistants.
- ii. Most of the companies have reported that vacancies within this occupation group are for entry to junior staff, with median time to fill reported is within 3 months. Minimum qualification required is Sijil Pelajaran Malaysia (SPM) and below. Candidates with teamwork and technical skills are preferred.
- iii. This occupation is being mentioned in the Professional Services Activities Environmental Scan. Further input from the Federation of Malaysian Manufacturers (FMM) indicated that physics technicians are difficult to find. They have also highlighted that the government, universities and industry players should continue to collaborate in promoting courses related to this field and provide internship placements at various industries. Given that there is limited evidence from bottom up and top down data does not pass shortage threshold overall, therefore this occupation is not included in the COL.



Occupation: Insurance Agent

MASCO 2013 (4-Digit Code): 3321

MASCO 2013 (6-Digit Code): 3321-02; 3321-03; 3321-06; 3321-07; 3321-08

Only the following job titles within this occupation are nominated:

Insurance Broker; Insurance Underwriter; Claim Underwriters; Non-motor Underwriter; General Insurance Underwriter

This occupation appears on COL:

2015	Yes	2017	Yes
2016	Yes	2018	No

Source of evidence:

Top-down indicators	Passes 7 out of 12 indicators
Bottom-up CfE survey	4 nominations
Consultation	3 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	Yes	Yes	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	Yes	Yes	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
Yes	Yes	NA	NA	

Occupation Overview:

Top Skills:

1. Communication Skills
2. English Language
3. Claims Knowledge

Top Sector:

1. Financial and Insurance/Takaful Activities

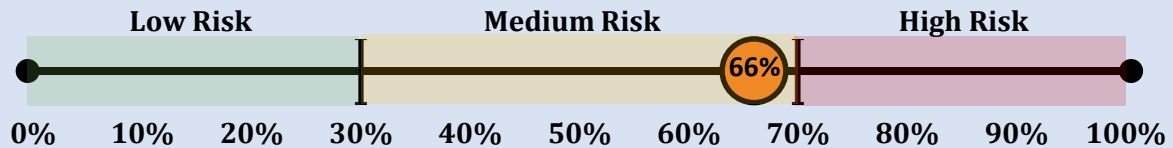
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Too few applicants or no applicant at all
3. Applicants lack the required technical or occupational skills

Top Strategies to Meet Shortages:

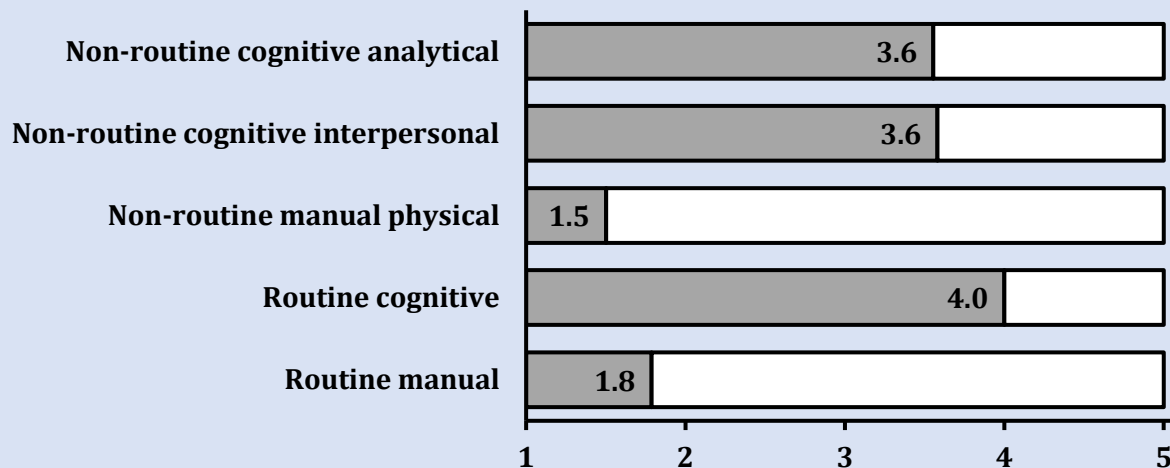
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Expanding international recruitment efforts
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?

Task importance (1-5)



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for insurance underwriters.
- ii. The majority of companies have reported that vacancies within this occupation group are for all level of staff, with the median time to fill of 2 to 3 months. The minimum qualification required for this occupation is a bachelor’s degree.
- iii. Evidence gathered from the Call-for-Evidence (CfE) survey indicated that many companies find the applicants lacking in relevant job experience and required skills. There is also the factor of



too few applicants or no applicants at all to fill this occupation. To mitigate this, most companies resorted to expanding both local and international recruitment efforts and increasing worker training.

- iv. The Life Insurance Association of Malaysia (LIAM) highlighted that for this occupation, it requires years of training and experience to achieve or be granted authority to underwrite sub-standard cases. Due to this, the time taken to fill in this occupation may take a little longer, yet it is still manageable. Additionally, LIAM also reported a high turnover rate and long training period for fresh graduates to be able to handle tasks independently. Although LIAM mentioned that there is no specific qualification needed for this occupation but there are also few certification papers which candidates are encouraged to take. One of the examples is the Associate, Life and Health Claims Designation (ALHC) offered by the International Claim Association.
- v. Although the top-down evidence indicates to a shortage, the weight of the bottom-up evidence is not enough to support the inclusion of this occupation in the COL. This is evidenced in the consultations where companies reported high turnover rate and difficult environment of work as factors causing shortage for this occupation. This does not reflect problem in talent supply but rather an issue of loyalty and talents attitudes which can be solved at companies' level. On the basis of these evidences, this occupation is not included in the COL.



Occupation: Real Estate and Property Agent

MASCO 2013 (4-Digit Code): 3334

MASCO 2013 (6-Digit Code): 3334-01; 3334-04

Only the following job titles within this occupation are nominated:

Real Estate Agent; Property Negotiator

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 0 out of 4 indicators
Bottom-up CfE survey	1 nomination
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. English Language and Communication Skills
2. Teamwork
3. Budgeting and Planning

Top Sector:

1. Real Estate Activities

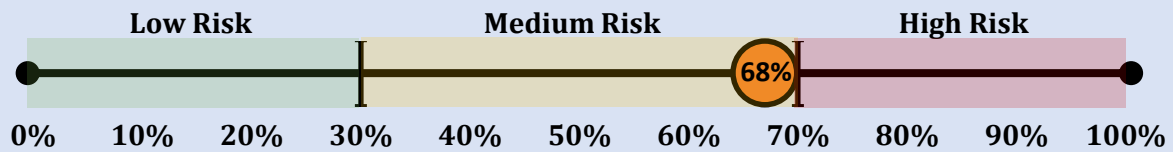
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all

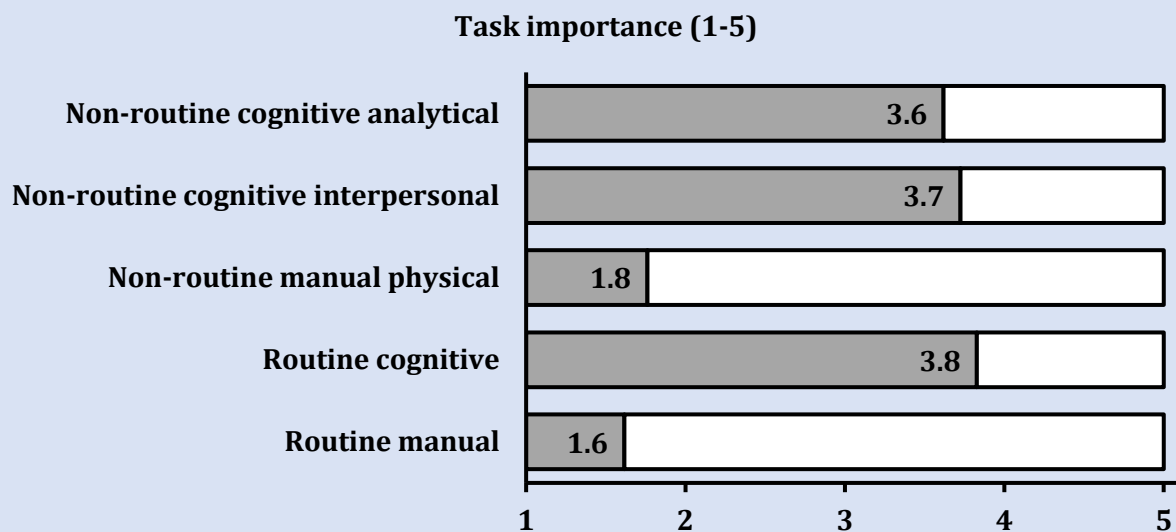
Top Strategies to Meet Shortages:

1. Increasing worker training
2. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect the need for property negotiators in real estate sector.
- ii. Company have reported that vacancies within this occupation group are for entry level positions with a time to fill of 2 to 3 months.
- iii. There is no minimum education requirement for this occupation which can be corroborated by the requirement of language and communication skills as top skills by respondent. Nonetheless, the Malaysians Institute of Estate Agents (MIEA) is actively organising and promoting the course “Negotiator Certification Course” for all potential and current property negotiators to produce certified and registered real estate negotiator (REN). They also shared that real estate agent (REA) need particular requirement and certification such as:
 - a) Certificate by Institut Penilaian Negara (INSPEN) or diploma by higher education institution.
 - b) Passed examination (Part 1 & 2) by the Board of Valuers, Appraisers, Estate Agents and Property Managers (BOVAEP)



- c) Registered as a Probationary Estate Agent (PEA)
 - d) Have completed two years of post-practical training with a real estate firm
- iv. The respondent from our Call-for-Evidence (CfE) survey have cited that too few applicants is the main reason for this occupation being hard to fill, and companies have responded to this by increasing the workers' training and expanding collaboration effort with education institutions to find qualified applicants.
- v. Based on the consultation with MIEA, they also cited that there were not enough applicants for REA and REN. This might be due to no vast promotion done to encourage more talent to join the industry. MIEA noted that the view of this occupation as business opportunity rather than a profession has cause some of the registered REA or REN to become inactive. Self-service buying or selling platform such as property technology has posed a challenge to this occupation as well because customer can interact freely with landlords without any intervention from the REA or REN.
- vi. There is insufficient evidence from both bottom up and top down evidence, plus with very low nominations, it does not provide robust indication for this occupation to be included in the COL.



Occupation: Broadcasting and Audio-Visual Technician

MASCO 2013 (4-Digit Code): 3521

MASCO 2013 (6-Digit Code): 3521-08; 3521-09

Only the following job titles within this occupation are nominated:

Sound Mixer; Sound Editor

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 6 indicators
Bottom-up CfE survey	-
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	Yes	Yes	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
No	No	NA	NA	

Occupation Overview:

Top Skills:

1. Videography
2. Editing
3. Creativity

Top Sector:

1. Information and Communication

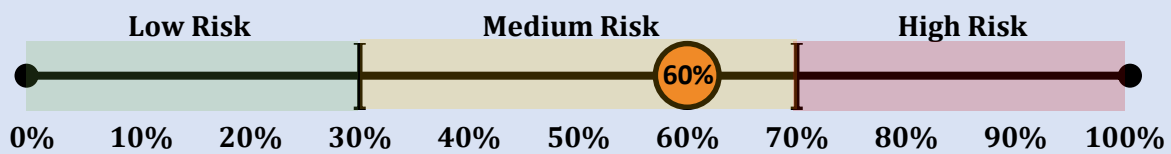
Top Reasons of Hard-to-Fill:

1. Applicants lack the required technical skills

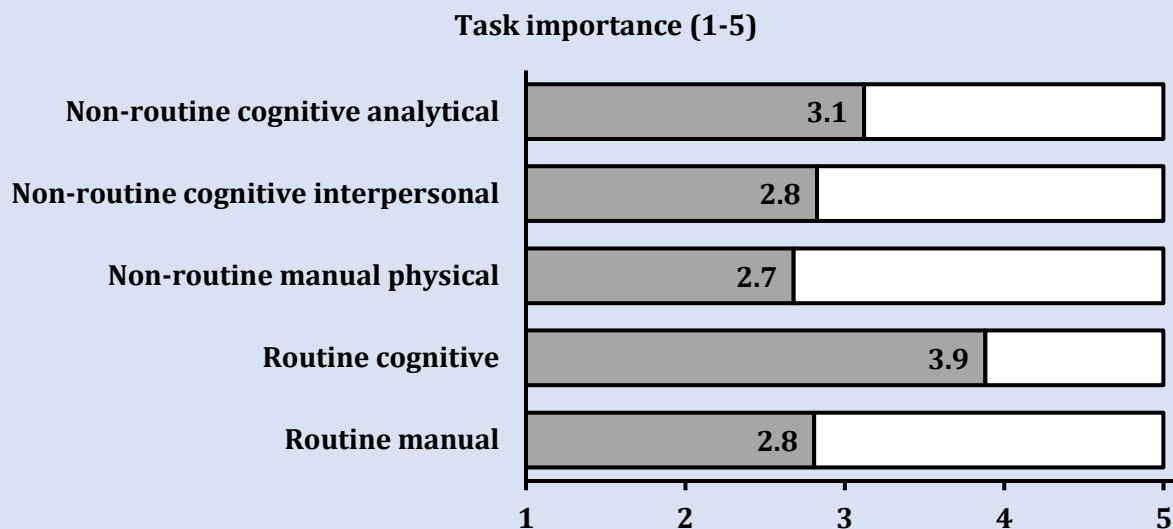
Top Strategies to Meet Shortages:

-

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for sound mixers and editors. According to Recording Industry Association of Malaysia (RIM), the media industry has gone through a transition from physical to digital media, although not rapid, millennials would prefer music streaming due to convenience and additional benefits. The music industry is a niche market and people are not interested to be in the industry because there is minimal exposure to this business.
- ii. Furthermore, this job works on the technical aspects of sound and music production by mixing, reproducing and manipulating the equalization and electronic effects of sound. It requires someone with well-trained ears together with knowledge of acoustics to produce the best quality of sound. RIM also suggested that to establish an agency to promote, maintain and facilitate the growth of the Malaysian music industry. Thus, this will create better industry environment and International artists will tend to pick Malaysia as a preferred international music event venue. Given that there is only one evidence received from bottom up and it does not pass the threshold shortage, this occupation is not included in the COL.



Occupation: Receptionist

MASCO 2013 (4-Digit Code): 4224

MASCO 2013 (6-Digit Code): 4224-01; 4224-05; 4224-06; 4224-08; 4224-09; 4224-17

Only the following job titles within this occupation are nominated:

Receptionists; Front Office Receptionists; Front Office Assistant; Front Office Personnel; Guest Service Agent; Guest Service Assistant

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 1 out of 12 indicators
Bottom-up CfE survey	6 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	No	

Occupation Overview:

Top Skills:

1. Administrative Support
2. English Language
3. Communication Skills

Top Sectors:

1. Arts, Entertainment and Recreation
2. Accommodation and Food Service
3. Administrative and Support Service Activities

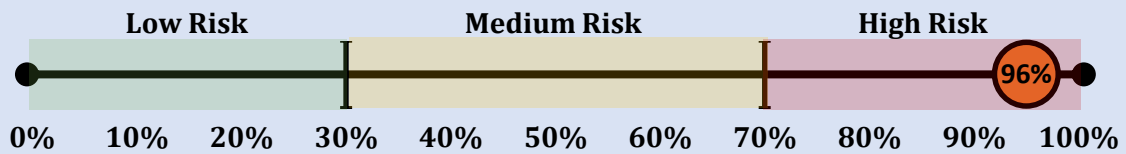
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack relevant job experience

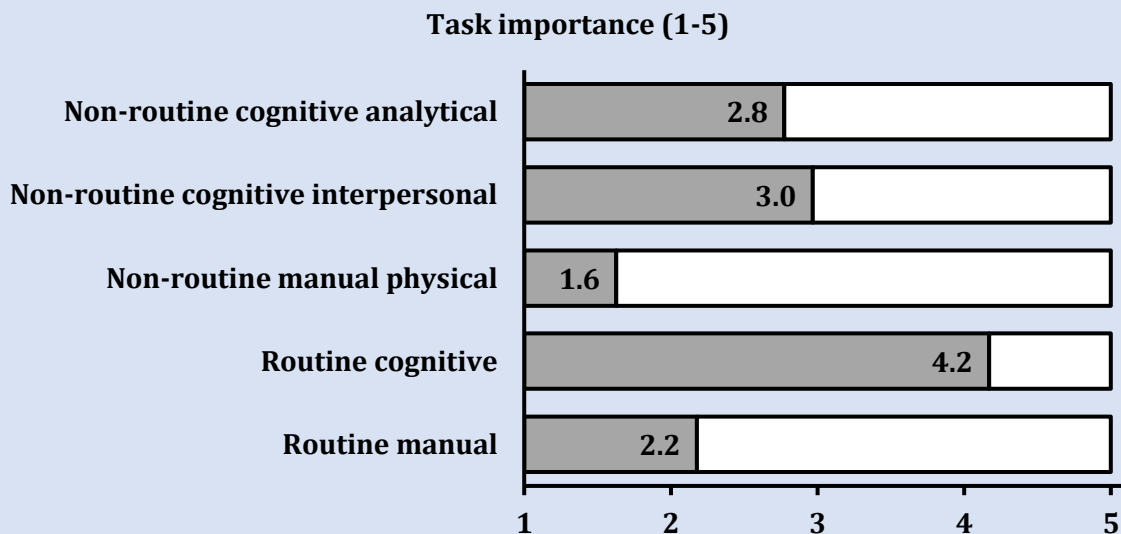
Top Strategies to Meet Shortages:

1. Increasing worker hours or overtime
2. Expanding local recruitment
3. Expanding international recruitment efforts

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for front office assistants.
- ii. The majority of companies have reported that vacancies within this occupation group are for entry level positions with a most common time to fill of 2 to 3 months. On the other hand, most respondents have found this occupation to be harder to fill as compared to one year ago. Most companies require candidates to have a Sijil Pelajaran Malaysia (SPM) and below for this post.
- iii. Malaysian Association of Hotel Owners (MAHO) highlighted during consultation that the hotel industry still needs human touch to provide services to customer rather than replacing it with artificial intelligence (AI). They also highlighted that automation would not really impact the headcount at the moment, but the hotels could foresee around 25% of the basic front liners, bellboys as well as concierges, being affected should the automation like auto check-in kiosks be implemented extensively as an alternative. Communication skills among the candidates are



crucial to boost their confidence, especially their command of English so that they could communicate and become more articulate at the workplaces. All entry levels are accepted but candidates who have gone for practical training would have an advantage as they are more likely to pick up new skills at workplaces.

- v. There are limited top-down and bottom-up evidences to support the indication of widespread shortage of this occupation. In addition, this occupation also faces the risk of being impacted by adoption of automation which might decrease the industry's reliance on manual labour. Hence, this occupation is not included in the COL.



Occupation: Field Crop Grower

MASCO 2013 (4-Digit Code): 6111

MASCO 2013 (6-Digit Code): 6111-01; 6111-04; 6111-12; 6111-13; 6111-14; 6111-15; 6111-16; 6111-18; 6111-19; 6111-23; 6111-24

Only the following job titles within this occupation are nominated:

Field Crop Grower; Oil Palm Grower; Conductor (Field and Factory Rubber Plantation); Conductor (Field and Factory Oil Palm Plantation); Inspector Quality (Plantation); Mandore (Plantation); Checker (Plantation); Supervisor (Plantation); Skilled Farm Worker (Field Crops); Field Farmer; Estate Supervisor

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 5 out of 12 indicators
Bottom-up CfE survey	18 nominations
Consultation	5 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
Yes	Yes	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
Yes	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	No	

Occupation Overview:

Top Skills:

1. Problem-solving
2. Team work

Top Sectors:

1. Agriculture, Forestry and Fishing
2. Manufacturing

Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills

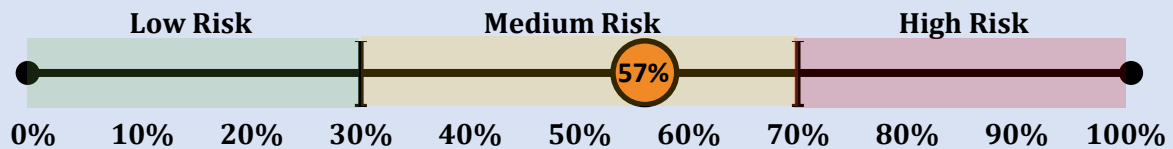
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Raising wages

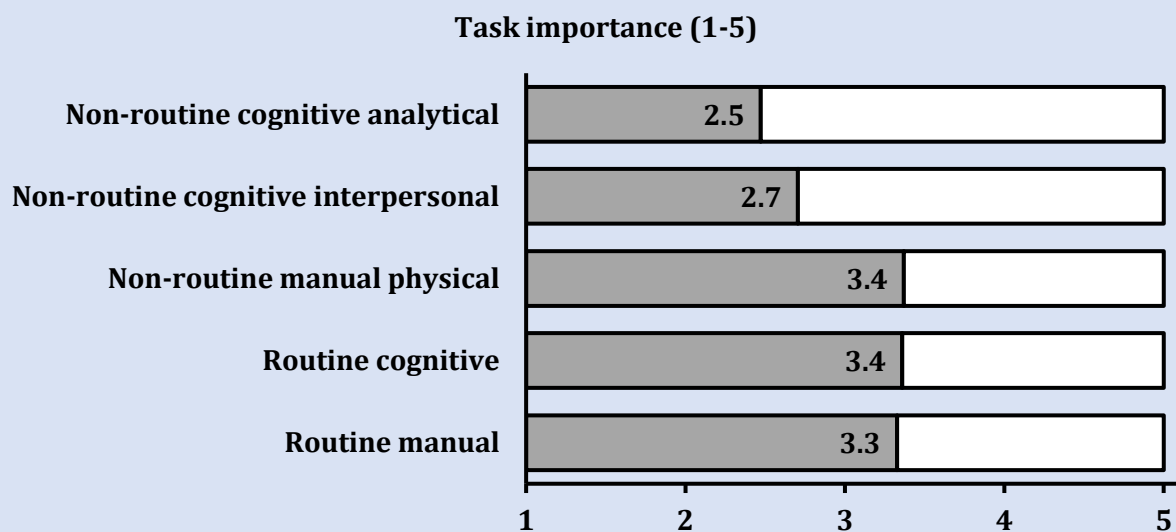
3. Applicants lack relevant job experience

3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for conductors in field and factory oil palm plantation as well as skilled farm workers in field crops.
- ii. Companies have reported that vacancies within this occupation group are from entry level to senior roles with most of the positions requiring at least Sijil Pelajaran Malaysia (SPM). The time taken to fill up the vacancies varies between 3 to 6 months. Even so, majority of respondents reported that this occupation is less hard to fill than a year ago.
- iii. Consultation with Malaysia Palm Oil Board (MPOB) stated that young generation is not interested with this job because they are unable to adapt with the estate life, where conductors must be at the field and know the condition of the estate. Due to this, companies have resorted to employ foreign workers. Additionally, they shared that automation has highly taken place in agriculture industry especially for downstream stage.

Meanwhile, automation is difficult to be applied in the upstream stage. High skilled jobs such as harvesters are difficult to be fully automated because it still depends on human power to solve uncertain situations during the harvesting process.

- iv. Nevertheless, efforts are being made to fully utilize a wide range of intensive mechanization technologies in order to increase the productivity of workers. For example, currently, MPOB and University Putra Malaysia (UPM) researchers are working on the possibility of using fibre pulsed lasers to cut frond and oil palm bunches. The lasers can also be manipulated to produce high energy pulses, which enables the cutting process to be conducted effectively. This new approach can be further researched and possibly will replace the traditional ways of using pruning (*cantas*) and mechanical harvesting machine.
- v. Besides that, local companies are also working on developing drones for agricultural purposes comprising sensor drone, harvesting drone and picker drone to be deployed at the field. By using drones, farmers can watch the process recorded by the drones including the footage from the top of the trees. Not to mention, they also can determine the trees' health condition and whether the fruits ripen well or otherwise. Thus, MPOB opined that with these high technologies, they could be the game changer for agriculture industry, which will create more high skill jobs and workers can get better pay. Yet many parameters need to be considered, especially on safety and cost issues before these mechanisms are introduced.
- vi. Input from Malaysian Agricultural Producers Association (MAPA) also highlighted that plantation companies are increasingly looking towards digital solutions such as Internet of Things (IoT), big data, artificial intelligence (AI) to reduce dependency on manual labour for processes that can be automated. This is also consistent with the findings from our Call-for-Evidence (CfE) survey, indicated that majority of companies are likely to automate the tasks of this occupation in the coming year. Hence, MAPA suggested to promote the sustainable oil palm industry, ease the recruitment process by standardising the recruitment of foreign workers process for all source countries, more research on mechanization, high yielding oil palm seedlings as well as revising the wage and promoting this industry to be more attractive for the locals.
- vii. Although the number of nominations is high, the top-down evidence did not pass the shortage threshold in overall rating. Plus, industry players are now looking towards automation which would most probably lead to a reduced reliance on manual labour. Therefore, this occupation is to not be included in the COL.



Occupation: Building Frame and Related Trades Worker Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 7119

MASCO 2013 (6-Digit Code): 7119-04; 7119-05; 7119-08; 7119-10; 7119-11; 7119-12; 7119-13

Only the following job titles within this occupation are nominated:

Scaffolder; Skilled Demolition Worker; Building Frame Worker; Bar Bender; Construction Worker; IBS Precast Concrete Installer (Industrialized Building System); IBS Lightweight Panel Installer (Industrialized Building System)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	4 nominations
Consultation	5 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Technical Skills
2. Team Work

Top Sector:

1. Construction

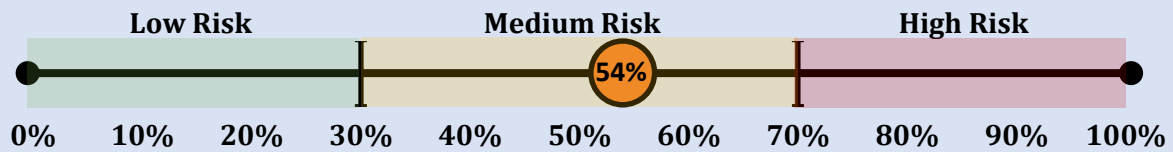
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants' expected compensation is beyond the market rate

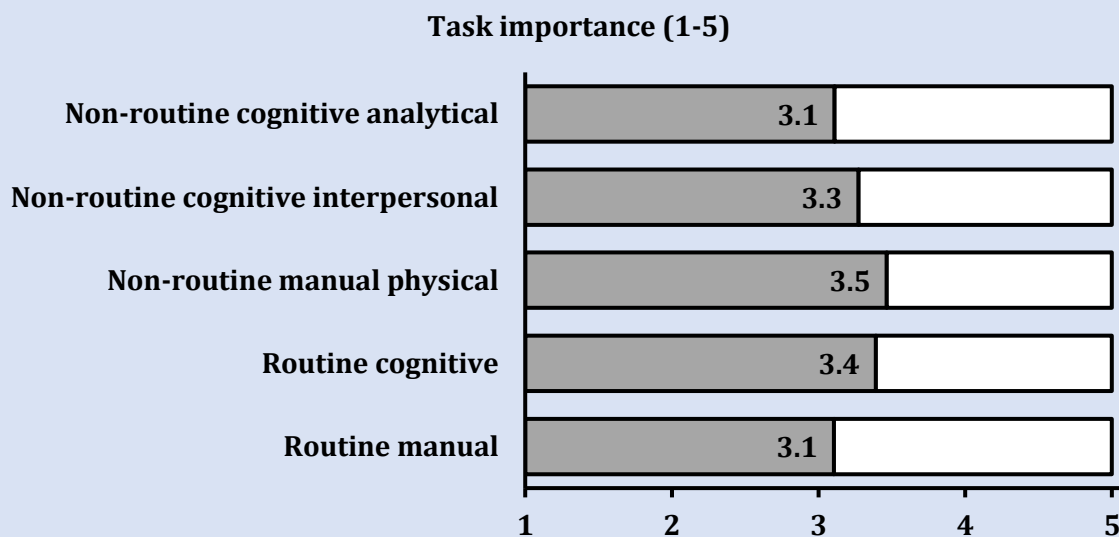
Top Strategies to Meet Shortages:

1. Expanding international recruitment efforts
2. Raising wages
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for IBS precast concrete installers (Industrialized Building System) in construction sector.
- ii. The majority of companies have reported that vacancies within this occupation group are for middle level positions and the time to fill for this occupation ranges from 2 to 3 months with some extreme cases of more than 6 months. However, most respondents stated that this occupation is neither more nor less hard to fill as compared to a year ago. Although the minimum requirement is a Sijil Pelajaran Malaysia (SPM) or below, skills certificate is advantageous. Technical skills and team work is the most cited top skills by the respondents.
- iii. Malaysian Chamber of Mines (MCOM) stated that this occupation is considered not desirable among the younger workforce due to the nature of the job and the stigma surrounding it. Many companies are now also experiencing aging workers with no potential candidates to replace them. To compensate the shortage of workforce, companies tend to hire foreign workers especially from Bangladesh and Nepal. Another issue faced by MCOM is the lack of technology and knowledge transfer between local and international company.



- iv. The Master Builders Association Malaysia (MBAM) commented that the adaption of Industrialised Building System (IBS) is still at lower rate (around 10% to 15%) due to high cost and the IBS installer positions are currently filled by foreign workers since local workforce is not keen to work in this construction industry (particularly trades work). Some applicants are also still taking the advantage to demand for unreasonable compensation not corresponding to productivity.
- v. Insufficient top-down data, bottom-up evidence as well as very low nominations shows that there is no widespread shortage. The bottom-up evidence shows that the difficulties faced in hiring local talents are due to the unattractive nature of the job within the construction sector and hence, replaced by foreign workers to sustain their business operations. Hence, this occupation is excluded in the COL.



Occupation: Welder and Flame Cutter

MASCO 2013 (4-Digit Code): 7212

MASCO 2013 (6-Digit Code): 7212-03; 7212-05; 7212-10; 7212-11

Only the following job titles within this occupation are nominated:

Welder; Welder (Foreman); Metal Welder; Gas Pipe Welder

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 2 out of 12 indicators
Bottom-up CfE survey	6 nominations
Consultation	3 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	No	Yes
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	No	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	Yes	No	

Occupation Overview:

Top Skills:

1. Welding
2. Metal Inert Gas (MIG) and Tungsten Inert Gas (TIG) Welding
3. Language Skills

Top Sectors:

1. Construction
2. Manufacturing
3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles

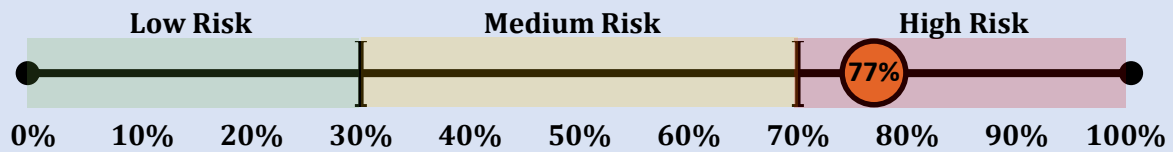
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required credentials or certification
3. Applicants lack the required technical skills

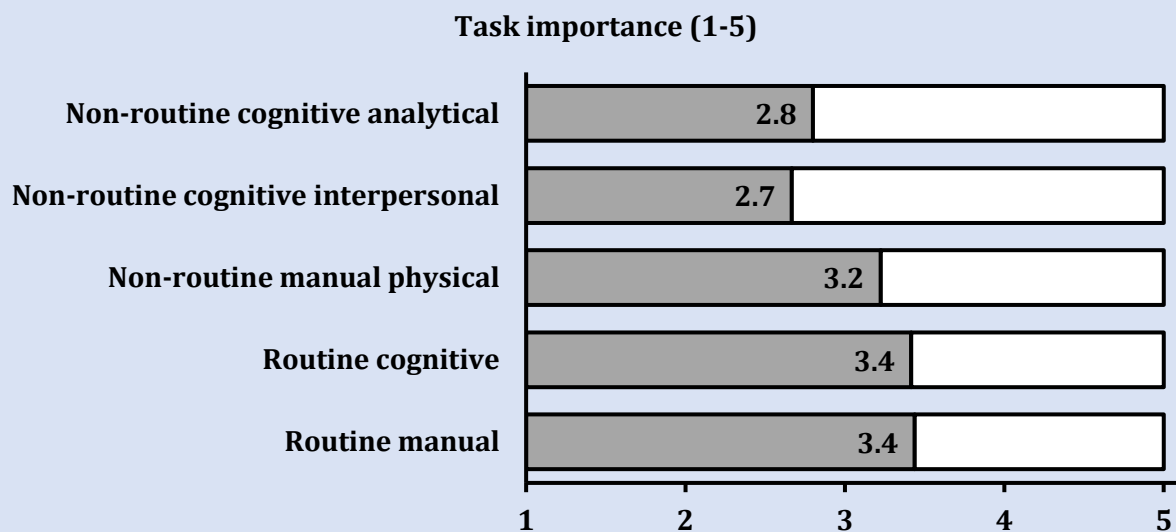
Top Strategies to Meet Shortages:

1. Expanding international recruitment efforts
2. Expanding local recruitment efforts
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for welders.
- ii. Most of the companies have reported that vacancies within this occupation group are for middle level staff, with minimum qualification requirement of a Sijil Pelajaran Malaysia (SPM) and below as well as equipped with welding skills. The median time to fill reported is within 3 months, where this occupation has become neither more nor less hard to fill as compared to a year ago.
- iii. To address this shortage, the companies have resorted to expanding both international and local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms) and increasing worker training.
- iv. Based on the consultation with Master Builders Association Malaysia (MBAM), metal and gas pipe welders are facing shortages in the construction industry. Currently, this occupation is being filled by migrant workers from neighbouring countries due to lack of interest from local



talents. For future sustainability, government must formulate practical and holistic policy to handle these workers for the benefit of the industry.

- v. Federation of Malaysian Manufacturers (FMM) has also agreed that this occupation is critical. The government should encourage more SPM school leavers to pursue vocational studies in this field. More vocational schools and institutions should be offering courses related and partnerships with Japan and European countries for training purposes.
- vi. However, according to Welding Institute of Malaysia (WIM), companies did not face any problem in hiring welders. Most of vacancies are being filled by trainees or interns if there are no applicants for the advertised posts. Furthermore, WIM has a working collaboration with government in conducting programmes that will guarantee job placements.
- vii. This occupation did not pass the top-down shortage overall threshold and the probability of this occupation will be automated is high. Therefore, based on the evidences received, we believe that this does not point to a widespread shortage. Hence, this occupation is not included in the COL.



Occupation: Tailors, Dressmakers, Furriers and Hatter

MASCO 2013 (4-Digit Code): 7621

MASCO 2013 (6-Digit Code): 7621-02; 7621-08; 7621-09; 7621-10; 7621-30

Only the following job titles within this occupation are nominated:

Tailor; Operator (Sewing); Sewer; Worker (Sewing); Sample Maker

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	Yes

Source of evidence:

Top-down indicators	Passes 3 out of 12 indicators
Bottom-up CfE survey	9 nominations
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	Yes	No	No	No
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	Yes	No	

Occupation Overview:

Top Skills:

1. Sewing
2. Creativity Skill
3. Teamwork

Top Sectors:

1. Manufacturing
2. Professional, Scientific and Technical Activities

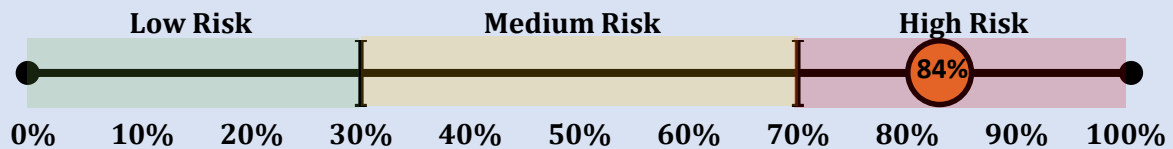
Top Reasons of Hard-to-Fill:

1. Applicants lack relevant job experience
2. Too few applicants or no applicant at all
3. Applicants lack the required technical skills

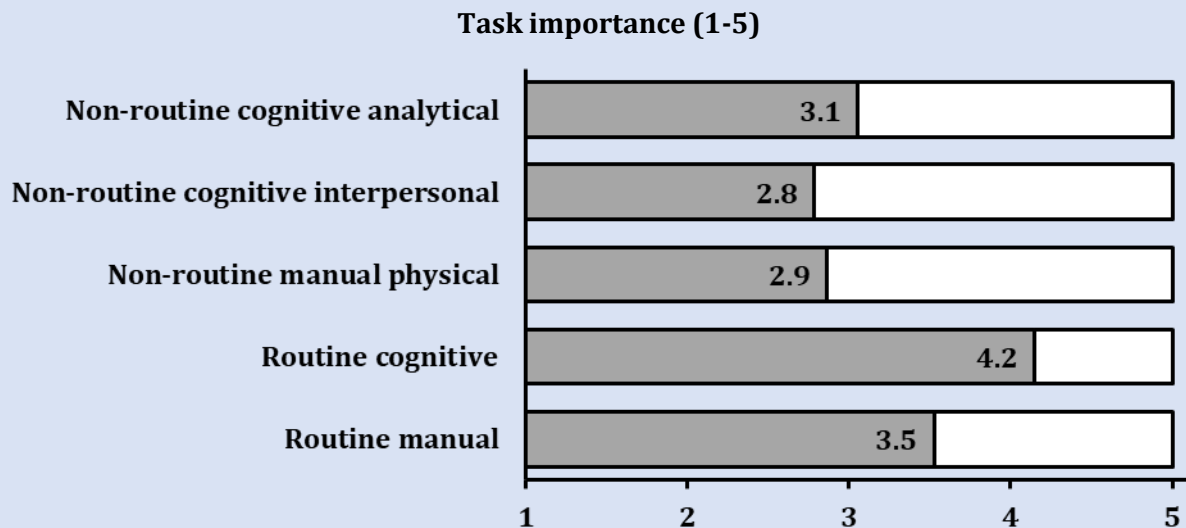
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for tailors and sewers.
- ii. The majority of companies have reported that vacancies within this occupation group are for all level of staff with at least Sijil Pelajaran Malaysia (SPM) and below for qualification. The median time to fill for this occupation is 2 to 3 months. However, some companies have also experienced more than 6 months of shortage before this occupation is filled.



- iii. Significant number of companies have also reported that this occupation is harder to fill compared to one year ago. The shortage is largely due to applicants' lack of relevant job experience and required technical skills, as well as from having too few or no applicants at all.
- iv. The Malaysian Textile Manufacturers Association (MTMA) highlighted that at least 70% of the workforce in the industry is approaching retirement age with no succession plan. Due to the non-glamorous nature of this occupation, many youths are reluctant to join, particularly when considering the low salary package, forcing most companies to hire foreigners. Similarly, there has been difficulty in filling in position for skilled workers and many companies are resorting to hiring foreign workers, especially from India and Bangladesh whose textile expertise are more recognised. The shortage is also contributed by lack of talent supply from education institutions. There are only a few universities which offers textile-related courses, such as Universiti Teknologi Mara (UiTM) and Universiti Tun Hussein Onn Malaysia (UTHM). As a result, many companies are competing to secure these talents. As a strategy, MTMA suggests that the public-private engagement should be enhanced as a way to develop a competent workforce in the industry and to also ensure the adoption of latest technology in training and education. For this occupation, MTMA seeks candidates with capability to operate various types of industrial sewing equipments and able to construct garment prototype with either visual or verbal instructions; using the industrial sewing equipment and sewing methods. (strategy: internship 90%)
- v. Further validation from The Malaysian Knitting Manufacturers Association (MKMA) and the Malaysian Textile and Apparel Centre (MATAC) confirms that the many youngsters find this occupation unattractive which leads to companies opting for foreign workers. MKMA also echoes the concern of replacing aging workforce after their retirement.
- vi. Due to insufficient evidence that refers to critical shortage, as it can be filled by the foreign workers, this occupation is not included in the COL. The top-down result shows insignificant number of indicators that pass to point widespread shortage. Companies have also reported initiatives in building talent pipeline through internship where most interns will be absorbed in employment. Considering all of these evidences, this occupation is not included in the COL.



Occupation: Well Driller and Borer and Related Worker

MASCO 2013 (4-Digit Code): 8113

MASCO 2013 (6-Digit Code): 8113-07

Only the following job titles within this occupation are nominated:

Driller

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	3 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. English Language
2. Communication
3. Computer Literacy

Top Sector:

1. Construction

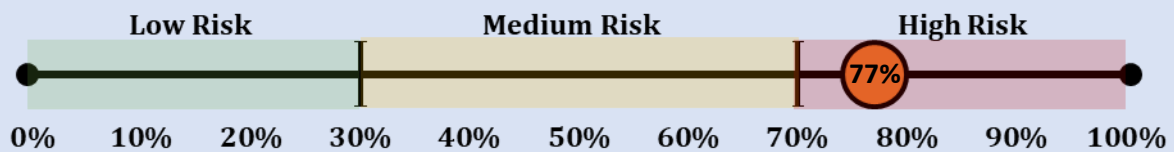
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills
3. Applicants lack the required credentials or certification

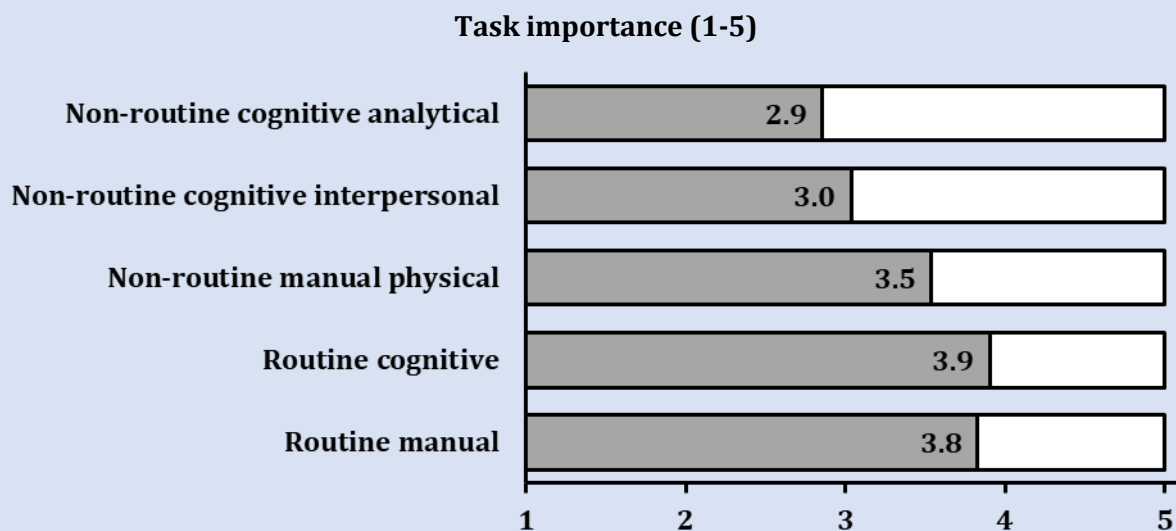
Top Strategies to Meet Shortages:

1. Expanding international recruitment efforts
2. Hiring temporary or contract workers
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect the need for drillers in the construction sector.
- ii. Companies have reported that vacancies within this occupation group are for entry to junior level positions, with a common time to fill of 2 to 3 months. Although, there are some extreme cases of more than 6 months. The respondents stated that this occupation has become harder to fill as compared to a year ago. The minimum qualification requirement is a Sijil Pelajaran Malaysia (SPM) or below. The top skills identified by companies are technical and analytical skills.
- iii. From a consultation with the Malaysian Chamber of Mines (MCOM) they have pointed out that the drillers are in demand. Candidates are required to have a driller's certificate and must undergo skill testing. The difficulty of this occupation and work locations become the main factors that affect younger workforce interest. Once senior staffs retire, there is difficulty in finding replacements. On top of that, companies would need to retrain new intakes.



- iv. From our Call-for-Evidence (CfE) survey, very few applicants and applicants lacking technical skills are the main reason for the shortages and thus, companies respond by increasing international recruitment and hiring temporary workers which are akin to the common strategies that was also highlighted by MCOM.
- v. The limited nominations and evidence from the bottom up, coupled with insufficient evidence from the top down indicators does not point to a strong justification for this occupation to be included in the COL. Hence, this occupation is not included in the COL.



Occupation: Metal Finishing, Plating and Coating Machine Operator

MASCO 2013 (4-Digit Code): 8122

MASCO 2013 (6-Digit Code): 8122-10; 8122-14

Only the following job titles within this occupation are nominated:

Casting Finisher; Operator (Moulding)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 6 indicators
Bottom-up CfE survey	4 nominations
Consultation	1 nomination
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	No	No	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	Yes	

Occupation Overview:

Top Skills:

1. Troubleshooting
2. Welding
3. Communication Skill

Top Sector:

1. Manufacturing

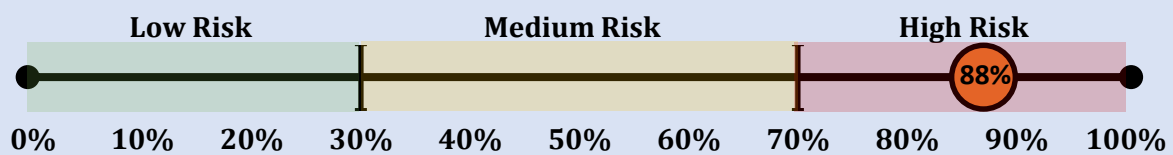
Top Reasons of Hard-to-Fill:

1. Too few applicants or no applicant at all
2. Applicants lack the required technical skills

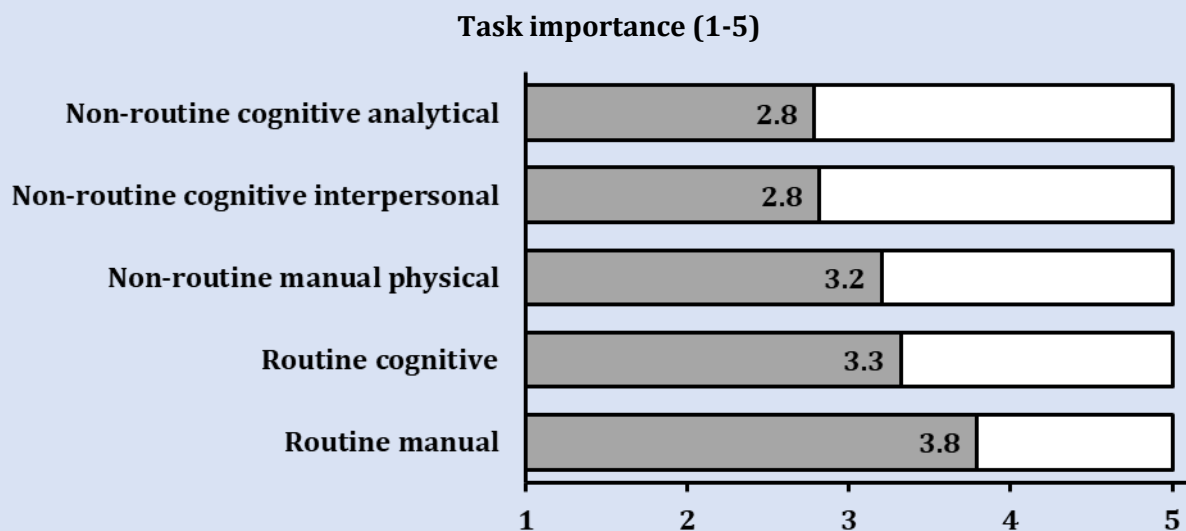
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)
2. Automating tasks performed in this occupation
3. Hiring less well qualified applicants

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- The job titles nominated reflect mostly the need for operators (moulding).
- The majority of companies have reported that vacancies within this occupation group are for all staff level with a median time to fill of more than 6 months. The minimum qualification required for this occupation is Sijil Pelajaran Malaysia (SPM) or below and the Sijil Kemahiran Malaysia (SKM).



- iii. Most companies reported that the occupation is hard to fill due to having too few applicants or no applicant at all and applicants lack of technical skills. Some companies have also highlighted high turnover rate and lack of interest by local talents to fill in the shortage. Additionally, there is also the issue of difficulty in adapting to harsh working environment.
- iv. The consultation with the Machinery & Engineering Industries Federation (MEIF) highlighted lack of interest by applicants and the long period of time taken for new workers to pick up necessary skills as among the significant factors contributing to shortage in this occupation. To address the issue, MEIF urges for government to ramp up efforts in upskilling and reskilling programmes and for talents to take self-initiative to improve their skills. With regards to automation, MEIF foresees heavier impact for traditional roles although these roles may still be labour intensive.
- v. Further input gathered from the Malaysian Special Tooling and Machining Association (MSTMA) reveals that many TVET graduates are yet to match labour market requirement. MSTMA echoes MEIF comment which emphasises Malaysians negative perception towards '3D' (dangerous, dirty, difficult) jobs because of low wages, social stigma as well as no interests, making it difficult to find talented candidate to work in the industry. This in turn, leads companies to resort to hiring foreign workers to mitigate the shortage.
- vi. The issue lies at the work environment which has always been deemed 3Ds and the unattractive salary package to sufficiently attract local talents. However, these problems have partly been addressed by companies by hiring migrant workers. Considering the insufficient data in top-down which indicates acute shortage, and low bottom-up nomination, this occupation is excluded from the COL.



Occupation: Plastics Products Machine Operator

MASCO 2013 (4-Digit Code): 8142

MASCO 2013 (6-Digit Code): 8142-01; 8142-02; 8142-03; 8142-04; 8142-05; 8142-09; 8142-11

Only the following job titles within this occupation are nominated:

Machine Operator (Plastics Mixing); Press-Machine Operator (Plastics Laminating); Machine Operator (Plastics Extruding); Machine Operator (Plastics Compression Moulding); Machine Operator (Vacuum Plastic-Forming); Machine Operator (Plastic Product); Plastic Moulder

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 3 out of 12 indicators
Bottom-up CfE survey	7 nominations
Consultation	2 nominations
Talent/Skills studies	<ul style="list-style-type: none"> Chemical and Petrochemical Environmental Scan

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
No	No	No	Yes	No
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
No	No	No	Yes	No
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	Yes	

Occupation Overview:

Top Skills:

- Teamwork / Collaboration
- Extrusion
- Problem Solving

Top Sector:

- Manufacturing

Top Reasons of Hard-to-Fill:

- Too few applicants or no applicant at all

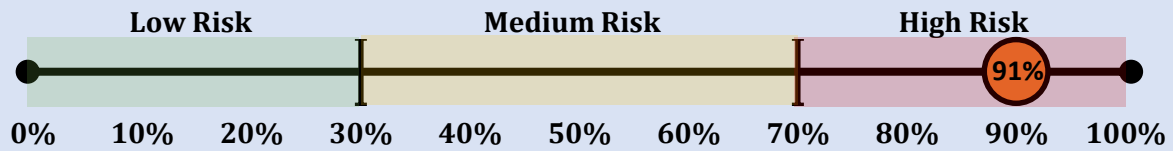
Top Strategies to Meet Shortages:

- Expanding local recruitment efforts

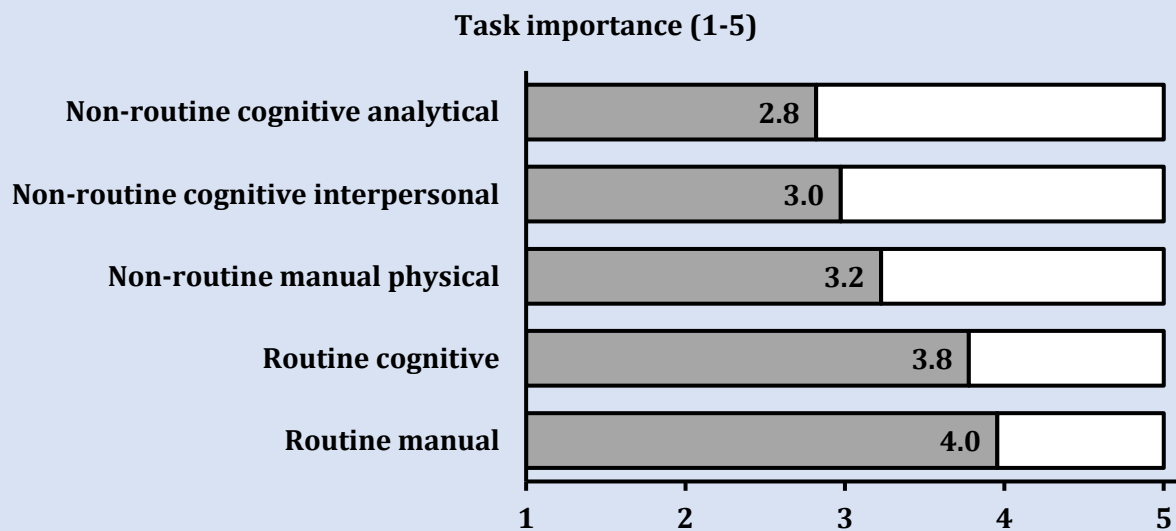
2. Applicants lack the required credentials or certification
3. Applicants lack relevant job experience

2. Hiring less well qualified applicants
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for plastic mixing and product machine operators.
- ii. Most of the companies have reported that vacancies within this occupation group varies from entry to senior level staffs. The median time to fill reported is between 3 to 6 months, where this occupation has become harder to fill as compared to a year ago. A minimum of Sijil Pelajaran Malaysia (SPM) and below is required for almost all vacancies listed by respondents in our Call-for-Evidence (CfE) survey with technical skills.
- iii. Based on the focus group discussion with Free Industrial Zone, Penang, Companies' Association (FREPENCA), plastics compression moulding machine operators and plastic moulders are critical in the industry. There is scarcity of talent pool with relevant, in-depth knowledge and



experience in plastic injection moulding machine and auxiliary equipment. Additionally, due to the smaller pool of talent in the northern region of Malaysia, companies have resorted to hire foreign talents to meet the needs of the industry. Moving forward, FREPENCA has proposed to incorporate plastic injection moulding module into the curriculum for technical and vocational schools.

- iv. Malaysian Plastics Manufacturers Association (MPMA) also seconded that some of the jobs nominated are critical in the industry due to insufficient local talents. Plastics laminating machine operators may be an exception as they may require higher skill sets for more complicated machines which are more highly automated. Chemical and Petrochemical Environmental Scan has also indicated that this occupation is critical in the industry.
- v. This occupation did not pass the top-down shortage overall threshold. The evidence we received concluded that there are issues in hiring local talents due to unattractive nature of the job, which results in companies opting for migrant workers to sustain their business operations. Additionally, this occupation is also facing a high risk of automation, where majority of the respondents are more likely to automate the task within this occupation in the coming year. Therefore, this occupation is excluded from the COL.



Occupation: Fibre Preparing, Spinning and Winding Machine Operator

MASCO 2013 (4-Digit Code): 8151

MASCO 2013 (6-Digit Code): 8151-01; 8151-03; 8151-06; 8151-07

Only the following job titles within this occupation are nominated:

Machine Operator (Thread and Yarn Twisting); Thread and Yarn Spinner; Machine Operator (Fibre Preparing); Machine Operator (Rope-Laying)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Passes 2 out of 4 indicators
Bottom-up CfE survey	2 nominations
Consultation	3 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	No	Yes
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	No	Yes	

Occupation Overview:

Top Skills:

1. Planning
2. English Language
3. Teamwork

Top Sector:

1. Manufacturing

Top Reasons of Hard-to-Fill:

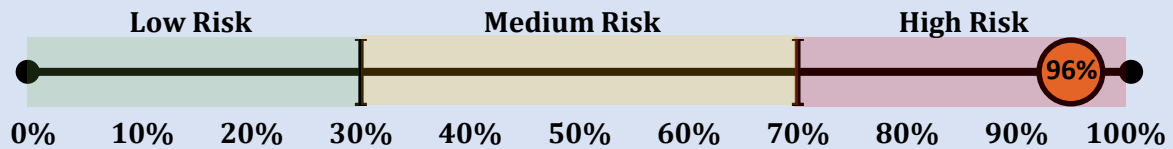
1. Too few applicants or no applicant at all
2. Applicants' expected compensation is beyond the market rate
3. Applicants lack relevant job experience

Top Strategies to Meet Shortages:

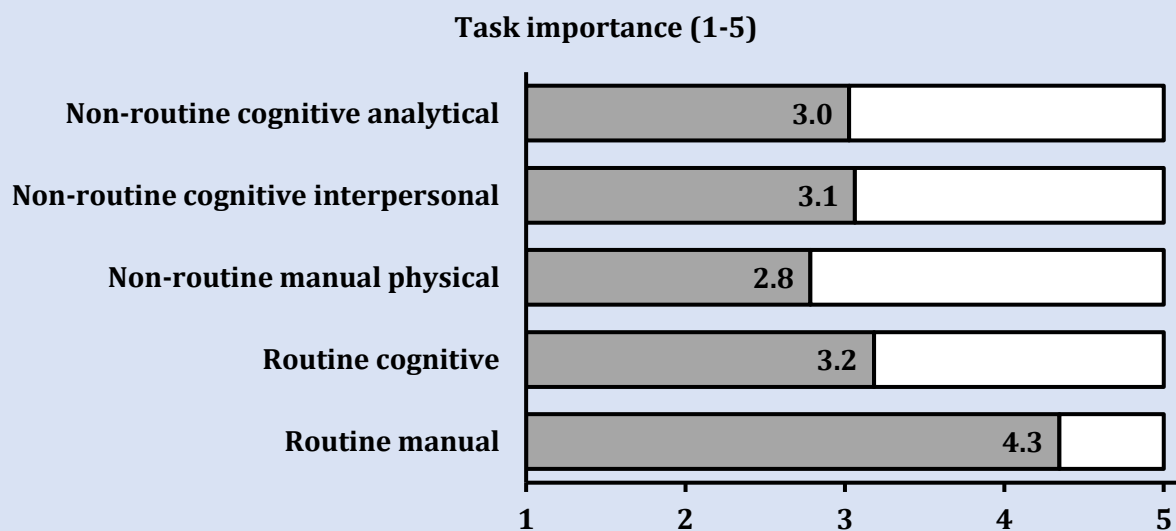
1. Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.)

2. Establishing or expanding partnerships with education or training providers focused on recruitment of graduates
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for machine operators for thread and yarn twisting.
- ii. Respondents have reported that vacancies within this occupation group are for entry level candidates with a minimum qualification of Sijil Pelajaran Malaysia (SPM). Additionally, having at least Sijil Kemahiran Malaysia (SKM) level 1 and arm hand steadiness, finger dexterity as well as near vision are also preferred as shared by the Malaysian Textile Manufacturers Association (MTMA). The median time to fill for this occupation is reported to be 2 to 3 months.



- iii. Input from the Malaysian Textile Manufacturers Association (MTMA) and the Malaysian Textile and Apparel Centre (MATAC) indicated that companies could not attract local applicants for this occupation as it is seen as non-glamorous jobs with low pay. Due to this, most foreign hires come from India and Bangladesh as they have related skills to textile. This is also supported by input from Malaysian Knitting Manufacturers Association (MKMA) where local candidates turn down employment opportunities in 3D (dangerous, dirty and difficult) industries not because of the small salaries but due to the jobs are often construed as lowly or demeaning.
- iv. Despite the limited top-down evidence available that points to a shortage, it seems that there is mismatch of salary expectations and the job itself which companies have begun to respond by expanding local recruitment efforts, establishing partnerships with education or training providers focused on recruitment of graduates and providing training. In addition, the weight of bottom-up evidence also does not support inclusion of this occupation.



Occupation: Weaving and Knitting Machine Operator

MASCO 2013 (4-Digit Code): 8152

MASCO 2013 (6-Digit Code): 8152-01; 8152-04; 8152-05

Only the following job titles within this occupation are nominated:

Machine Operator Warping Beam (Textile Weaving);
Machine Operator (Knitting); Machine Operator (Net Production)

This occupation appears on COL:

2015	No	2017	No
2016	No	2018	No

Source of evidence:

Top-down indicators	Insufficient data
Bottom-up CfE survey	3 nominations
Consultation	2 nominations
Talent/Skills studies	-

Top-down Data:

Working hours growth (1 year)	Working hours growth (3 years)	Employment growth (1 year)	Employment growth (3 years)	Wage premium growth (1 year)
NA	NA	NA	NA	NA
Wage premium growth (3 years)	Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate
NA	NA	NA	NA	NA
Falling experience requirements in job postings	Falling education requirements in job postings	Median vacancy duration	Share of vacancies posted for more than 6 weeks	
NA	NA	NA	NA	

Occupation Overview:

Top Skills:

1. Team Work
2. Technical Skills
3. Problem Solving

Top Sector:

1. Manufacturing

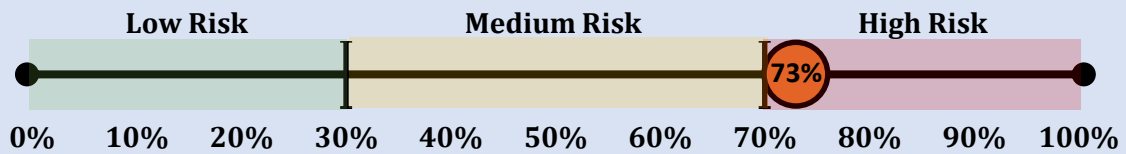
Top Reasons of Hard-to-Fill:

4. Too few applicants or no applicant at all
5. Applicants lack relevant job experience

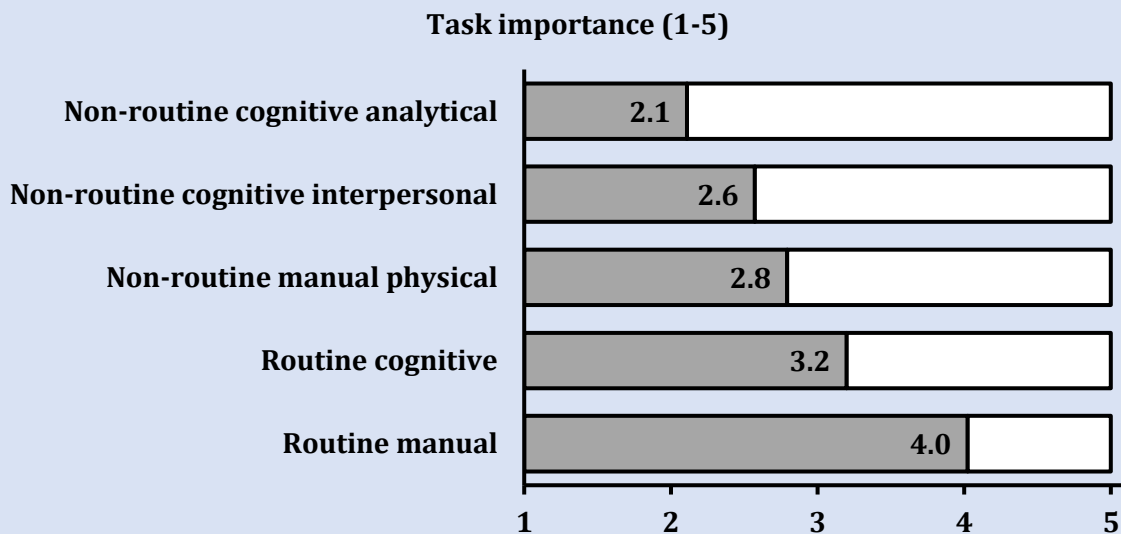
Top Strategies to Meet Shortages:

1. Expanding local recruitment efforts
2. Raising wages
3. Increasing worker training

Automatability: What is the probability that this occupation will be automated given current technology?



Task Importance: How important are different tasks related to automatability?



Bottom-up Evidence:

This occupation is not included in the COL.

- i. The job titles nominated reflect mostly the need for machine operators (knitting).
- ii. Most companies have reported that vacancies within this occupation group are for entry level positions with a median time to fill of 2 to 3 months. In addition, companies have reported that this occupation has become neither more nor less hard to fill as compared to a year ago. A minimum of a Sijil Pelajaran Malaysia (SPM) or below is required to qualify for this occupation.
- iii. Consultation with Malaysian Textile Manufacturers Association (MTMA) highlighted that this occupation could not attract local applicants due to unattractive salary. Jobs at low and semi-skilled level are usually dominated by foreign workers from India and Bangladesh as they have related skills in textile industry.
- iv. Further validation from Malaysian Knitting Manufacturers Association (MKMA) stated that local talent turns down employment opportunities in 3D (dangerous, dirty and difficult) industries because the jobs are often construed as demeaning. The Malaysian Textile and Apparel Centre



(MATAAC) noted that this occupation is being seen as low-level job, thus it does not really attract local and young generations.

- v. The shortage that the industry is experiencing is mostly influenced by talents' interest and career preferences as opposed to the lack of supply in the market. Additionally, the lack of robust evidences in both top-down data and bottom-up findings point to no widespread shortage. Hence, this occupation is not included in the COL.