



TalentCorp
GROUP OF COMPANIES



CRITICAL OCCUPATIONS LIST 2020/2021

OCCUPATION REPORT

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CSC

Critical Skills Monitoring Committee

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EXECUTIVE SUMMARY

The Government of Malaysia established the Critical Skills Monitoring Committee (CSC) as part of the Eleventh (11th) Malaysia Plan with the mandate to monitor skills imbalances.

One of the CSC's primary objectives is to develop a Critical Occupations List (COL) to serve as a platform for the coordination of human capital development policies. The CSC is jointly chaired by Talent Corporation Malaysia (TalentCorp), an agency under the purview of Ministry of Human Resources (MOHR); and the Institute of Labour Market Information and Analysis (ILMIA) from the Department of Statistics Malaysia (DOSM). This institutional structure allows the CSC to draw on ILMIA's labour market information sources, including its Labour Market Information Data Warehouse, and on TalentCorp's ties with stakeholders in the private sector.

The CSC has published an annual COL since 2015. The COL is a list of occupations for which there is strong evidence that there is significant labour market shortage that may be alleviated through Government action. Occupations on the COL meet the criteria of being **skilled**, **sought-after**, and **strategic**. The COL seeks to identify and draw stakeholder attention to this set of occupations that are critical to the continued growth and development of the Malaysian economy but are currently difficult to fill.

The 2020/2021 COL includes 42 occupations. This represents 9 per cent of the 451 non-military 4-digit occupations included in the Malaysia Standard Classification of Occupations (MASCO) 2020. Most of these occupations are high-skilled occupations at the managerial, professional, and associate professional level. Approximately 12 per cent of the occupations on the 2020/2021 COL are mid-skilled occupations, such as craft and trades workers and plant and machine operators and assemblers.

The impact of the COVID-19 pandemic towards the Malaysian economy and the labour market is significant. From the bottom-up evidence collected through the Call-for-Evidence (CfE) survey and consultation sessions with industry associations and companies, it is observed that most of the companies have deepened reliance on technology during the pandemic and have become more aware of digitalisation and automation. This has directly influenced the greater need for human capital development, training, and upskilling for the existing talent pool and future graduates on Information Technology and digital skills. An increased number of companies have also nominated digital professions as critical occupations this year.

86 per cent of the occupations (six out of seven occupations) that appear on the 2020/2021 COL for the first time are predominantly digital professions. The seven (7) occupations that appear for the first time on the 2020/2021 COL are: (1) Nursing Professionals, (2) Web and Multimedia Developers, (3) Data Professionals, (4) Cybersecurity Professionals, (5) Animation and Visual Effects Professionals, (6) Digital Games and eSports Professionals, and (7) Creative Content Designers Professionals.

OCCUPATIONS ON THE 2020/2021 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 (42 Occupations)		
No.	Critical Occupations (MASCO Code)	Additional Information
1	Managing Director and Chief Executive (1121)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Chief Executive Officer; Chief Operating Officer; Chief Technical Officer; Executive Director; Managing Director
2	Finance Managers (1211)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Chief Financial Officer (CFO); Finance Manager; Account Manager; Budget Manager; Audit Manager; Audit and Risk Management Manager; Credit Manager; Financial and Institution Manager; Tax Manager; Procurement Manager; Risk Modelling Manager; Actuarial Valuation Manager
3	Human Resource Managers (1212)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Human Resource Manager; Recruitment Manager; Occupational Safety Manager; Health, Safety, Environment and Quality Manager
4	Policy and Planning Managers (1213)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Policy and Planning Manager; Strategic Planning Manager; Corporate Planning Manager; Project Planning Manager; Regulatory Affairs Manager
5	Business Services Managers (1214)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Chief Compliance Officer; Production Manager; Production and Business Operation Manager; Business Services Development Manager; Production Planner; Production Controller; Business Development Manager; Compliance Manager; Supply Chain Manager; Sustainability Manager; Project Manager; Assistant Project Manager; Operation Planner
6	Sales and Marketing Managers (1221)	The following job titles within this occupation are included in the COL: Chief Marketing Officer; Sales Manager; Sales and Marketing Manager; Marketing Manager; Sales Promotion Manager;

Table 1: Critical Occupations List – Full List (42 Occupations)

		Product Manager; Sales Director; Branch Manager; Marketing Assistant Manager
7	Advertising and Public Relations Managers (1222)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Customer Relationship Manager; Social Media Manager
8	Information and Communications Technology Managers (1511)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Chief Data Officer; Chief Information Technology Officer; Information Technology Manager; Data Processing Manager; Application Development Manager; Database Manager; Information Technology Project Manager; Information Technology Infrastructure Manager; Network Operations Manager; Information Technology Support Manager; Software Development Manager; E-Commerce Application Development Manager; Information Technology Governance Manager; Building Information Modelling Manager (BIM); Risk Manager (Information Technology); Security Operation Manager (Information Technology); Software Architect Manager; Data Analytics Manager
9	Chemists (2113)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Chemist; Chemist, Rubber; Chemist, Inorganic; Chemist, Pharmaceutical
10	Mathematician, Actuaries and Statisticians (2121)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Mathematician; Actuarial Science
11	Industrial and Production Engineers (2141)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Automation Engineer; Industrial Engineer; Production Engineer; Planning Engineer; Printing Technologist; Textile Technologist; Wood Technologist; Plant Engineer; Automation Design Engineer; Product Engineer; Project Engineer; Process Engineer; Robotic Process Automation (RPA) Developer
12	Civil Engineers (2142)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Executive Officer (Engineering) Grade 41; Engineer; Civil Engineer; Civil Engineer, Structural; Civil Engineer, Highways and Road; Civil Engineer, Road Construction; Civil Engineer, Hydraulics; Geotechnical Engineer
13	Mechanical Engineers (2144)	The following job titles within this occupation are included in the COL:

Table 1: Critical Occupations List – Full List (42 Occupations)

		<ul style="list-style-type: none"> Mechanical Engineer; Internal Combustion Engine Engineer; Steam Engineer; Welding Technologist; Microprogramming Engineer; Technology Technical Engineer; Equipment Engineer; Instrumentation Engineer; Mechanical Maintenance Engineer; Operation Engineer; Research and Development Engineer; CAD/CAM Engineer (Computer-Aided Design and Manufacturing); Vehicle Engineer; Industrial Automation Engineer; Mechatronic Engineer; Technical Service Engineer
14	Manufacturing Professionals (2182)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> Quality Assurance Executive; Quality Assurance Analyst; Quality Control Executive; Production Executive; Warehouse Executive; Supply Chain/Procurement Specialist; Production Specialist; Logistics Executive; Logistic Coordinator; Quality Control Analyst; Operation Coordinator
15	Specialist Medical Professionals (2212)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> Anaesthetist; Medical Oncologist; Radiotherapy Oncologist; Neurologist; Gynaecologist; Paediatrician; Physician, Cardiology
16	Nursing Professionals (2221)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> District Nurse; Nurse; Operation Theatre Nurse
17	Environmental and Occupational Health and Hygiene Professionals (2263)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> Occupational Health and Safety Officer; Industrial Safety Officer - Occupational Safety and Health; Occupational Health and Safety Officer
18	Accountants (2411)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> Accountant; Liquidator; Management Accountant; Company Accountant; Account Executive; Financial Controller; Auditor; Internal Auditor; Executive Account Officer; Account Officer; Administrative and Account Executive; Cost Analyst
19	Financial and Investment Advisers (2412)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> Financial and Investment Adviser; Finance Executive; Bank Executive Officer; Estate Planner; Wealth Consultant; Leasing Executive

Table 1: Critical Occupations List – Full List (42 Occupations)

20	Research and Development Professionals (2426)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Research and Development Executive; Scientist
21	Advertising and Marketing Professionals (2431)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Business Market Research Executive; Marketing; Communications Specialist; Compliance Officer; Shariah; Compliance Officer; Technical Adviser; Sales Executive; Marketing Executive; Business Development Executive; Sales Administrative Executive; Sales Engineer; Social; Media Marketing Executive; Digital Marketing Executive; Sales Officer; Sales Executive Coordinator; Sales and Marketing Executive; Event Executive; Sales Consultant; Advertising/Promotion Executive; Order Management Coordinator
22	Systems Analysts (2511)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Management Information Systems (MIS) Analyst, Computer Systems Analyst, Computer Consultant, Information Technology Systems Consultant, Information Technology Specialist SAP (Systems Applications and Products)
23	Software Developers (2512)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Software Developer; Application Developer (.Net); Application Engineer (.Net); Software Engineer; Debug Software Engineer; Mobile Application Developer (Mobile App); Blockchain Developer; Programmable Logic Controller (PLC) Engineer; Computer Systems Engineer; System Developer; Software Engineer (Python); Software Consultant; Application Developer; Application Architect; Manufacturing Execution System Developer
24	Web and Multimedia Developers (2513)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Website Developer; Full Stack Developer
25	Applications Programmers (2514)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Computer Programmer; Software Programmer; Information Technology Programmer; Applications Programmer; Animation Programmer; User Interface (UI)/ Gameplay Coders

Table 1: Critical Occupations List – Full List (42 Occupations)

26	Software and Applications Developers and Analysts not Elsewhere Classified (2519)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Software Tester; Systems Tester; Product Quality Assurance Engineer (Information Technology); Quality Assurance Analyst (Information Technology); Solution Architect (Information Technology); Information Technology Auditor; Tester (Selenium, Cucumber Skills)
27	Systems Administrators (2522)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Information System Officer; Computer System Administrator; Information Technology Executive; System Support Specialist; Cloud Computing Solution Architect; Information Technology Architect; Enterprise Applications Architect; Technical Support Engineer (Information Technology); Information Technology Infrastructure Specialists; Information Technology Engineer; Technical System Administrator; BIM Coordinator (Building Information Modelling)
28	Computer Network Professionals (2523)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Network Analyst; Network Engineer; Cloud Specialist; Network System Engineer (Information Technology)
29	Data Professionals (2524)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Data Scientist; Big Data Engineer; Data Analyst; Data Architect; Machine Learning Engineer; Artificial Intelligence Engineer (AI)
30	Cybersecurity Professionals (2531)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • Information and Communication Technology Security Executive; Digital Forensic Specialist; Security Engineer (Information Technology); Cybersecurity Specialist; Information Security Analyst; Incident Responder (Information Technology); Penetration Tester (Information Technology); Cyber Risk Analyst
31	Animation and Visual Effects Professional (2541)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none"> • 3D Animator; 2D Animator; CG Modeller; 3D Modeller; Lighting Artist; Composer/ Composite Artist; Graphics Illustrator; Visualization Specialist; Content Writer/ Creator; Content Moderator

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32	Digital Games and eSports Professionals (2542)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Game Designer (Digital); Game Producer (Digital); 3D Artist; 2D Artist; Game Programmer (Digital); Digital, Games, and eSports Professionals
33	Creative Content Designer Professionals (2543)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Web Designer; Graphic Designer; Multimedia Designer; Creative Designer; UI Designer (User Interface)
34	Mechanical Engineering Technicians (3115)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Mechanical Engineering Technician; Mechanical Engineering Technician, Industrial Machinery and Tools; Refrigeration and Air-Conditioning System Engineering Technician; Automobile Engineering Assistant; Machine Technician; Welding Technician; Spinning Technician; Knitting Technician; Weaving Technician; AutoCad Drafter; Equipment Technician; Repair and Maintenance (R&M) Technician
35	Physical and Engineering Science Technicians Not Elsewhere Classified (3119)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Maintenance Technician; Methods Engineering Technician; Quality Control Technician; Production Technician; Quality Assurance Engineering Technician; Water Technician; Test Technician
36	Manufacturing Supervisors (3122)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Manufacturing Supervisor; Production Supervisor; Plywood Inspection Supervisor; Quality Controller; Non-destructive Testing (NDT) Inspector; Supervisor; Store Supervisor; Maintenance Supervisor; Warehouse Supervisor, Halal Logistics Operation; Assistant Supervisor; Quality Assurance Supervisor
37	Construction Supervisors (3123)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Operation Supervisor; Project Supervisor; Construction Supervisor; Site Supervisor; Site Safety Supervisor; Environmental Supervisor; Supervisor, Building Operations
38	Welders and Flame Cutters (7212)	The following job titles within this occupation are included in the COL: <ul style="list-style-type: none"> • Welder; Foreman, Welder; Underwater Welder
39	Agricultural And Industrial	The following job titles within this occupation are included in the COL:

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	Machinery Mechanics and Repairers (7233)	<ul style="list-style-type: none">• Machinery Mechanic; Mechanic, Plant Maintenance; Farm Machinery Repairer; Industrial Machinist; CNC Machinist (Computer Numerical Control)
40	Electrical Mechanics and Fitters (7412)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none">• Wireman; Foreman, Electrical; Foreman, Maintenance; Chargeman; AO Chargeman; BO Chargeman; Electrical Wireman
41	Steam Engine and Boiler Operators (8182)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none">• Boilerman; Operator, Steam Boiler Plant; Operator, Steam Engine
42	Heavy Truck and Lorry Drivers (8332)	<p>The following job titles within this occupation are included in the COL:</p> <ul style="list-style-type: none">• Driver, Lorry; Assistant Driver, Lorry; Driver, Truck; Driver, Halal Logistics; Uploader Machinery Driver

DOVETAILING REPORTS OF OCCUPATIONS ON THE 2020/2021 CRITICAL OCCUPATIONS LIST

Occupation: Managing Director and Chief Executive									
MASCO 2020(4-Digit Code): 1121									
MASCO 2020(6-Digit Code): 1121-01, 1121-02, 1121-04, 1121-05, 1121-08									
Only the following job titles within this occupation are included in the Critical Occupations List (COL):			Chief Executive Officer; Chief Operating Officer; Chief Technical Officer; Executive Director; Managing Director						
This occupation appears on COL:									
2015	No	2016	Yes	2017	Yes	2018	Yes	2019	Yes
Source of evidence:									
Top-down indicators		Passes 9 out of 11 indicators							
Bottom-up CfE survey		12 nominations							
Consultation		4 nominations							
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)	Wage premium growth (3 years)				
No	No	Yes	Yes	Yes	Yes				
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings					
Yes	Yes	Yes	Yes	Yes					

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Interpersonal and Communication Skills 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Education 2. Transportation and Storage 3. Agriculture, Forestry, and Fishing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Expanding local recruitment efforts 4. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate 2. STPM Level/ Matriculation 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. General Programmes 3. Services

Bottom-up Evidence:

This occupation is included in the COL.

- All five job titles nominated above (Chief Executive Officer, Chief Operating Officer, Chief Technical Officer, Executive Director, Managing Director) received equal number of nominations.
- Majority of vacancies reported within this category require middle to senior level experience. The years of experience required falls within the range of 5 to 10 years. The predominant time taken to fill vacancies in this job title ranges between 2 to 3 months.
- Minimum level of qualifications required for this job title is reported as STPM/matriculation level. Minimum level of qualifications varies vastly by organisations where smaller organisations tend to be more flexible on paper qualification criteria. The industry places higher emphasis on applied skills and industry experience.
- Lack of relevant job experience is the most prevalent reason leading to this job title being characterised as hard-to-fill. Increase of supply for this job title is limited by the nature of experience required that can only be gained through hands on experience in the industry.
- Key challenges in filling vacancies in this job title are to find candidates with the suitable business acumen and expertise, and the ability for employers to pay above market rate compensation package.
- Evidence that support the inclusion of this job title as a critical occupation is backed by 9 out of 11 top-down indicators and 16 bottom-up nominations.

Occupation: Finance Managers

MASCO 2020(4-Digit Code): 1211

MASCO 2020(6-Digit Code): 1211-01, 1211-02, 1211-03, 1211-04, 1211-05, 1211-06, 1211-07, 1211-11, 1211-14, 1211-21, 1211-22, 1211-23

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Chief Financial Officer (CFO); Finance Manager; Account Manager; Budget Manager; Audit Manager; Audit and Risk Management Manager; Credit Manager; Financial and Institution Manager; Tax Manager; Procurement Manager; Risk Modelling Manager; Actuarial Valuation Manager
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This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	20 nominations
Consultation	7 nominations

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)	Wage premium growth (3 years)
No	No	No	No	NA	Yes
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Professional, Scientific and Technical Activities 2. Manufacturing 3. Financial and Insurance/Takaful Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicant 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode and Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certification 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. Science, Mathematics, and Computing 3. General Programmes
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for finance managers, actuarial valuation managers, and tax managers. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the middle level experience equivalent to at least 5 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a bachelor's degree is required for all vacancies listed by the respondents in the CfE survey. In some cases, applicants are also required to have a minimum of a master's degree with inter-field experience, i.e. Risk Management. Applicants for this occupation also requires professional certifications such as those offered by the Association of Chartered Certified Accountants (ACCA), the Chartered Institute of Management Accountants (CIMA), Chartered Financial Analyst (CFA), be a member of the Malaysian Institute of Accountant (MIA), and/or member of the Malaysian Institute of Certified Public Accountants (MICPA). The top skills required for this occupation group are technical skills, analytical skills, and problem solving. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies may take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to the applicants' lack of relevant job experience, applicants' lack of required credential or certifications, and too few applicants for the vacancies. 	

- v. Consultation with the Association of Banks in Malaysia (ABM) indicated that there is a lack of talents for credit managers in the Malaysian market as the current talent pool lack the ability to be accountable in approving big ticket deals due to insufficient allocation of delegation and confidence in decision making.
- vi. Furthermore, based on consultations with the National Tech Association of Malaysia (PIKOM), the Malaysian Association of Hotels (MAH), the Sarawak Chamber of Commerce & Industry (SCCI), and the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated that there is also lack of local talent for this occupation in the market, as the existing talents mainly lack relevant credentials and skills, lack relevant job experience to the specific industry or company, and some expect compensation packages beyond the market rate. The jobs that were mentioned in the consultations are finance and accounting managers, risk management officers, credit managers and credit analysts, and risk modelling managers.
- vii. With the increasing number of vacancies, vacancy rate, and wage premium growth for this occupation, coupled with the high number of nominations and strong evidence from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Human Resource Managers

MASCO 2020(4-Digit Code): 1212

MASCO 2020(6-Digit Code): 1212-02, 1212-07, 1212-08, 1212-13

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

Human Resource Manager; Recruitment Manager; Occupational Safety Manager; Health, Safety, Environment and Quality Manager

This occupation appears on COL:

2015	No	2016	Yes	2017	No	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 10 indicators
Bottom-up CfE survey	7 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	NA	Yes
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Problem Solving 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Construction 3. Information and Communication
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicant 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode & Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for human resource managers and health, safety, environment and quality managers. ii. The majority of companies reported that vacancies within this occupation group are mainly for the middle to senior level with at least 5 to 10 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, majority of the respondents mentioned that a minimum of a bachelor's degree is preferable.. In some cases, applicants for this occupation will require having professional certifications such as the Green Book or Yellow Book certifications to qualify for particular roles, such as for the occupational safety and health managers, and health, safety, environment and quality managers. The top skills required for this occupation group are interpersonal and communication skills, problem solving, and analytical skills. iv. Most companies cited that it usually takes at least about 5 to 6 months for the vacancies to be filled, while some companies mentioned that it can take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, applicants' lack of required credential or certifications, and too few applicants for the vacancies. v. Consultation with the National Tech Association of Malaysia (PIKOM) indicated that this occupation is critical as the applicants require professional certification and a certain level of 	

job experience in the relevant industry or companies. Some of these jobs in this occupation group will require the applicants to not only know about interviewing and recruitment, but also other human resource skills such as being able to negotiate remuneration packages, being responsible for the wellbeing of the employees, developing training and development plans for employees, and also running campaigns in university and colleges to expose brand presence for the company and recruiting fresh graduates.

- vi. In addition, consultation with the Malaysian Petrochemicals Association (MPA) indicated that there is difficulty securing good candidates especially when the post requires the applicants to relocate to other locations such as the East Coast.
- vii. With the strong results from the top-down analysis and the bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Policy and Planning Managers

MASCO 2020(4-Digit Code): 1213

MASCO 2020(6-Digit Code): 1213-01, 1213-02, 1213-03, 1213-05, 1213-08

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

Policy and Planning Manager; Strategic Planning Manager; Corporate Planning Manager; Project Planning Manager; Regulatory Affairs Manager

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 1 out of 3 indicators
Bottom-up CfE survey	4 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	Yes	No	No	

Occupation Overview:	
Top Skills: 1. Interpersonal and Communication Skills 2. Problem Solving 3. Technical Skills	Top Sectors: 1. Manufacturing 2. Construction 3. Information and Communication
Top Reasons of Hard-to-Fill: 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicant	Top Strategies to Meet Shortages: 1. Expanding local recruitment efforts 2. Raising wages 3. Increasing worker training
Minimum Level of Qualification: 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate	Top Field of Study: 1. Social Sciences, Business, and Law 2. Science, Mathematics, and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for strategic planning managers. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the middle level experience equivalent to at least 5 years of working experience. In addition, the companies mentioned that it is equally hard to fill the vacancies, if not harder to fill as compared to a year ago. iii. A minimum of a bachelor's degree is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are interpersonal and communication skills, problem solving, and technical skills. iv. It is reported that majority of the companies take more than 6 months on average to have the vacancies filled. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, applicants' lack of required credential or certifications, and too few applicants for the vacancies. v. Consultation with the Master Builder Association Malaysia (MBAM) indicated that the position of a project planning manager usually takes around half a year to fill due to lack of talent. MBAM also suggests that the Government provide grants to accelerate training and development for the required skills for this position, and that there should be greater academia engagement efforts with the industry. vi. Additionally, according to consultation with the Public Relations and Communications Association of Malaysia (PRCA Malaysia), the position of a policy and planning manager requires specific industry experience and the ability to lead and manage a team which would not be gained entirely through training. 	

vii. With the increasing number of vacancies and the data and evidence collected from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Business Services Managers

MASCO 2020(4-Digit Code): 1214

MASCO 2020(6-Digit Code): 1214-01, 1214-02, 1214-03, 1214-04, 1214-05, 1214-06, 1214-07, 1214-08, 1214-11, 1214-13, 1214-14, 1214-15, 1214-19

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

Chief Compliance Officer; Production Manager; Production and Business Operation Manager; Business Services Development Manager; Production Planner; Production Controller; Business Development Manager; Compliance Manager; Supply Chain Manager; Sustainability Manager; Project Manager; Assistant Project Manager; Operation Planner

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 4 out of 9 indicators
Bottom-up CfE survey	30 nominations
Consultation	6 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	NA	Yes
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Technical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Construction 2. Manufacturing 3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Advanced Diploma/ SKM Level 5 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. Social Sciences, Business, and Law 3. Science, Mathematics, and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for project managers, business development managers, business services development managers, and production managers. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior levels, but more for the junior level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, majority of the respondents mentioned that a minimum of a bachelor's degree is preferred. In some cases, applicants for this occupation in a financial institution may require professional certification as a Certified Financial Planner (CFP), and some other specific requirements that were listed include, Registered Financial Planner (RFP), Software Development Life Cycle (SDLC), Process Reengineering, and Business Analysis. As for the pharmaceutical industry, applicants will require at least a bachelor's degree in science with minimum of 6 years of relevant pharmaceutical experience. The top skills required for this occupation group are interpersonal and communication skills, technical skills, and problem solving. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies cited that it could take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, too few applicants for the vacancies, and applicants' lack of required credential or certifications. 	

- v. Consultations with the Malaysian Textile Manufacturers Association (MTMA), the Malaysian Textile and Apparel Centre (MATAC), and the Federation of Malaysian Fashion, Textiles & Apparels (FMFTA) indicate that there is lack of talent for the production planner and controller role, as there are insufficient applicants due to low awareness and interest of job opportunities in the textile industry. There are also no universities currently offering textile technology/engineering courses.
- vi. In addition, consultation with the Malaysian Organisation of Pharmaceutical Industries (MOPI) indicates that business development managers are increasingly difficult to hire due to the stringent regulations by the National Pharmaceutical Control Bureau (NCB) and a lot more tedious documentation work to complete before a hiring can be done. Furthermore, consultation with the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicates that the role of a compliance manager is also hard to fill as the banks are pinching potential Compliance candidates from one another, causing high turnover for this job, and more talents eventually changing career directions as well.
- vii. According to consultation with the Sarawak Chamber of Commerce and Industry (SCCI), most of the companies in Sarawak usually groom their own staff and talents, or their own family members for this occupation group. Meanwhile, the large companies or Government-linked Companies (GLCs) have different considerations when hiring a talent for this occupation based on the required skills and job experience.
- viii. With the increasing number of vacancies, vacancy rate, employment growth, and wage premium growth for this occupation, coupled with the strong bottom-up evidence from both CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Sales and Marketing Managers

MASCO 2020(4-Digit Code): 1221

MASCO 2020(6-Digit Code): 1221-01, 1221-02, 1221-03, 1221-04, 1221-05, 1221-07, 1221-13, 1221-14, 1221-18

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

Chief Marketing Officer; Sales Manager; Sales and Marketing Manager; Marketing Manager; Sales Promotion Manager; Product Manager; Sales Director; Branch Manager; Marketing Assistant Manager

This occupation appears on COL:

2015	No	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 11 indicators
Bottom-up CfE survey	20 nominations
Consultation	4 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	Yes	Yes
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Technical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 2. Accommodation and Food Service Activities 3. Arts, Entertainment and Recreation
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode & Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. Engineering, Manufacturing and Construction 3. Services
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for sales managers, sales and marketing managers, and marketing managers. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are interpersonal and communication skills, technical skills, and problem-solving. iv. The average time for the vacancies to be filled varies across industries, but most companies cited that it usually takes at least about 2 to 3 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, too few applicants for the vacancies, and applicants' lack of required credential or certifications. v. Consultation with the National Tech Association of Malaysia (PIKOM) indicated that Malaysia ranked top-3 in the Global Services Location Index in 2019, and there is a huge demand for talents to be upskilled, including for sales and marketing manager roles. PIKOM also mentioned that sales and marketing managers require certain level of job experience particularly in the specific industry to fully understand the products and services. The Association of Islamic 	

Banking and Financial Institution Malaysia (AIBIM) mentioned the same that a talent for this occupation will require years of experience to build the knowledge on products and services in order to attract customers to make purchases.

- vi. Following from consultation with the Malaysian Association of Themepark & Family Attractions (MATFA), it is indicated that although there may be many marketing graduates produced by the universities and colleges, not many possess the creativity to drive sales and marketing for the tourism and theme park industry, especially when creativity comes with experience. These talents are also required to be good at digital marketing, which is a digital skill that is increasingly in demand today.
- vii. Consultation with Coca-Cola Malaysia also highlighted that someone who works in this occupation will need to be good at route-to-market strategies for different products and services and understand how to grow revenue for the company.
- viii. With the increasing number of vacancies, employment growth, and wage premium growth for this occupation, with supporting data and evidence collected from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Advertising and Public Relations Managers

MASCO 2020(4-Digit Code): 1222

MASCO 2020(6-Digit Code): 1222-12, 1222-13

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

Customer Relationship Manager; Social Media Manager

This occupation appears on COL:

2015	No	2016	Yes	2017	No	2018	Yes	2019	No
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Source of evidence:

Top-down indicators	Passes 4 out of 6 indicators
Bottom-up CfE survey	2 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
NA	No	NA	No	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	Yes	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Technical Skills 3. IT and Digital Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Wholesale and retail trade; repair of motor vehicles and motorcycles 2. Information and communication 3. Other services activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Applicants lack relevant job experience 3. Applicants lack the required technical skills 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Hiring less well qualified applicants 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree / Graduate 2. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Services 2. Engineering, manufacturing, and construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job title nominated reflects mostly the need for customer relationship managers. ii. The majority of companies reported that vacancies within this occupation group are mainly for the middle to senior level equivalent to at least 5 to 10 years of working experience. In addition, all the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, and the top skills required for this occupation group are interpersonal and communication skills, technical skills, and IT and digital skills. iv. Most of the companies cited that it usually takes at least about 2 to 4 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of required credential or certifications, applicants' lack of relevant job experience, and applicants lack the require technical or occupational skills. v. Consultation with the National Tech Association of Malaysia (PIKOM) indicated that this occupation is critical as the applicants will require professional certification and a certain level of job experience in the relevant industry or companies, particularly in the field of digital advertising. vi. In addition, consultation with the Public Relations and Communications Association of Malaysia (PRCA Malaysia) indicates that the key challenge in filling vacancies for social media manager roles include difficulties in finding candidates with skills in writing storyboards in English, Bahasa Malaysia, and Mandarin. Experienced candidates lack familiarity with the latest digital marketing/technologies and trends. On the contrary, fresh graduates that have knowledge of 	

digital marketing/technologies and trends, lack the required business acumen that comes with the experience in being in the market.

- vii. Meanwhile, consultation with the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated that the talent pool for customer relationship managers for the banking industry lack license and knowledge about the banking products and the industries to sell and upsell their products to their customers.
- viii. The associations and the companies have also stated that they have been working with universities to provide feedback on the course syllabus offered in the education institutions, while they also provide training to upskill talents with professional qualifications.
- ix. With the strong results and evidence from top-down and bottom-up analysis, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Information and Communications Technology Managers

MASCO 2020(4-Digit Code): 1511

MASCO 2020(6-Digit Code): 1511-02, 1511-04, 1511-07, 1511-11, 1511-12, 1511-20, 1511-22, 1511-23, 1511-30, 1511-34, 1511-35, 1511-36, 1511-37, 1511-38, 1511-39, 1511-41, 1511-43, 1511-44

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

Chief Data Officer; Chief Information Technology Officer; Information Technology Manager; Data Processing Manager; Application Development Manager; Database Manager; Information Technology Project Manager; Information Technology Infrastructure Manager; Network Operations Manager; Information Technology Support Manager; Software Development Manager; E-Commerce Application Development Manager; Information Technology Governance Manager; Building Information Modelling Manager (BIM); Risk Manager (Information Technology); Security Operation Manager (Information Technology); Software Architect Manager; Data Analytics Manager

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 6 out of 9 indicators
Bottom-up CfE survey	5 nominations
Consultation	12 nominations

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)	Wage premium growth (3 years)
No	Yes	Yes	Yes	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Technical Skills 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Arts, Entertainment and Recreation 2. Information and Communication 3. Financial and Insurance/Takaful Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Applicants lack the required technical or occupational skills 3. Too few or no applicant 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Hiring less well qualified applicants 3. Partnerships with education or training providers
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing

Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for application development managers, information technology managers, and data analytics managers.
- The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the middle to senior level experience equivalent to at least 5 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago.
- A minimum of a bachelor's degree is required for all vacancies listed by the respondents in the CfE survey. This occupation requires professional certifications such as project management office (PMO), and information technology (IT) software engineering related certifications. The top skills required for this occupation group are problem-solving, technical skills, and analytical skills.
- Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies may take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of required credential or certifications, applicants' lack the required technical or occupational skills, and too few applicants for the vacancies.
- Consultations with the Association of Banks in Malaysia (ABM), the Master Builders Association Malaysia (MBAM), and the Association of Islamic Banking and Financial Institution (AIBIM) indicate that there is lack of local talent for this occupation in the market, while the existing talents lack credentials and skills or job experience.

- vi. Meanwhile, consultation with the Malaysian Oil and Gas Services Council (MOGSC) indicates that applicants are demanding for higher remuneration than the market average, however their skills are not up to par to match the employers' willingness to offer. Besides, consultation with the Malaysian Association of Themepark & Family Attractions (MATFA) indicates that this occupation is in demand especially with the exponential growth of the ICT industry, and data is a very important asset to help companies improve customer experience, customers' usage pattern, etc. to help companies with product development and product upselling.
- vii. With strong results from the top-down analysis and bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Chemists

MASCO 2020(4-Digit Code): 2113

MASCO 2020(6-Digit Code): 2113-02, 2113-03, 2113-05, 2113-24

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

Chemist; Chemist, Rubber; Chemist, Inorganic; Chemist, Pharmaceutical

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 5 indicators
Bottom-up CfE survey	1 nomination
Consultation	4 nominations

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)	Wage premium growth (3 years)
No	NA	Yes	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	NA	Yes	Yes	NA	

Occupation Overview:	
Top Skills: 1. Technical Skills 2. Problem Solving 3. Analytical Skills	Top Sectors: 1. Manufacturing
Top Reasons of Hard-to-Fill: 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack the required technical or occupational skills	Top Strategies to Meet Shortages: 1. Hiring less well qualified applicants 2. Expanding local recruitment efforts 3. Expanding international recruitment efforts
Minimum Level of Qualification: 1. Bachelor's Degree / Graduate	Top Field of Study: 1. Science, Mathematics, and Computing

Bottom-up Evidence:

This occupation is included in the COL.

- i. Analysis of the nomination trends indicate that all job titles under the chemist category are of equal importance. This includes chemist, chemist-rubber, chemist-inorganic, and chemist-pharmaceutical
- ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the entry and junior level experience equivalent to fresh graduates for entry level, and at least 2 years of working experience for junior level experience. In addition, all the companies mentioned that this occupation has not been less hard to fill as compared to a year ago.
- iii. A minimum of a bachelor's degree qualification is required for all vacancies listed by some of the respondents in the CfE survey. In some cases, applicants for this occupation will require having professional certifications such as a bachelor's degree in Polymer Chemistry or Chemical Engineering to be qualified for a chemist role in the textile industry, and some other Chemist roles may require obtaining certification from the Chemicals Commission. The top skills required for this occupation group are technical skills, problem solving, and analytical skills.
- iv. Most of the companies cited that it usually takes about 2 to 3 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants' lack of required credential or certifications, and applicants' lack the required technical or occupational skills.
- v. Consultation with the Chemical Industries Council of Malaysia (CICM) indicates that there is shortage in talents that meet the specialised areas of chemical manufacturing. These talents are required to have an expertise in the niche skills for specific industries. In addition, consultation with the Malaysian Organisation of Pharmaceutical Industries (MOPI) indicates that talents in Malaysia only either have background in chemical or in pharmaceutical, but not both. The

companies that require talents with both backgrounds will have the positions typically filled by expatriates from India.

- vi. Meanwhile, consultation with the Malaysian Rubber Products Manufacturers' Association (MRPMA) indicates that certain industries require specialisation, especially for rubber and pharmaceuticals industries. Due to shortages in the domestic labour market, companies have resorted to hiring expatriates. The industry also faces challenges in hiring locals as the manufacturing industries suffer from a poor perception of being 'dirty, dangerous and difficult. Besides, consultation with the Sarawak Chamber of Commerce and Industry (SCCI) indicates that shortages in chemists are noted regionally in Sarawak where demand is mainly driven by chemical and quality control labs.
- vii. The industry associations have taken several strategies to overcome shortages of Chemists, such as signing Memorandum of Understandings (MoUs) with the Selangor Human Resource Development Centre and multiple universities to improve collaboration between industry and learning institutions and improving working skills and move towards Smart Manufacturing and the 4th Industry Revolution (I.R. 4.0).
- viii. With the strong evidence from top-down and bottom-up analysis, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Mathematician, Actuaries and Statisticians

MASCO 2020(4-Digit Code): 2121

MASCO 2020(6-Digit Code): 2121-05

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

Mathematician, Actuarial Science

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 1 out of 3 indicators
Bottom-up CfE survey	4 nominations
Consultation	1 nomination

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	Yes	No	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Financial and Insurance/Takaful Activities 2. Professional, Scientific and Technical Activities 3. Real Estate Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. We cannot afford to pay the market rate for the applicants due to cost-cutting 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate 2. Diploma/SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Science, Business and Law 2. Science, Mathematics, and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job title actuaries as referred to by the industry or mathematician, actuarial science by MASCO definitions is the sole job title nominated under this job category. ii. Vacancies for this job title are predominantly in junior to middle level experience category. The level of experience required by the industry is at least 3 years and due to the increase in demand, companies are finding it hard to find candidates. The predominant time taken to fill vacancies in this job title ranges between 1 to 4 months. iii. The minimum qualification level for this job title is from the diploma level. Among the factors contributing to the occupation being hard-to-fill is the lack of relevant job experience among candidates. iv. The industry experienced a slowdown during the COVID-19 pandemic lockdowns. With restrictions easing, the industry is observing resumption in hiring. Due to the difficulties in finding candidates with a suitable level of experience, the industry is adapting to the situation by investing in training and development. v. Consultation with Life Insurance Association of Malaysia (LIAM) indicates that a shortage in the occupation is largely due to the requirement of at least 3 years of work experience. When there is a surge in demand, the industry finds it hard to find candidates with the right fit. Close to 50 per cent of LIAM's members are facing shortages in recruiting actuarial scientists. vi. The bottom-up evidence shows that this occupation is critical and supports the inclusion in the COL. 	

Occupation: Industrial and Production Engineers

MASCO 2020(4-Digit Code): 2141

MASCO 2020(6-Digit Code): 2141-01, 2141-03, 2141-04, 2141-09, 2141-19, 2141-22, 2141-23, 2141-24, 2141-37, 2141-52, 2141-67, 2141-68, 2141-78

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

Automation Engineer; Industrial Engineer; Production Engineer; Planning Engineer; Printing Technologist; Textile Technologist; Wood Technologist; Plant Engineer; Automation Design Engineer; Product Engineer; Project Engineer; Process Engineer; Robotic Process Automation (RPA) Developer

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 7 out of 11 indicators
Bottom-up CfE survey	27 nominations
Consultation	5 nominations

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)	Wage premium growth (3 years)
Yes	Yes	Yes	Yes	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Technical Skills 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Construction 3. Electricity, Gas, Steam and Air Conditioning Supply
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicant 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Advanced Diploma/ SKM Level 5 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. Science, Mathematics, and Computing 3. General Programmes
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for process engineers, production engineers, and project engineers. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior level experience equivalent to at least 2 years of working experience. In addition, most of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a diploma level qualification is required for all vacancies listed by the respondents in the CfE survey, however most of the respondents indicated that a bachelor's degree is required. This occupation requires professional certifications such as project management professional (PMP), and Primavera P6 certification. The top skills required for this occupation group are problem-solving, technical skills, and analytical skills. iv. Most of the companies cited that it usually takes at least about 3 to 6 months for the vacancies to be filled, while some companies may take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, applicants' lack the required credential or certification, and too few applicants for the vacancies. v. Consultation with the Malaysia Automation Technology Association (MATA) indicates that the smaller companies tend to find it challenging to fill the job roles for this occupation as they operate within a lower cost structure and are not able to provide attractive remuneration packages. Furthermore, they mentioned that the work experience is very important for this industry, and this can only be acquired through on-the-job training. 	

- vi. Meanwhile, consultation with the Sarawak Chamber of Commerce & Industry (SCCI) indicates that most graduates in Sarawak in this field of study are more likely to look out for job opportunities in the oil and gas industry as they can provide better remuneration packages, as compared to other industries such as timber production or plantation for engineering roles.
- vii. The Malaysian Textile Manufacturers Association (MTMA), the Malaysian Textile and Apparel Centre (MATAC), and the Federation of Malaysian Fashion, Textiles & Apparels (FMFTA) indicate that there is insufficient applicants due to low awareness and interest of job opportunities in textile industry, while the National Tech Association of Malaysia (PIKOM) cited that this engineering occupation requires professional certifications and a certain level of job experience which the current existing talent pool may not have.
- viii. With strong results from the top-down analysis coupled with the high number of nominations and evidence from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Civil Engineers

MASCO 2020(4-Digit Code): 2142

MASCO 2020(6-Digit Code): 2142-01, 2142-04, 2142-07, 2142-16, 2142-18, 2142-19, 2142-27, 2142-33

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

Executive Officer (Engineering) Grade 41; Engineer; Civil Engineer; Civil Engineer, Structural; Civil Engineer, Highways and Road; Civil Engineer, Road Construction; Civil Engineer, Hydraulics; Geotechnical Engineer

This occupation appears on COL:

2015	Yes	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 11 indicators
Bottom-up CfE survey	21 nominations
Consultation	9 nominations

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)	Wage premium growth (3 years)
No	No	Yes	Yes	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Technical Skills 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Construction 2. Professional, Scientific and Technical Activities 3. Manufacturing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicant 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Expanding international recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree / Graduate 2. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing, and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. Job titles nominated reflect predominantly the demand for civil engineers, geotechnical engineers, hydraulic engineers, and structural engineers. ii. Vacancies are largely for entry to junior level employees. Consultations with the industry have revealed another dimension to demand for civil engineers where the requirement is for highly specialised skills with over 10 years of experience overseas. The predominant time taken to fill vacancies in this job title ranges between 2 to 3 months. iii. The minimum qualification level for this job title is from the diploma level. iv. Among the factors contributing to the occupation being hard-to-fill is the lack of relevant job experience among candidates. v. Shortages in specialised skills such as civil engineering in oil and gas production facilities, bridges, subways, and water dams are in short supply. These specialised skills require knowledge typically acquired through experience abroad which gives candidates better exposure to highly complex engineering scenarios. Civil engineers in traditional building construction fields do not have the necessary experience in addressing engineering requirements needed, for instance in the area of oil and gas production plant structures. vi. Evidence that supports the inclusion of this job title as a critical occupation is backed by 5 out of 11 top-down indicators and 30 bottom-up nominations. 	

Occupation: Mechanical Engineers

MASCO 2020(4-Digit Code): 2144

MASCO 2020(6-Digit Code): 2144-02, 2144-13, 2144-21, 2144-24, 2144-32, 2144-34, 2144-35, 2144-37, 2144-38, 2144-40, 2144-46, 2144-49, 2144-55, 2144-57, 2144-60, 2144-62

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

Mechanical Engineer; Internal Combustion Engine Engineer; Steam Engineer; Welding Technologist; Microprogramming Engineer; Technology Technical Engineer; Equipment Engineer; Instrumentation Engineer; Mechanical Maintenance Engineer; Operation Engineer; Research and Development Engineer; CAD/CAM Engineer (Computer-Aided Design and Manufacturing); Vehicle Engineer; Industrial Automation Engineer; Mechatronic Engineer; Technical Service Engineer

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 11 indicators
Bottom-up CfE survey	16 nominations
Consultation	10 nominations

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)	Wage premium growth (3 years)
No	No	No	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing (mainly; >50%) 2. Construction 3. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Applicants lack relevant job experience 3. Applicants lack the required technical or occupational skills 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 3. STPM Level/ Matriculation/ Foundation/ Pre-University Program 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. General Programmes
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for mechanical engineers in the manufacturing sector. ii. The vacancies within this occupation group are across all experience levels, from entry to senior level, with slightly higher demand for entry level (less than 2 years of experience) and junior level (2 to 5 years of experience). The most common time to fill for this occupation is reported to be 2 to 3 months, but some companies also took up to 6 months to find suitable candidates for the position. Around half of the companies that claimed this occupation group to be critical have reported that this occupation has become harder 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 CfE survey. Certain positions within this job category would require additional certifications, e.g. special certificate for vessel engineer, steam engineer, CNC programmer, and aircraft maintenance engineer. iv. The top skills required for this job category are technical skills, problem-solving skills and analytical skills. Although there are a good number of mechanical engineers graduating every year, companies find the job category hard to fill, mainly due to applicants lacking the required credential or certifications, applicants lacking relevant job experience, and applicants lacking the required technical or occupational skills. Some industry subsectors are also facing more difficulties in attracting talents as compared to others because the subsectors are perceived as less prestigious or are not regarded as top choices for the candidates. Many companies claimed 	

to have expanded their recruitment effort, raised wages, and increased worker training, but still unable to fill the gap.

- v. According to the Malaysian Petrochemicals Association (MPA), there is a good number of graduates applying into the industry. However, many do not fit the technical skills requirement of the industry. Out of over 700 applicants, only around 10 can be shortlisted. The Machinery & Equipment Manufacturing Association (MEMA) and the Malaysian Special Tooling and Machining Association (MSTMA) also indicated that the quality and attitude of the candidates have deteriorated as compared to 10 to 20 years ago. The candidates may have the paper qualification but not necessarily have the technical knowledge and skills required.
- vi. Consultation with the Chemical Industries Council of Malaysia (CICM) revealed that Steam Engineers have very specialised skillsets and need to be certified by authorised bodies and currently it is difficult to find candidates with such certification. Besides that, it is also challenging to find Mechanical Engineers with niche skills to work on advance/high tech projects.
- vii. Based on consultation with the Machinery and Equipment Manufacturers Association (MEMA), and the Malaysian Special Tooling and Machining Association (MSTMA), a Research and Development (R&D) engineer would need 10 to 15 years of related industry experience before the candidate is able to take on the role. It is difficult to find talents that are interested in R&D role and have such vast experience.
- viii. According to the Malaysian Textile Manufacturers Association (MTMA) and the Malaysian Rubber Products Manufacturers' Association (MRPMA), there are insufficient applicants due to low awareness and interest of job opportunities in the subsector. A high number of mechanical engineering graduates also do not have the basic understanding of the industry nor the products. The Sarawak Chamber of Commerce and Industry (SCCI) indicated that most graduates in the region will first look into the oil and gas industry for job opportunities and very rarely explore engineering roles in timber production or plantation subsector, partly due to the higher pay in the oil and gas industry.
- ix. The Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated that the skillsets of microprogramming engineer are not widely available in Malaysia. As a result, the financial institutions are competing with other industries for such talent.
- x. Based on the feedback from the Malaysia Automation Technology Association (MATA) and the Federation of Malaysian Manufacturers Sabah (FMM Sabah), there is a shortage of instrumentation engineer in the market as work experience is very important for the job. As a result, skilled workforce with this area of specialisation gets absorbed by the industry very quickly, and smaller companies tend to find it challenging to fill these job roles because they are unable to provide attractive remuneration packages as compared to the bigger players.
- xi. The evidence collected from the bottom-up approach indicates that this occupation is in demand, and it is increasingly difficult to find candidates in specialised/niche areas. Hence, this occupation is included in the COL.

Occupation: Manufacturing Professionals

MASCO 2020(4-Digit Code): 2182

MASCO 2020(6-Digit Code): 2182-02, 2182-03, 2182-04, 2182-05, 2182-06, 2182-18, 2182-22, 2182-26, 2182-28, 2182-47, 2182-48

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

Quality Assurance Executive; Quality Assurance Analyst; Quality Control Executive; Production Executive; Warehouse Executive; Supply Chain/Procurement Specialist; Production Specialist; Logistics Executive; Logistic Coordinator; Quality Control Analyst; Operation Coordinator

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 9 indicators
Bottom-up CfE survey	15 nominations
Consultation	1 nomination

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)	Wage premium growth (3 years)
No	No	Yes	No	NA	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
Yes	Yes	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Technical Skills 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Transportation and Storage 3. Construction
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Applicants lack relevant job experience 3. Too few or no applicants 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode & Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. Services 3. Science, Mathematics, and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for logistics executives, quality assurance executives, and production executives. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more demand for the entry to junior level experience equivalent to fresh graduates, and up to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are interpersonal and communication skills, technical skills, and teamwork. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies may take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to the applicants' lack of required credential or certifications, applicants' lack of relevant job experience, and too few applicants for the vacancies. v. Consultation with the National Tech Association of Malaysia (PIKOM) indicated that there is lack of talent particularly for the supply chain/procurement specialist as this occupation requires a certain level of job experience in the relevant industry. This occupation is critical and largely affected by the companies in the manufacturing sector and transportation and storage sector. 	

Furthermore, as companies continue to pursue digital transformation and technology advancement, the existing talent pool for this occupation will require further upskilling with some basic emerging technology skills.

- vi. As the manufacturing sector still plays a prominent role in the Malaysian economy, and with strong results from the top-down analysis, supported with a high number of nominations and evidence from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Specialist Medical Professionals									
MASCO 2020(4-Digit Code): 2212									
MASCO 2020(6-Digit Code): 2212-04, 2212-06, 2212-07, 2212-11, 2212-12, 2212-36, 2212-49									
Only the following job titles within this occupation are included in the Critical Occupations List (COL):					Anaesthetist; Medical Oncologist; Radiotherapy Oncologist; Neurologist; Gynaecologist; Paediatrician; Physician, Cardiology				
This occupation appears on COL:									
2015	No	2016	No	2017	Yes	2018	No	2019	Yes
Source of evidence:									
Top-down indicators		Passes 1 out of 2 indicators							
Bottom-up CfE survey		7 nominations							
Consultation		0 nominations							
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)	Wage premium growth (3 years)				
NA	NA	NA	NA	NA	NA				
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings					
NA	NA	Yes	No	NA					

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Analytical Skills 2. Interpersonal and Communication Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Human Health and Social Work Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants' expected compensation is beyond the market rate 2. Applicants lack the required credential or certification 3. Employers cannot afford to pay the market rate for the applicants due to cost-cutting effort during the MCO 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding international recruitment efforts 2. Raising wages 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode and Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 	Top Field of Study: <ol style="list-style-type: none"> 1. Health and Welfare
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for neurologists and oncologists. ii. The majority of companies reported that vacancies within this occupation group are for the middle level experience equivalent to at least 5 years of working experience. In addition, all the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a bachelor's degree is required for all vacancies listed by the respondents in the CfE survey. Aside from having a Bachelor of Medicine and Bachelor of Surgery (MBBS), a specialist medical professional will require to have additional qualification in the field of the specialisation. The top skills required for this occupation group are analytical skills, interpersonal and communication skills, and problem solving. iv. Most of the companies cited that it usually takes at least about 3 to 6 months for the vacancies to be filled, while some companies may take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' expected compensation being above the market rate, applicants lack the required credential or certification, and companies are not able to afford to pay the market rate for the applicants due to cost-cutting efforts during the Movement Control Order (MCO). 	

- v. From the validation session with the Association of Private Hospitals of Malaysia (APHM), it is indicated that there is particular shortage of doctors entering several fields of specialists, such as medical oncologist, radiotherapy oncologist, and neurologist.
- vi. Furthermore, with a recent news article highlighted by the Malaysia Health Ministry director-general Dr. Noor Hisham Abdullah, there has been a deficiency in anaesthesia manpower even before the COVID-19 pandemic, where there were only 1,024 registered anaesthesiologist and 50 registered intensivists as of November 2019, and there were even lesser anaesthesiologists and intensivists serving in the Health Ministry when the pandemic hit Malaysia in early 2020. The Health DG also mentioned that it will take more than 10 years to overcome the shortage if the current training capacity is not increased.
- vii. With the bottom-up evidence supported by validation from the relevant association and news article, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Nursing Professionals

MASCO 2020(4-Digit Code): 2221

MASCO 2020(6-Digit Code): 2221-04, 2221-11, 2221-14

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

District Nurse; Nurse; Operation Theatre Nurse

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 7 out of 11 indicators
Bottom-up CfE survey	19 nominations
Consultation	0 nominations

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)	Wage premium growth (3 years)
Yes	Yes	Yes	No	No	Yes
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Teamwork 3. Interpersonal and Communication Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Human Health and Social Work Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Applicants' expected compensation is beyond the market rate 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Expanding international recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Advanced Diploma/ SKM Level 5 2. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Health and Welfare
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for nurses and operation theatre nurses. ii. The majority of companies reported that vacancies within this occupation group are for the entry and junior level experience equivalent to fresh graduate and up to at least 2 years of working experience. In addition, all the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a diploma level certification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are problem-solving, teamwork, and interpersonal and communication skills. iv. Most of the companies cited that it usually takes at least about 2 to 4 months for the vacancies to be filled, while some companies cited that it could take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, applicants lack the required credential or certification, and applicants' expected compensation is beyond the market rate. v. According to the bottom-up evidence, majority of the companies mentioned that nurses specialised in intensive care unit (ICU) is in critical shortage. In addition, from the validation session with the Association of Private Hospitals of Malaysia (APHM) and the Malaysian Nurses Association (MNA), they have indicated that there is particular shortage of post-basic trained nurses for both nurses, and operating theatre nurses. It is also highlighted that the current shortages of nurses occur mainly due to shortages of talents that has happened even before the pandemic. 	

- vi. With strong results from the top-down analysis, supported with a high number of nominations and strong evidence from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Environmental and Occupational Health and Hygiene Professionals

MASCO 2020(4-Digit Code): 2263

MASCO 2020(6-Digit Code): 2263-06, 2263-14, 2263-15

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

Occupational Health and Safety Officer; Industrial Safety Officer - Occupational Safety and Health; Occupational Health and Safety Officer

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 6 out of 11 indicators
Bottom-up CfE survey	3 nominations
Consultation	3 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	Yes	Yes
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	Yes	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Interpersonal and Communication Skills 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Arts, Entertainment, and Recreation 3. Construction
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research) 2. Bachelor's Degree/ Graduate 	Top Field of Study: <ol style="list-style-type: none"> 1. General Programmes 2. Science, Mathematics, and Computing 3. Engineering, Manufacturing, and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. Job titles nominated reflect predominantly the demand for what the industry refers to as the Department of Occupational Safety and Health certified health and safety officers. The other predominant job titles are for what the industry refers to as environmental officers that are certified by the Department of Environment. ii. Vacancies are largely for personnel with junior level experience. Junior employees are typically provided training over a 3-year period before qualifying to become safety officers. The predominant time taken to fill vacancies in this job title ranges between 1 to 6 months. iii. The minimum qualification level for this job title based on evidence from consultations with the industry indicates SPM level and above is acceptable. iv. The factors that contribute to this job title becoming hard-to-fill are the lack of applicants. v. The lack of people interested to join this profession was identified as among one of the main contributing factors to the lack of applicants. Consultations with the industry have also revealed shortages exist not only in the manufacturing sector but also in the theme park operator sector. vi. Evidence that supports the inclusion of this job title as a critical occupation is backed by 6 out of 11 top-down indicators and 6 bottom-up nominations. 	

Occupation: Accountants

MASCO 2020(4-Digit Code): 2411

MASCO 2020(6-Digit Code): 2411-06, 2411-10, 2411-14, 2411-16, 2411-17, 2411-20, 2411-25, 2411-37, 2411-41, 2411-42, 2411-47, 2411-51

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Accountant; Liquidator; Management Accountant; Company Accountant; Account Executive; Financial Controller; Auditor; Internal Auditor; Executive Account Officer; Account Officer; Administrative and Account Executive; Cost Analyst
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This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 6 out of 11 indicators
Bottom-up CfE survey	55 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
No	No	Yes	Yes	Yes	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Problem Solving 2. Technical Skills 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 2. Accommodation and Food Service Activities 3. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Too few or no applicant 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode & Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. General Programme 3. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for account executives, company accountants, and accountants. ii. The majority of companies reported that vacancies within this occupation group are for the entry level to junior level experience equivalent to fresh graduate to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are problem-solving, technical skills, and analytical skills. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies can take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants lack the required credential or certification, too few applicants for the vacancies, and applicants lack of relevant job experience. v. Consultation with the Life Insurance Association of Malaysia (LIAM) indicated that the shortages for accountants are mainly for those with the skill set and specialisation in financial reporting standards (FRS), which not many in the existing talent pool have. 	

- vi. Furthermore, consultation with the Sarawak Chamber of Commerce and Industry (SCCI) indicated while there are plenty of accounting graduates from the universities and colleges, there has been a challenge to look for suitable applicants and talents with good accounting background with relevant experience and familiarity in the particular industry to understand the different terminologies and accounting reporting method that the employers need.
- vii. With strong results from the top-down analysis and high number of nominations and evidence from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Financial and Investment Advisers

MASCO 2020(4-Digit Code): 2412

MASCO 2020(6-Digit Code): 2412-04, 2412-06, 2412-07, 2412-09, 2412-16, 2412-17

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

Financial and Investment Adviser; Finance Executive; Bank Executive Officer; Estate Planner; Wealth Consultant; Leasing Executive

This occupation appears on COL:

2015	Yes	2016	Yes	2017	No	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 11 indicators
Bottom-up CfE survey	6 nominations
Consultation	3 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Problem Solving 3. Technical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Administrative and Support Service Activities 2. Financial and Insurance/Takaful Activities 3. Real Estate Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Hiring less well qualified applicants 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. General Programmes
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for finance executives and leasing executives. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are interpersonal and communication skills, problem solving, and technical skills. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies cited that it can take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants lacking the relevant job experience, too few applicants for the vacancies, and applicants lacking the required credential or certification. v. Consultations with the National Tech Association of Malaysia (PIKOM) and the Malaysian Association of Amusement Themepark & Family Attractions (MATFA) indicated that there is shortage of talents who possess certain level of experience, and talents who are familiar with e-commerce, especially with the rise of ICT in today's era. vi. Aside from shortage of talents and applicants with relevant job experience, consultation with the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) also indicated that there are shortages of licensed applicants in the market today. Especially for wealth consultants, the applicants should possess license from the Federation of Investment Managers (FIMM) and the Securities Industry Development Corporation (SIDC). 	

- vii. With the increasing number of vacancies, employment growth, and vacancy rate for this occupation, and supported with the data and evidence collected from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Research and Development Professionals									
MASCO 2020(4-Digit Code): 2426									
MASCO 2020(6-Digit Code): 2426-09, 2426-11									
Only the following job titles within this occupation are included in the Critical Occupations List (COL):			Research and Development Executive; Scientist						
This occupation appears on COL:									
2015	No	2016	No	2017	Yes	2018	No	2019	No
Source of evidence:									
Top-down indicators		Passes 4 out of 8 indicators							
Bottom-up CfE survey		4 nominations							
Consultation		1 nomination							
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)	Wage premium growth (3 years)				
Yes	Yes	No	No	NA	NA				
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings					
No	No	Yes	Yes	NA					

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Analytical Skills 2. Problem Solving 3. Technical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Too few or no applicant 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Master's Degree (by Research or Mixed Mode and Coursework)/ Postgraduate Diploma/ Postgraduate Certificate 2. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 3. Advanced Diploma/ SKM Level 5 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for research and development executives, and scientists. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior and middle level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of an advanced diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are analytical skills, problem solving, and technical skills. iv. Most of the companies cited that it usually takes at least about 2 to 4 months for the vacancies to be filled, while some companies can take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of the required credential or certification, too few applicants for the vacancies, and applicants' lack of relevant job experience. v. Consultation with the Malaysian Organisation of Pharmaceutical Industries (MOPI) indicated that there is shortage of research and development talents in the Malaysian market as most local universities focus less on research work or formulation work. As a result, many companies have to resort to hiring expatriates to fill in this position which is currently filled by expatriates from India. 	

- vi. It is also emphasised by companies that research and development work is important as it helps with product development, enhancement, and innovation, which could potentially lead to positive outcome from increased operational efficiency in manufacturing, to increasing sales due to greater products offered to meet the customer's needs.
- vii. With strong results from top-down analysis and bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Advertising and Marketing Professionals

MASCO 2020(4-Digit Code): 2431

MASCO 2020(6-Digit Code): 2431-02, 2431-10, 2431-11, 2431-12, 2431-17, 2431-19, 2431-20, 2431-21, 2431-22, 2431-30, 2431-34, 2431-35, 2431-37, 2431-38, 2431-40, 2431-41, 2431-42, 2431-50, 2431-57

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

Business Market Research Executive; Marketing; Communications Specialist; Compliance Officer; Shariah; Compliance Officer; Technical Adviser; Sales Executive; Marketing Executive; Business Development Executive; Sales Administrative Executive; Sales Engineer; Social; Media Marketing Executive; Digital Marketing Executive; Sales Officer; Sales Executive Coordinator; Sales and Marketing Executive; Event Executive; Sales Consultant; Advertising/Promotion Executive; Order Management Coordinator

This occupation appears on COL:

2015	Yes	2016	No	2017	No	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 7 out of 9 indicators
Bottom-up CfE survey	156 nominations
Consultation	8 nominations

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)	Wage premium growth (3 years)
No	Yes	Yes	Yes	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
Yes	Yes	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Interpersonal and Communication Skills 2. Language Skills 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 2. Other Service Activities 3. Accommodation and Food Service Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack relevant job experience 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 3. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Social Sciences, Business, and Law 2. General Programmes 3. Science, Mathematics, and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for sales executives, marketing executives, and digital marketing executives. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the entry level experience equivalent to a fresh graduate. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. While some respondents in the CfE survey indicated that a minimum of an SPM level qualification is required for all vacancies listed, most of the respondents think that a minimum of a diploma level qualification is preferable. The top skills required for this occupation group are interpersonal and communication skills, language skills, and teamwork. iv. Most of the companies cited that it usually takes at least about 1 to 3 months for the vacancies to be filled, while some companies may take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants' lack of the relevant job experience, and applicants lacking the required credential or certification. v. Consultations with the National Tech Association of Malaysia (PIKOM), the Malaysian Association of Private Colleges and Universities (MAPCU), the Public Relations and Communications Association of Malaysia (PRCA Malaysia), and the Malaysian Association of Hotels (MAH) indicated that there is a possibility that most of the companies have downsized their sales and marketing team in view of the COVID-19 pandemic, however this occupation is critical to bring in sales and revenue for the companies regardless of the pandemic. From the 	

consultations, it is observed that companies are looking for applicants and talents who have storytelling abilities to improve marketing campaigns to attract more sales or customers, and to help upsell products and services to the customers. Besides that, these applicants and talents should also be familiar with the latest digital marketing trends and technologies, of which, many from the existing talent pool are not familiar with it.

- vi. In addition, consultations with associations related to financial services, such as the Association of Banks in Malaysia, and the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated that jobs such as compliance officers and Shariah compliance officers are lacking in the market today as well, as the applicants lack of required credentials, specific skillset and knowledge about the regulatory requirements (for both commercial banking compliance and Shariah banking compliance).
- vii. Furthermore, while many assume that there are plenty of college and university graduates that offer courses in this field, there still seems to be a much greater demand for talents in this occupation than the supply, based on the Job Market Insights (JMI) data from the Department of Statistics Malaysia (DOSM).
- viii. With strong results from top-down analysis, the high number of nominations and strong evidence from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Systems Analysts

MASCO 2020(4-Digit Code): 2511

MASCO 2020(6-Digit Code): 2511-01, 2511-02, 2511-03, 2511-04, 2511-34

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

Management Information Systems (MIS) Analyst, Computer Systems Analyst, Computer Consultant, Information Technology Systems Consultant, Information Technology Specialist SAP (Systems Applications and Products)

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 10 indicators
Bottom-up CfE survey	4 nominations
Consultation	4 nominations

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)	Wage premium growth (3 years)
No	No	Yes	Yes	NA	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. IT and Digital Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Financial and Insurance/Takaful Activities 2. Professional, Scientific and Technical Activities 3. Information and communication
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Partnership with education or training providers 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate 2. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing

Bottom-up Evidence:

This occupation is included in the COL.

- Job titles nominated reflect the demand for various enterprise information systems related job roles such as analysts, consultants, and specialists in SAP (Systems Applications and Products).
- The majority of companies reported that vacancies within this occupation group are mainly for junior level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago.
- While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, some of the respondents have mentioned that a minimum of a bachelor's degree would be better. In some cases, applicants for this occupation will require to have at least a bachelor's degree in related fields such as Computer Science, Information Technology, Information System or equivalent. Companies are also more likely to prioritise applicants with certifications from SAP or Oracle. For IT security analysts and cybersecurity analysts, CISCO Certified Network Professional (CCNP) and CISCO Certified Internetwork Expert (CCIE) are required. The top skills required for this occupation group are IT and digital skills, analytical skills, and problem solving.
- Most of the companies cited that it usually takes at least about 5 to 6 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants' lack of required credential or certifications, and applicants' lack of relevant job experience.
- Consultation with the Association of Banks in Malaysia (ABM) indicated this occupation as being critical as there have been too few applicants for this particular occupation group, and/or applicants lack the required credential and certification to fulfil the job role. Meanwhile, ABM has also suggested that with a significant majority of jobs in the high skilled category, technology

is more likely to augment and redefine job roles in the financial sector, rather than eliminate occupations altogether over the next decade. The effects of automation will also likely be heterogeneous. Banks would embark in initiatives to re-align their internal strategies in relation to manpower requirements for better efficiency to suit their respective business objectives in light of advancement of technology which is more system-driven. With the emergence of financial technology and digitalisation in the banking sector, banks may take on approaches to trim its workforce in certain areas of its operations while increasing its workforce in other key focus areas. Many of the new roles created are more focussed in the areas of automation and Information Technology (IT) which is crucial to meet the demands of the evolving dynamics of the digital banking eco-system. Also, to remain competitive in the digital banking sphere, banks have also initiated efforts with staff retraining, upskilling and/or deploying opportunities in order to meet current demands of the banking industry. It is impetus for mass upskilling in staff digital proficiency to adapt to increasing task automation, digitalisation, and re-engineering of business processes.

- vi. Additionally, consultation with Coca-Cola Malaysia indicated that SAP certified professionals were identified as one of the prominent shortages that are critical to supporting the information technology infrastructure systems of companies. The demand for information systems professionals is in part driven by growth in digitalisation trend in particular in the financial technology field. The demand is driven by further digitalisation of existing business processes in the company.
- vii. With the strong results from top-down analysis and the bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Software Developers

MASCO 2020(4-Digit Code): 2512

MASCO 2020(6-Digit Code): 2512-01, 2512-06, 2512-07, 2512-23, 2512-32, 2512-36, 2512-38, 2512-40, 2512-45, 2512-47, 2512-49, 2512-55, 2512-56, 2512-58, 2512-66

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

Software Developer; Application Developer (.Net); Application Engineer (.Net); Software Engineer; Debug Software Engineer; Mobile Application Developer (Mobile App); Blockchain Developer; Programmable Logic Controller (PLC) Engineer; Computer Systems Engineer; System Developer; Software Engineer (Python); Software Consultant; Application Developer; Application Architect; Manufacturing Execution System Developer

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 4 out of 9 indicators
Bottom-up CfE survey	21 nominations
Consultation	7 nominations

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)	Wage premium growth (3 years)
No	No	No	Yes	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Manufacturing 3. Financial and Insurance/Takaful Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required technical or occupational skills 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Increasing worker training 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Advanced Diploma/ SKM Level 5 3. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing 2. Engineering, Manufacturing and Construction 3. Social Sciences, Business, and Law
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for software engineers, software developers, and programmable logic controller (PLC) engineers. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior to middle level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is equally hard to fill as compared to a year ago. iii. While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, majority of the respondents have mentioned that a minimum of a bachelor's degree is preferred. The bachelor's degree that the applicants hold is preferably in Electrical, Computer Engineering, or Computer Programming (i.e. Java based applications). In some cases, companies also require applicants to have Java certification and/or Structured Query Language (SQL) certification. The top skills required for this occupation group are technical skills, analytical skills, and problem solving. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies can take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, too few applicants for the vacancies, and applicants lacking the required technical or occupational skills. v. Consultations with the Association of Banks in Malaysia (ABM), and the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated jobs like application developer, blockchain developer, and mobile application developer are high in demand today, but the applicants do not have the required skillset or relevant job experience particularly for the 	

financial services. Besides, it is observed that these jobs are also in demand by other industries, which caused heightened competition for these talents as applicants are offered with multiple opportunities from other companies and industries.

- vi. Furthermore, consultation with the National Tech Association of Malaysia (PIKOM), the Malaysian Organisation of Pharmaceutical Industries (MOPI), and the Malaysian Oil and Gas Services Council (MOGSC) indicated that the jobs in this occupation require very specific and niche industrial skillset, knowledge, and training, and there has been insufficient cross-functional training for talents of all levels of experience.
- vii. With the increasing number of vacancies, vacancy rate, employment growth for this occupation, and the high number of nominations and strong bottom-up evidence from both CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Web and Multimedia Developers

MASCO 2020(4-Digit Code): 2513

MASCO 2020(6-Digit Code): 2513-01, 2513-07

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

Website Developer; Full Stack Developer

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 1 out of 3 indicators
Bottom-up CfE survey	1 nomination
Consultation	2 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	Yes	No	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. IT and Digital Skills 2. Problem Solving 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Financial and Insurance/Takaful Activities 2. Information and Communication
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Applicants lack the required technical or occupational skills 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Increasing worker training 3. Partnership with education or training providers
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing

Bottom-up Evidence:

This occupation is included in the COL.

- Job titles nominated reflect the demand for front end and server-side web development requirements. The nominated job titles are website developer and full stack developer.
- The majority of companies reported that vacancies within this occupation group are mainly for the middle to senior level experience equivalent to at least 5 to 10 years of working experience. In addition, all the companies mentioned that this occupation is not less hard to fill as compared to a year ago.
- A minimum of a bachelor's degree qualification is required for all vacancies listed by some of the respondents in the CfE survey. According to consultations with the industry associations, in some cases, applicants for this occupation will require specific skills that include AS400, IBM mainframe, COBOL, and full stack development. The top skills required for this occupation group are IT and digital skills, problem solving, and analytical skills.
- All the companies cited that it usually takes more than 6 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, applicants' lack of required credential or certifications, and applicants lacking the required technical or occupational skills.
- Consultation with the National Tech Association of Malaysia (PIKOM) indicated that this occupation is critical as the applicants require huge skillsets, and there has been insufficient cross-functional training for all levels for this occupation as talents are required to work across business units and departments, which includes advertising and marketing, sales, and IT department for successful web and multimedia deployment.
- Additionally, consultation with the Association of Banks in Malaysia (ABM) indicated that the jobs in this occupation group are also high in demand by other industries, which causes

heightened competition for these talents as applicants are offered with multiple opportunities from other companies and industries.

- vii. Furthermore, due to the extensive number of years of experience required for this job title, some of the inputs from the consultation sessions cited that the industry associations and companies have also tried to address the supply shortages via in-house skills training or via hiring foreign skilled professionals.
- viii. With the strong results from top-down analysis and the bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Applications Programmers

MASCO 2020(4-Digit Code): 2514

MASCO 2020(6-Digit Code): 2514-01, 2514-02, 2514-04, 2514-09, 2514-27, 2514-34

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

Computer Programmer; Software Programmer; Information Technology Programmer; Applications Programmer; Animation Programmer; User Interface (UI)/ Gameplay Coders

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 10 indicators
Bottom-up CfE survey	4 nominations
Consultation	6 nominations

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)	Wage premium growth (3 years)
Yes	No	Yes	No	NA	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Arts, Entertainment and Recreation 2. Information and Communication 3. Manufacturing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required technical or occupational skills 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Hiring less well-qualified applications 2. Partnerships with education or training providers 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate 2. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics & Computing 2. Engineering, Manufacturing & Construction

Bottom-up Evidence:

This occupation is included in the COL.

- Job titles nominated reflect the demand for various programming related roles in software applications, animations, and game user interface/game play development.
- The majority of companies reported that vacancies within this occupation group are mainly for the entry to middle level experience equivalent to a fresh graduate for entry level, and at least 2 to 5 years of working experience for junior and middle level. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago.
- While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, majority of the respondents have mentioned that a minimum of bachelor's degree would be better. The top skills required for this occupation group are technical skills, problem solving, and teamwork.
- Most of the companies cited it usually takes at least about 1 to 2 months for the vacancies to be filled, and some companies cited it can take up to 5 months as well. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of the required technical or occupational skills, applicants' lack of required credential or certifications, and applicants' lack of relevant job experience.
- Consultation with the Malaysian Organisation of Pharmaceutical Industries (MOPI) indicated that demand for programmers have also been noted in the pharmaceutical industry where digitalisation of processes is used to further optimise the tedious documentation work in compliance with pharmaceutical regulatory standards.
- In addition, consultation with the Malaysian Association of Amusement Themepark & Family Attractions (MATFA) indicated that the demand for skills within this occupation group is largely

driven by the increasing demand for online sales platforms and the overall business strategy of making use of data to drive improvements in overall customer experience.

- vii. With the strong results from top-down analysis and the bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Software and Applications Developers and Analysts not Elsewhere Classified

MASCO 2020(4-Digit Code): 2519

MASCO 2020(6-Digit Code): 2519-01, 2519-02, 2519-03, 2519-04, 2519-08, 2519-16, 2519-18

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Software Tester; Systems Tester; Product Quality Assurance Engineer (Information Technology); Quality Assurance Analyst (Information Technology); Solution Architect (Information Technology); Information Technology Auditor; Tester (Selenium, Cucumber Skills)
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This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 2 out of 3 indicators
Bottom-up CfE survey	4 nominations
Consultation	7 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	Yes	No	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. IT & Digital Skills 2. Analytical Skills 3. Technical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Information & Communication 2. Financial & Insurance/Takaful Activities 3. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required technical or occupational skills 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Expanding local recruitment efforts 3. Partnerships with education or training providers
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. Job titles nominated reflect the demand for various quality assurance roles such as testers, engineers, analysts, and architects. Specific skills in Selenium and Cucumber testing were noted. ii. Vacancies for this job title are predominantly for entry to middle level roles. The average time taken to fill this vacancy ranges between 2 to 3 months. iii. The minimum level of qualification required for this job title is a bachelor's degree. iv. Software testing job roles require certified individuals, and at present, the take up rates on the education side is limited, leading to a shortage in applications for the job role. Software testing as a field of education is not well promoted while at the same time companies have limited knowledge on the importance of software testers. Specific focus areas in software testing that is in demand include regression and automation testing. v. Industry respondents indicated that testers should be classified as analysts as analytical thinking is greatly involved. While there are hundreds of thousands certified software testers in the world today, the numbers are fewer in Malaysia. vi. Evidence that supports the inclusion of this job title as a critical occupation is backed by 11 bottom-up nominations. 	

Occupation: Systems Administrators

MASCO 2020(4-Digit Code): 2522

MASCO 2020(6-Digit Code): 2522-05, 2522-10, 2522-11, 2522-20, 2522-22, 2522-24, 2522-25, 2522-28, 2522-31, 2522-34, 2522-36, 2522-37

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

Information System Officer; Computer System Administrator; Information Technology Executive; System Support Specialist; Cloud Computing Solution Architect; Information Technology Architect; Enterprise Applications Architect; Technical Support Engineer (Information Technology); Information Technology Infrastructure Specialists; Information Technology Engineer; Technical System Administrator; BIM Coordinator (Building Information Modelling)

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 2 out of 11 indicators
Bottom-up CfE survey	8 nominations
Consultation	4 nominations

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)	Wage premium growth (3 years)
No	No	No	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. IT and Digital Skills 2. Problem Solving 3. Technical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Financial and Insurance/Takaful Activities 3. Manufacturing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicant 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing 2. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for information technology executives. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior to middle level experience equivalent to at least 2 to 5 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, majority of the respondents have mentioned that a minimum of a bachelor's degree is preferred. The top skills required for this occupation group are IT and digital skills, problem solving, and technical skills. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies cited that it can take up to 6 months. v. Consultations with the Association of Banks in Malaysia (ABM), and the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated jobs like information technology architects, enterprise application architects, cloud computing solution architects, and computer system administrators are high in demand today, as these jobs require specific professional certification and certain level of job experience, but not many of the applicants or the existing talent pool possess all the required criteria to be employed. These jobs are important to the financial institutions as it helps to ensure that the banks' IT systems are constantly managed and maintained to keep the financial services running. 	

- vi. Furthermore, consultation with the National Tech Association of Malaysia (PIKOM) indicated that some of the job opportunities for this occupation are coming slower than expected as it depends on the IT infrastructure that a certain industry builds and occupies.
- vii. Based on observations from the consultations, some of the jobs in this occupation may require professional or proficiency certifications such as in 5G networks, Internet-of-Things (IoT), or for softwares like Microsoft Azure, Microsoft System Centre Configuration Manager (SCCM), Altiris, AWS Cloud, Google Cloud, etc.
- viii. With the increasing number of vacancies and vacancy rate for this occupation, and the strong bottom-up evidence from both CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Computer Network Professionals

MASCO 2020(4-Digit Code): 2523

MASCO 2020(6-Digit Code): 2523-01, 2523-05, 2523-07, 2523-10

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

Network Analyst; Network Engineer; Cloud Specialist; Network System Engineer (Information Technology)

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 2 out of 3 indicators
Bottom-up CfE survey	3 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	Yes	No	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. IT and Digital Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Education 3. Other Service Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Expanding local recruitment efforts 3. Expanding international recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing

Bottom-up Evidence:

This occupation is included in the COL.

- The job titles nominated reflect mostly the need for network engineers, and cloud specialists.
- The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior to senior level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago.
- A minimum of a diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. This occupation requires professional certifications such as CCNP certification for network engineers, and other cloud related certifications. The top skills required for this occupation group are IT and digital skills, analytical skills, and problem solving.
- Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, too few applicants for the vacancies, and applicants lack of required credential or certifications.
- Consultations with the National Tech Association of Malaysia (PIKOM) and the Malaysian Association of Private Colleges and Universities (MAPCU) indicated that cloud specialists are currently in shortages as the 5G intervention has caused a gap within the talent demand. Furthermore, cloud specialists are required to help support and implement a good ecosystem within the online platform and the IT systems to facilitate business requirements.
- Additionally, consultation with Coca-Cola Malaysia indicated that there is a shortage of network analysts with relevant technical skills and knowledge in managing company networks and ICT hardware as companies today drive digital transformation.

- vii. Considering the niche skills required for this occupation and the rise of emerging technologies such as Internet-of-Things (IoT) and 5G network, with the results from top-down analysis and bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Data Professionals

MASCO 2020(4-Digit Code): 2524

MASCO 2020(6-Digit Code): 2524-01, 2524-02, 2524-03, 2524-06, 2524-11, 2524-13

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

Data Scientist; Big Data Engineer; Data Analyst; Data Architect; Machine Learning Engineer; Artificial Intelligence Engineer (AI)

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 0 out of 0 indicators (new MASCO 2020 code)
Bottom-up CfE survey	1 nomination
Consultation	11 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	NA	NA	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. IT and Digital Skills 2. Technical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Professional, Scientific and Technical Activities 3. Education
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicants 2. Applicants lack relevant job experience 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Expanding international recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing & Construction

Bottom-up Evidence:

This occupation is included in the COL.

- This job title is unrepresented in the top-down evidence as it is a new addition to the MASCO list. Job titles nominated largely represents data analysis related roles where the predominant category is data scientist and data analyst.
- The majority of companies reported that vacancies within this occupation group are across all level of experiences, from entry level to senior level, equivalent to fresh graduate for entry level, and at least 5 to 10 years of working experience for other experience level. In addition, all the companies mentioned that this occupation is harder to fill as compared to a year ago.
- While a minimum of a diploma level qualification is required for all vacancies listed by some of the respondents in the CfE survey, some of the respondents have mentioned that a minimum of a bachelor's degree would be better. In some cases, applicants for this occupation will require to have specialised and niche technical skills to fulfil the data professionals role, which include Python or SQL coding, skills in Apache Hadoop platform, Apache Spark, machine learning and artificial intelligence. The top skills required for this occupation group are IT and digital skills, technical skills, and problem solving.
- Most of the companies cited that it usually takes about 2 to 3 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants' lack of relevant job experience, and applicants' lack of required credential or certifications.
- Consultation with the Malaysia Digital Economy Corporation (MDEC) indicated that this occupation has been increasingly critical with the rise of the digital economy, and companies moving towards digitalisation and the boom of e-Commerce. Big data is one of the emerging technology trends that companies are looking into today, and there is lack of talents who have the required skills and relevant industry experience now.

- vi. In addition, consultations with the Association of Banks in Malaysia (ABM) and the Association of Islamic Banking and Financial Institutions in Malaysia (AIBIM) indicated that the banking industry mainly rely on foreign talent for this position, and the shortage in data professionals has been identified as a factor that not only affects the Malaysian labour market but is characterised as a global phenomenon. Consultation with the Malaysian Employers Federation (MEF) have also indicated that there is currently lack of talents that have deep knowledge and relevant experience for the job roles in this occupation group as companies require talents who are able to immediately address data crunching work.
- vii. Furthermore, consultation with the Malaysian Association of Private Colleges and Universities (MAPCU) indicated that the universities too require talents in this occupation group to support and implement a good platform and system that can facilitate and improve online teaching and learning experiences. As for consultation with the Malaysian Oil and Gas Services Council (MOGSC) indicated that there has been more emphasis on digitalisation projects within the oil and gas industry post COVID-19 pandemic, and there has been difficulty to look for good data scientists as most of the applicants do not qualify the requirements, and some applicants have also demanded remuneration packages that the industry is not able to fulfil.
- viii. In addition, inputs from the consultation sessions with the industry associations suggest that data science is a combination of different disciplines covering data inference, algorithm development, and technology to solve analytically complex problems. Skill set requirements for data professionals is seeing a converging trend across different fields of knowledge. Blended data analysis skills combined with knowledge in human resources, finance, and accounting is required in certain vacancies.
- ix. As big data and data analytics are the emerging technologies in the era of digitalisation, coupled with the strong results from top-down analysis and the bottom-up evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Cybersecurity Professionals

MASCO 2020(4-Digit Code): 2531

MASCO 2020(6-Digit Code): 2531-01, 2531-03, 2531-15, 2531-17, 2531-18, 2531-21, 2531-22, 2531-34

Only the following job titles within this occupation are included in the Critical Occupations List (COL):	Information and Communication Technology Security Executive; Digital Forensic Specialist; Security Engineer (Information Technology); Cybersecurity Specialist; Information Security Analyst; Incident Responder (Information Technology); Penetration Tester (Information Technology); Cyber Risk Analyst
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This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 0 out of 0 indicators (new MASCO 2020 code)
Bottom-up CfE survey	3 nominations
Consultation	8 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	NA	NA	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical skills 2. Problem solving 3. IT and Digital Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Financial and Insurance/ Takaful Activities 3. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicants 2. Applicants lack the required credential or certification 3. Applicants lack the required technical or occupational skills 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Expanding local recruitment efforts 3. Partnerships with education or training providers
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. This job title is unrepresented in the top-down evidence as it is a new addition to the MASCO list. Job titles nominated largely represents demand for information and communication technology security executives, cybersecurity specialists, information security analysts, and cyber risk analysts. ii. Vacancies for this job title are predominant in junior to senior level roles. Time taken to fulfil these vacancies fall largely in the range of between 2 to 3 months. iii. The minimum level of qualification required for this job title is a bachelor's degree. iv. Demand for cybersecurity professionals is most notably within the financial technology and digital banking sectors. Demand for digitalisation has far outstripped the supply of human resources and the industry is collaborating with financial technology companies to enhance its capacity. Demand for cyber security professionals have also been noted in other industries such as the food and beverage sector. v. Certifications in demand for this job title include certified information security managers, cisco certified network professionals, and other forms of cisco expert-level certifications. vi. Evidence that supports the inclusion of this job title as a critical occupation is backed by 11 bottom-up nominations and evidence above that support this job title as a new emerging area that is facing shortages. 	

Occupation: Animation and Visual Effects Professional

MASCO 2020(4-Digit Code): 2541

MASCO 2020(6-Digit Code): 2541-02, 2541-03, 2541-04, 2541-05, 2541-07, 2541-10, 2541-21 2541-26, 2541-30, 2541-34

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

3D Animator; 2D Animator; CG Modeller; 3D Modeller; Lighting Artist; Composer/ Composite Artist; Graphics Illustrator; Visualization Specialist; Content Writer/ Creator; Content Moderator

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of

evidence:

Top-down indicators	Passes 0 out of 0 indicators (new MASCO 2020 code)
Bottom-up CfE survey	1 nomination
Consultation	14 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	NA	NA	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. IT and Digital Skills 3. Interpersonal and Communication Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Arts, Entertainment and Recreation 3. Manufacturing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Applicants lack relevant job experience 3. Applicants lack the required technical or occupational skills 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Hiring less well-qualified applications 2. Raising wages 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Arts and Humanities

Bottom-up Evidence:

This occupation is included in the COL.

- This job title is unrepresented in the top-down evidence as it is a new addition to the MASCO list. Job titles nominated largely represents demand for 3D Animators, 2D Animators, CG Modellers, and 3D Modellers.
- Vacancies for this job title are most predominant in the middle to senior level roles. Time taken to fulfil these vacancies fall largely in the range of between 2 to 3 months while the minimum level of qualification required for this job title is a diploma level.
- Demand for animation and visual effects professionals are driven by growing investments in the creative multimedia industry. Its applications in other industries such as theme parks and attractions, and advertising and communications are factors that continue to drive demand for this job title.
- Sought after skills for computer graphics modelling roles include capabilities in modelling software (e.g., Blender, 3ds Max, Maya, 3D Coat, and Cinema 4D), 2D Software (e.g., Photoshop & Illustrator), compositing visuals, texturing, sculpting, model optimisation, and image editing.
- Sought after skills for animation related roles include 3D animation, 2D software, compositing visuals, and concept creation.
- Evidence that supports the inclusion of this job title as a critical occupation is backed by 15 bottom-up nominations and evidence above that support this job title as a new emerging area that is facing shortages.

Occupation: Digital Games and eSports Professionals

MASCO 2020(4-Digit Code): 2542

MASCO 2020(6-Digit Code): 2542-01, 2542-04, 2542-06, 2542-07, 2542-12, 2542-24

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

Game Designer (Digital); Game Producer (Digital); 3D Artist; 2D Artist; Game Programmer (Digital); Digital, Games, and eSports Professionals

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 0 out of 0 indicators (new MASCO 2020 code)
Bottom-up CfE survey	1 nomination
Consultation	10 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	NA	NA	NA	

Occupation Overview:	
Top Skills: 1. Technical Skills 2. IT and Digital Skills 3. Analytical skills	Top Sectors: 1. Information and Communication 2. Arts, Entertainment and Recreation
Top Reasons of Hard-to-Fill: 1. Applicants lack relevant job experience 2. Applicants lack the required credential or certification 3. Too few or no applicants	Top Strategies to Meet Shortages: 1. Raising wages 2. Hiring less well-qualified applications 3. Expanding international recruitment efforts
Minimum Level of Qualification: 1. Diploma/ SKM Level 4	Top Field of Study: 1. Science, Mathematics and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. This job title is unrepresented in the top-down evidence as it is a new addition to the MASCO list. Job titles nominated largely represent demand for game designers, game producers, and game programmers. ii. Vacancies for this job title are largely spread across all levels of experience with a heavier weightage on entry level roles. Time taken to fulfil these vacancies fall largely in the range of between 3 to 4 months with minimum level of qualification required for this job title is diploma level. iii. Demand for game programmers is largely driven by increasing investments into the creative multimedia industry. Major game production studios located in Cyberjaya has been a key factor in supporting growth in this segment. iv. Core skills of game designers include game conceptualisation and game design, level design, prototyping and scripting, narrative design and game writing, content design, system/technical design, analytics and user behaviour, and design documentation. v. Meanwhile for game producers, the core skills required include project management, product management, team management, scheduling and budgeting, contract and vendor management, game quality assurance testing, market research and analysis, marketing and public relations, and production pipeline. vi. Core skills of game programmers include coding and programming, software design and architecture, domain specific programming (AI / Graphics / Physics / Network), debugging and bug-fixing, and profiling and optimisation. 	

- vii. Evidence that supports the inclusion of this job title as a critical occupation is backed by 11 bottom-up nominations and evidence above that support this job title as a new emerging area that is facing shortages.

Occupation: Creative Content Designer Professionals

MASCO 2020(4-Digit Code): 2543

MASCO 2020(6-Digit Code): 2543-01, 2543-02, 2543-05, 2543-08, 2543-13

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

Web Designer; Graphic Designer; Multimedia Designer; Creative Designer; UI Designer (User Interface)

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 0 out of 0 indicators (new MASCO 2020 code)
Bottom-up CfE survey	3 nominations
Consultation	7 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	NA	NA	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. IT and Digital Skills 3. Interpersonal & Communication Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Information and Communication 2. Education 3. Arts, Entertainment and Recreation
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack relevant job experience 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Outsourcing this job function 3. Hiring less well-qualified applications
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma 2. Diploma/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Arts and Humanities 2. Social Sciences, Business and Law 3. Science, Mathematics and Computing
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. Job titles nominated largely represent demand for graphic designers. ii. Vacancies for this job title are predominantly spread across all levels of experience with a heavier weightage on entry level roles. Time taken to fulfil these vacancies fall largely in the range of between 1 to 6 months with diploma being the minimum level of qualification required. iii. Core skills required for the graphic designer role include graphic design, typography, UI design, print design, branding design, marketing materials, photography, and art fundamentals. iv. It is also indicated from the consultation conducted with the Public Relations and Communications Association of Malaysia (PCRA) that talents are not only demanded to have technical skills to gain preference in the industry, but are also emphasised to have strong writing abilities to tell eye-catching stories in business language to be able to attract consumers' attention. v. Evidence that supports the inclusion of this job title as a critical occupation is backed by 10 bottom-up nominations. 	

Occupation: Mechanical Engineering Technicians

MASCO 2020(4-Digit Code): 3115

MASCO 2020(6-Digit Code): 3115-04, 3115-05, 3115-10, 3115-13, 3115-25, 3115-28, 3115-41, 3115-42, 3115-43, 3115-44, 3115-48, 3115-55

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; Refrigeration and Air-Conditioning System Engineering Technician; Automobile Engineering Assistant; Machine Technician; Welding Technician; Spinning Technician; Knitting Technician; Weaving Technician; AutoCAD Drafter; Equipment Technician; Repair and Maintenance (R&M) Technician

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 11 indicators
Bottom-up CfE survey	25 nominations
Consultation	10 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	No	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Interpersonal and Communication Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 3. Electricity, Gas, Steam and Air Conditioning Supply
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack relevant job experience 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Diploma Level/ SKM Level 4 2. SKM Level 3 3. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. General Programmes
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for Repair and Maintenance (R&M) Technicians, Refrigeration and Air-Conditioning System Engineering Technicians, and Automobile Engineering Assistants. ii. Vacancies within this occupation group are across all experience levels, from entry to senior level, with highest ratio for entry level (less than 2 years of experience), followed by junior level (2 to 5 years of experience). The most common time to fill the vacancy for this occupation is reported to be 2 to 3 months, but some companies also took up to 6 months to find suitable candidates for the position. Majority of the companies indicated that this occupation has become harder to fill as compared to a year ago. iii. Although many companies require a minimum of SKM level 3 or SKM level 4/diploma for the vacancies listed in the CfE survey, some companies are willing to take in SPM leavers and train them on the job. iv. Some industry subsectors face more difficulties in attracting talents than others because the subsectors are perceived as less prestigious or are not regarded as top choices for the candidates. Many companies claimed to have expanded their recruitment effort, raised wages and hired less qualified candidate, but are still unable to fill the gap. v. According to the Malaysian Textile Manufacturers Association (MTMA) and the Malaysian Rubber Products Manufacturers' Association (MRPMA), there are insufficient applicants due to low awareness and interest of job opportunities in the subsector. Mechanical engineering graduates are also observed to lack basic understanding of the industry and the products. The Malaysian Association of Amusement Themepark & Family Attractions (MATFA) cited that many 	

of the graduates will choose to enter the engineering, oil and gas, or manufacturing industry, putting the tourism industry as their last choice.

- vi. The Machinery and Equipment Manufacturers Association (MEMA), and the Malaysian Special Tooling and Machining Association (MSTMA) indicated that the quality and attitude of the candidates have deteriorated as compared to 10 to 20 years ago. The candidates may have the paper qualification but do not have the technical knowledge and skills that are critical for the industry. It is observed that these fresh graduates lack discipline and do not possess dedication for their work.
- vii. Consultation with the Master Builders Association Malaysia (MBAM) revealed that the industry is facing difficulties in filling technical and foreman jobs. This is particularly due to ageing and retiring Malaysian workers, and the lack of access to hire foreign workers as many have returned to their home country under the Malaysian current regulations relating to COVID-19. There are insufficient Malaysians joining the industry despite the above average wages because it is regarded as 3D (dirty, dangerous, and difficult) jobs. It usually will take around a year for an industry player to fill up the position of mechanical engineering technician due to the lack of talents.
- viii. Based on consultation with the Sarawak Chamber of Commerce and Industry (SCCI), for wood-based industry/timber production, most of the vocational school graduates in Sarawak will be pre-booked by SMEs. Larger companies are at a disadvantage because the job responsibilities tend to be larger but at the same pay grade as the SMEs.
- ix. The top-down result shows growth in employment, increase in number of vacancies rate and decrease in education requirements. Supported by high nominations from the bottom-up evidence which indicates this occupation is in demand, this occupation is included in the COL.

Occupation: Physical and Engineering Science Technicians Not Elsewhere Classified

MASCO 2020(4-Digit Code): 3119

MASCO 2020(6-Digit Code): 3119-03, 3119-04, 3119-19, 3119-26, 3119-28, 3119-38, 3119-48

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

Maintenance Technician; Methods Engineering Technician; Quality Control Technician; Production Technician; Quality Assurance Engineering Technician; Water Technician; Test Technician

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 4 out of 11 indicators
Bottom-up CfE survey	6 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	Yes	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 3. Construction
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants' expected compensation is beyond the market rate 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Partnerships with education or training providers 3. Outsourcing this job function
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 3. SKM Level 3 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for production technicians. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the entry to junior level experience equivalent to a fresh graduate up to at least 2 years of working experience. In addition, some of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a SKM level 3 or diploma level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are technical skills, problem solving, and teamwork. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies can take up to 6 months. iv. The top skills required for this occupation group are technical skills, problem solving, and teamwork. The main reasons behind the occupation being hard to fill are mainly due to applicants' lack of relevant job experience, too few applicants for the vacancies, and applicants' expected compensation is beyond the market rate. v. Consultation with the Master Builders Association Malaysia (MBAM) and the Malaysian Oil and Gas Services Council (MOGSC) indicated that this occupation faces shortage of talent as many locals perceive this occupation to be 3D (dirty, dangerous, and difficult). It is also noted that this occupation is particularly important to the manufacturing sector, but most of the positions in this occupation are usually filled by foreigners. However, the industry association has increasingly put effort to work with training institutions to address the shortages in talent 	

supply, and talents are able to receive training and accreditation from the Construction Industry Development Board (CIDB) to increase their employability.

- vi. Furthermore, in regard to automation, MBAM also cited that the existing scale is not enough to pursue automation in a significant way as every construction project has high levels of customisation in addition to the regulation requiring brick firewalls impedes the ability to implement the industrialised building system (IBS) construction in a big way.
- vii. With the results from the top-down analysis and the strong data and evidence collected from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Manufacturing Supervisors

MASCO 2020(4-Digit Code): 3122

MASCO 2020(6-Digit Code): 3122-01, 3122-02, 3122-09, 3122-16, 3122-22, 3122-23, 3122-24, 3122-26, 3122-29, 3122-30, 3122-35

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

Manufacturing Supervisor; Production Supervisor; Plywood Inspection Supervisor; Quality Controller; Non-destructive Testing (NDT) Inspector; Supervisor; Store Supervisor; Maintenance Supervisor; Warehouse Supervisor, Halal Logistics Operation; Assistant Supervisor; Quality Assurance Supervisor

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 2 out of 10 indicators
Bottom-up CfE survey	28 nominations
Consultation	2 nominations

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)	Wage premium growth (3 years)
No	No	No	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Interpersonal and Communication Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 3. Transportation and Storage
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack relevant job experience 2. Too few or no applicant 3. Applicants lack the required credential or certification 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Hiring less well qualified applicants 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 3. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. General Programmes 3. Social Sciences, Business, and Law
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for quality controllers, store supervisors, and quality assurance supervisors. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the entry to junior level experience equivalent to fresh graduate up to at least 2 years of working experience. In addition, some of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of a SPM level qualification is required for all vacancies listed by the respondents in the CfE survey. The top skills required for this occupation group are technical skills, interpersonal and communication skills, and problem solving. Most of the companies cited that it usually takes at least about 1 to 3 months for the vacancies to be filled, while some companies can take up to 5 months. iv. Consultation with the Malaysian Textile Manufacturers Association (MTMA), the Malaysian Textile and Apparel Centre (MATAC), and the Federation of Malaysian Fashion, Textiles & Apparels (FMFTA) indicated that this occupation faces shortage of talent as the universities which used to offer textile technology/engineering courses are no longer offering now, and there are insufficient applicants due to low awareness and interest of job opportunities in textile industry, particularly for the quality controller job in the manufacturing sites. v. Meanwhile, consultation with the Malaysia Aerospace Industry Association (MAIA) highlighted that there is a shortage of non-destructive testing (NDT) inspectors in the market today, as the job require certain level of job experience and very high level of technical expertise due to the 	

stringent regulations in the aerospace industry, but many of the existing local talent pool do not fit the criteria.

- vi. Additionally, based on the consultations, it is noted that the occupations such as for quality control/assurance and NDT inspector require niche industrial and technical skills, and a certain level of job experience which most fresh graduates do not possess, and it takes time to build their skillsets, knowledge, and experience. On the other hand, store supervisor job in this occupation received high nomination as well. It is observed that there may be many locals who do not find interest in this occupation as supervisory roles in a manufacturing plant or as warehouse or store supervisor, as these jobs may be considered as 3D (dirty, dangerous, and difficult).
- vii. With the increasing number of vacancies, and vacancy rate for this occupation, substantiated with a high number of nominations and the strong evidence collected from the bottom-up CfE survey and consultations, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Construction Supervisors

MASCO 2020(4-Digit Code): 3123

MASCO 2020(6-Digit Code): 3123-01, 3123-02, 3123-03, 3123-04, 3123-06, 3123-10, 3123-12

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

Operation Supervisor; Project Supervisor; Construction Supervisor; Site Supervisor; Site Safety Supervisor; Environmental Supervisor; Supervisor, Building Operations

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	No	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 10 indicators
Bottom-up CfE survey	17 nominations
Consultation	3 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Construction 2. Manufacturing 3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 3. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. General Programmes 3. Services
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for site supervisors, operation supervisors, and site safety supervisors. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the entry to junior level experience equivalent to fresh graduate up to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of SPM level qualification is required for all vacancies listed by the respondents in the CfE survey. This occupation requires professional certification especially for the site safety supervisor to be accredited by the Construction Industry Development Board (CIDB) under Clause 33A of the CIDB Act 520 (Amendment 2011). The top skills required for this occupation group are technical skills, problem solving, and teamwork. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies can take up to 6 months. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants lack required credential or certifications, and applicants' lack of relevant job experience. v. Consultation with the Master Builders Association Malaysia (MBAM) indicated that it takes around half a year for the positions in this occupation to be filled, especially for the site safety supervisor. They would need to go through courses and assessments to get the accreditation from CIDB before being allowed to work on-site on top of the certain level/years of experience 	

that the applicant should possess before being allowed to go for the assessment and accreditation by CIDB.

- vi. The Sarawak Chamber of Commerce and Industry (SCCI) mentioned that talents in Sarawak would usually opt for job opportunities with SMEs as there is smaller job scope as compared to the same position in a larger company. However, there is a trend observed recently that the applicants are demanding for better remuneration package above the market rate from their employers.
- vii. With the increasing number of vacancies, vacancy rate, and employment growth for this occupation, and supported with high nominations from the bottom-up CfE survey together with the data and evidence collected, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Welders and Flame Cutters

MASCO 2020(4-Digit Code): 7212

MASCO 2020(6-Digit Code): 7212-01, 7212-03, 7212-06

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

Welder; Foreman, Welder; Underwater Welder

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	Yes	2019	No
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Source of evidence:

Top-down indicators	Passes 2 out of 10 indicators
Bottom-up CfE survey	3 nominations
Consultation	5 nominations

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)	Wage premium growth (3 years)
No	No	No	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Construction 3. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. SKM Level 3 2. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for welders, especially those that are highly skilled, e.g. for oil and gas industry and aerospace industry. ii. Companies reported that vacancies within this occupation group are across all experience levels, from entry level to senior level. The most common time taken to fill for this occupation is reported to be around 1 month for normal welder, and more than 6 months for highly skilled welders. Companies have indicated that this occupation has become harder to fill as compared to a year ago. iii. A minimum of SKM level 3 is required for most vacancies. Some companies are also willing to take SPM leavers. Applicants need certifications in the respective fields to qualify for this occupation, for example in non-destructive testing (NDT), underwater welding and inspection. iv. The top skills required by companies are technical skills, problem solving and teamwork. Companies face difficulty to fill up the positions mainly due to having too few or no applicants. v. Consultation with the Welding Institute of Malaysia (WIM) indicated that there is no short supply of welders in the market currently. Its affiliate company, The Welding Institute (TWI), is able to train welders within 3 to 6 months. In fact, during the pandemic there are a lot more talents available in the market now due to job loss and the return to Malaysia from neighbouring countries. vi. According to the Malaysia Aerospace Industry Association (MAIA), the welding standard demanded by the aerospace industry is very high due to strict regulations and the nature of the industry that allows no room for error. MAIA commented that welding technology for aerospace industry in Malaysia (quality of certification) is not up to international standards. As compared 	

to the course duration of 4 years in the UK, the course in Malaysia would only take 2 to 2.5 years to be completed. It is extremely difficult to find welders with the required certification, so much so that qualified candidates are able to command their own salary.

- vii. The Master Builders Association Malaysia (MBAM) revealed that it took the construction industry around a year to fill in this position due to lack of talent. There are too few applicants, and the applicants lack the relevant job experience.
- viii. Based on consultation with the Sarawak Chamber of Commerce and Industry (SCCI), the talents in the region either join the oil and gas industry, or the smaller firms, but hardly venture into timber production or manufacturing industry. In addition, the long working hours (12-hour shifts a day, 6 full days a week) within the timber production industry is making the industry less attractive.
- ix. The Malaysian Oil and Gas Services Council (MOGSC) commented that the oil and gas industry is facing difficulties to find entry level and junior level talents for this job. Currently, the industry has enough senior talents available but the number of fresh talents may not be sufficient to replace them. This would be an issue especially in the long run.
- x. The bottom-up evidence indicates that this occupation is critical and hence it is included in the COL.

Occupation: Agricultural and Industrial Machinery Mechanics and Repairers

MASCO 2020(4-Digit Code): 7233

MASCO 2020(6-Digit Code): 7233-01, 7233-05, 7233-09, 7233-14, 7233-15

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

Machinery Mechanic; Mechanic, Plant Maintenance; Farm Machinery Repairer; Industrial Machinist; CNC Machinist (Computer Numerical Control)

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 4 out of 10 indicators
Bottom-up CfE survey	1 nomination
Consultation	5 nominations

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)	Wage premium growth (3 years)
No	No	Yes	Yes	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. IT and Digital Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Agriculture, Forestry and Fishing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Hiring less well qualified applicants 2. Expanding international recruitment efforts 3. Outsourcing this job function
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for machinists. ii. Companies have reported that vacancies within this occupation group are across all experience levels, from entry to senior level. 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. iii. Candidates for the position need to have at least a technical and vocational education and training (TVET) education. Applicants for industrial machinist and CNC machinist positions are required to have machinist certification to qualify for this occupation. iv. The top skills identified by companies are technical skills, problem solving, as well as IT and digital skills. The position is hard to fill mainly due to the lack of applicants and the applicants do not have the required credential or certification. v. The Machinery and Equipment Manufacturers Association (MEMA) and the Malaysian Special Tooling and Machining Association (MSTMA) opined that there is a lack of machinists in the labour market. As a result, there are not many applicants. It is also very difficult to retain the talents within the company as they would be pinched by other competitors or industries. vi. Consultation with the Sarawak Chamber of Commerce and Industry (SCCI) indicated that the locals are reluctant to work in the agriculture/forestry industry under the hot sun, and for long hours. The job would also require the candidate to climb hills and do seeding; it is a very tiring and dirty job. Hence, the industry is heavily reliant on foreigners currently. vii. The bottom-up evidence indicates that this occupation is in demand. Therefore, it is included in this year's COL. 	

Occupation: Electrical Mechanics and Fitters

MASCO 2020(4-Digit Code): 7412

MASCO 2020(6-Digit Code): 7412-06, 7412-08, 7412-09, 7412-21, 7412-23, 7412-24, 7412-25

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

Wireman; Foreman, Electrical; Foreman, Maintenance Chargeman; AO Chargeman; BO Chargeman; Electrical Wireman

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 2 out of 11 indicators
Bottom-up CfE survey	8 nominations
Consultation	9 nominations

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)	Wage premium growth (3 years)
No	No	No	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Construction 3. Electricity, Gas, Steam and Air Conditioning Supply
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Expanding local recruitment efforts 2. Raising wages 3. Hiring less well qualified applicants
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. SKM Level 3 2. SPM Level 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. General Programmes
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for chagemen, BO chagemen, and wiremen. ii. The majority of companies have reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the middle level experience equivalent to at least 5 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of SPM level qualification is required for all vacancies listed by the respondents in the CfE survey. This occupation requires professional certification from the Energy Commission, such as PJ1, PJ2, PJ32, PJ3 and PJ4 certificates for low voltage system chagemen (Categories AO, A1, A4-2, A4-1 and A4), and PJ52, PJ5, PJ6, PJ7, PJ8 certificates for high voltage system chagemen (Categories BO-2, BO-1, BO, B1 and B4). The top skills required for this occupation group are technical skills, problem solving, and teamwork. iv. Most of the companies cited that it usually takes more than 6 months for the vacancies to be filled. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants lack required credential or certifications, and applicants' lack of relevant job experience. v. Consultations with the Master Builders Association Malaysia (MBAM), the Malaysian Petrochemicals Association (MPA), the Chemical Industries Council of Malaysia (CICM), the Electrical and Electronics Association of Malaysia (TEEAM), and the Malaysian Organisation of Pharmaceutical Industries (MOPI) indicated that there is significant shortage of talent for this occupation, particularly for chageman as it takes long years of experience to obtain the certification. Applicants also perceive the occupation as high risk, and 3D (dirty, dangerous, and 	

difficult). Therefore, there have not been many applicants interested in this occupation. Besides, there are very limited seats available at the training centres that offer such courses. Other challenges faced by the industry are that the qualities of graduates do not meet the industry demand, where there is lack of skills and poor working attitude.

- vi. Furthermore, consultation with the Master Builders Association Malaysia (MBAM) also indicated that there is shortage of talent for electrical foreman as the industry faces difficulties filling technical and foreman jobs where existing local workers are getting old and retiring, many foreign workers have returned to the home country, and there are not enough locals joining the industry despite the industry trying to offer wages above the market rate.
- vii. With the increasing number of vacancies, and vacancy rate for this occupation, and supported with high nominations from the bottom-up CfE survey and the data and evidence collected, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Steam Engine and Boiler Operators

MASCO 2020(4-Digit Code): 8182

MASCO 2020(6-Digit Code): 8182-02, 8182-05, 8182-06

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

Boilerman; Operator, Steam Boiler Plant; Operator, Steam Engine

This occupation appears on COL:

2015	No	2016	No	2017	No	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 3 out of 9 indicators
Bottom-up CfE survey	4 nominations
Consultation	5 nominations

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)	Wage premium growth (3 years)
No	No	Yes	No	NA	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	NA	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Applicants lack the required credential or certification 2. Too few or no applicant 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Hiring less well qualified applicants 2. Expanding local recruitment efforts 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. SKM Level 3 2. STPM Level/ Matriculation/ Foundation/ Pre-University Program 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. Services
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for boilerman. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the junior level experience equivalent to at least 2 years of working experience. In addition, majority of the companies mentioned that this occupation is harder to fill as compared to a year ago. iii. A minimum of STPM level or SKM level 3 qualifications is required for all vacancies listed by the respondents in the CfE survey. This occupation requires professional certification from the Department of Occupational Safety and Health (DOSH), particularly for Boilerman Grade 1 and Steam Engine Driver Grade 1 certifications. The top skills required for this occupation group are technical skills, analytical skills, and problem solving. iv. Most of the companies cited that it usually takes at least about 2 to 3 months for the vacancies to be filled, while some companies can take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to applicants lack required credential or certifications, too few applicants for the vacancies, and applicants' lack of relevant job experience. v. Consultations with the Malaysian Petrochemicals Association (MPA), the Chemical Industries Council of Malaysia (CICM), and Coca-Cola Malaysia indicated that there is enough number of graduates applying into the industry however many do not fit the technical skills requirement of the industry, and most of the applicants are not competent enough or possess professional certifications and endorsement by DOSH. 	

- vi. Consultation with the Sarawak Chamber of Commerce and Industry (SCCI) also indicated that applicants in Sarawak would normally opt to join companies in the oil and gas industry, instead of other manufacturing industry such as timber production. It is also cited that many applicants do not take up the position in this occupation as it requires them to work long hours.
- vii. Considering that this occupation is hard to fill due to the niche skills and endorsement required by the Government body, supported with the results from top-down analysis and the moderately high number of nominations from the bottom-up CfE survey and evidence, it indicates that this occupation is critical and therefore is included in the COL.

Occupation: Heavy Truck and Lorry Drivers

MASCO 2020(4-Digit Code): 8332

MASCO 2020(6-Digit Code): 8332-01, 8332-02, 8332-05, 8332-11, 8332-13

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

Driver, Lorry; Assistant Driver, Lorry; Driver, Truck; Driver, Halal Logistics; Uploader Machinery Driver

This occupation appears on COL:

2015	No	2016	No	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 2 out of 11 indicators
Bottom-up CfE survey	28 nominations
Consultation	4 nominations

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)	Wage premium growth (3 years)
No	No	No	No	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Interpersonal and Communication Skills 3. Teamwork 	Top Sectors: <ol style="list-style-type: none"> 1. Transportation and Storage 2. Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles 3. Manufacturing
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack relevant job experience 3. Applicants' expected compensation is beyond the market rate 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Hiring less well qualified applicants 3. Expanding local recruitment efforts
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. SPM Level 2. PMR/ PT3 Level 3. No formal Education Required 	Top Field of Study: <ol style="list-style-type: none"> 1. General Programmes 2. Services
Bottom-up Evidence:	
<p>This occupation is included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for driver, lorry. ii. The majority of companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, but more for the entry level experience equivalent to a fresh graduate. iii. While there is no minimum level of qualification required for all vacancies listed by the respondents in the CfE survey, this occupation requires a relevant truck and lorry driver's license. The top skills required for this occupation group are technical skills, interpersonal and communication skills, and teamwork. iv. Most of the companies cited that it usually takes at least about 1 to 3 months for the vacancies to be filled, while some companies can take more than 6 months. The main reasons behind the occupation being hard to fill are mainly due to too few applicants for the vacancies, applicants' lack of relevant job experience, and applicants' expected compensation are beyond the market rate. v. Consultation with the Federation of Malaysian Freight Forwarders (FMFF) indicated that these truck and lorry drivers have to deal with high level of stress due to the working condition and environment, the traffic, and other logistical issues at the ports. Furthermore, locals usually consider the freight industry or this occupation as 3D (dirty, dangerous, and difficult). The applicants may also have poor work ethics and hop around companies depending on which employer could offer slightly higher pay which causes high turnover rate on the workforce. 	

- vi. With the increasing number of vacancies, and vacancy rate for this occupation, supported with high nominations from the bottom-up CfE survey and the data and evidence collected, it indicates that this occupation is critical and therefore is included in the COL.

DOVETAILING REPORTS OF OCCUPATIONS EXCLUDED FROM THE 2020/2021 CRITICAL OCCUPATIONS LIST

The following occupation reports are based on 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 additional insights or reasons to consider the inclusion of the occupation.

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

Occupation: Electrical Engineers

MASCO 2020(4-Digit Code): 2151

MASCO 2020(6-Digit Code): 2151-02

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

Electrical Engineer

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 5 out of 11 indicators
Bottom-up CfE survey	5 nominations
Consultation	3 nominations

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)	Wage premium growth (3 years)
No	No	Yes	Yes	No	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	Yes	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Problem Solving 3. Analytical Skills 	Top Sectors: <ol style="list-style-type: none"> 1. Manufacturing 2. Construction 3. Administrative and Support Service Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicants 2. Applicants lack the required credential or certification 3. Applicants lack relevant job experience 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Raising wages 2. Expanding local recruitment efforts 3. Increasing worker training
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Engineering, Manufacturing and Construction 2. General Programmes
Bottom-up Evidence:	
<p>This occupation is not included in the COL.</p> <ol style="list-style-type: none"> i. All the job titles nominated are for electrical engineers. ii. The companies reported that vacancies within this occupation group are across all experience levels, from entry to senior level, with majority of the companies looking to hire junior level with 3 to 5 years working experience. The most common time taken to fill this occupation is reported to be 1 to 3 months. 60 per cent of the companies claimed that this occupation has become neither more nor less hard to fill as compared to a year ago, while 40 per cent of them find it harder to fill now. iii. Many companies require a minimum of a bachelor's degree in Electrical Engineering for the position, while some would also accept diploma level. iv. The top skills identified by companies are mainly technical skills and problem-solving skills. Most companies are facing difficulty to hire for this position mainly due to the lack of applicants, and the applicants lack the required certification or relevant job experience. v. Consultation with the Electrical and Electronics Association of Malaysia (TEEAM) indicated that the industry is facing challenges in hiring for this position because although there are many electrical engineering graduates generated every year, many graduates do not work in the respective field after graduation because they are not interested to work in a position that is regarded as a 3D job. Besides that, the association feels that the institutes of higher learning have been too lenient in their filtering process, and this has resulted in low quality of graduates (lack of skills and bad working attitude). vi. The Machinery and Equipment Manufacturers Association (MEMA), and the Malaysian Special Tooling and Machining Association (MSTMA) also commented that the quality and attitude of 	

the candidates have deteriorated as compared to 10 to 20 years ago. The candidates may have the paper qualification but do not have the technical knowledge and skills.

- vii. Meanwhile, consultation with the Sarawak Chamber of Commerce and Industry (SCCI) indicated that most graduates in Sarawak in this field of study are more likely to look out for job opportunities in the oil and gas industry as they can provide better remuneration packages, as compared to other industries such as timber production or plantation for engineering roles.
- viii. The occupation did not pass the top-down analysis while the bottom-up inputs suggested that the criticality of this occupation lies in quality or skills rather than supply, which can be addressed by providing 4-months structured internship opportunities to students to gain hands-on experience and provide re-training / upskilling for the junior level workforce.

Occupation: Financial Analysts

MASCO 2020(4-Digit Code): 2413

MASCO 2020(6-Digit Code): 2413-01, 2413-05, 2413-11, 2413-12, 2413-13, 2413-14, 2413-15, 2413-19, 2413-21, 2413-25

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

Financial Analyst; Pricing Analyst; Risk Management Officer; Market Risk Officer; Operational Risk Officer; Risk Analyst; Risk Modeller; Credit Risk Management Executive; Anti-Money Laundering Specialist; Tax Analyst

This occupation appears on COL:

2015	Yes	2016	Yes	2017	Yes	2018	Yes	2019	Yes
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Source of evidence:

Top-down indicators	Passes 1 out of 3 indicators
Bottom-up CfE survey	4 nominations
Consultation	4 nominations

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)	Wage premium growth (3 years)
NA	NA	NA	NA	NA	NA
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
NA	NA	Yes	No	No	

Occupation Overview:	
Top Skills: <ol style="list-style-type: none"> 1. Technical Skills 2. Analytical Skills 3. Problem Solving 	Top Sectors: <ol style="list-style-type: none"> 1. Financial and Insurance/Takaful Activities 2. Professional, Scientific and Technical Activities
Top Reasons of Hard-to-Fill: <ol style="list-style-type: none"> 1. Too few or no applicant 2. Applicants lack the required credential or certification 3. Applicants lack other required skills (e.g. time management, ability to get along with others, teamwork, creativity, problem solving, reading, writing, speaking, maths and logic, etc.) 	Top Strategies to Meet Shortages: <ol style="list-style-type: none"> 1. Increasing worker training 2. Expanding local recruitment efforts 3. Automating tasks performed in this occupation
Minimum Level of Qualification: <ol style="list-style-type: none"> 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate 2. Diploma Level/ SKM Level 4 	Top Field of Study: <ol style="list-style-type: none"> 1. Science, Mathematics, and Computing 2. General Programmes 3. Social Sciences, Business, and Law
Bottom-up Evidence:	
<p>This occupation is not included in the COL.</p> <ol style="list-style-type: none"> i. The job titles nominated reflect mostly the need for risk management officers and operational risk officers. ii. The majority of companies reported that vacancies within this occupation group are for junior level to senior level (with at least 2 years of working experience). The most common time to fill for this occupation is reported to be 2 to 6 months. However, 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 most vacancies listed by respondents in the CfE survey. Talents with the Association of Chartered Certified Accountants (ACCA) certification would usually have an advantage. For the anti-money laundering specialist position, AML/CFT certification is required. iv. The top skills identified by companies are technical skills, analytical skills, and problem-solving skills. Companies are facing difficulties in hiring for the position mainly due to the lack of applicants. v. Consultation with the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated that it is difficult to find suitable financial analysts and credit risk management executives. The availability of risk management officers as well as anti-money laundering specialists are also scarce. 	

- vi. Further validation with the Association of Banks in Malaysia (ABM) revealed that this occupation may only be critical for selected financial institutions.
- vii. There is insufficient evidence from top-down results and bottom-up inputs to suggest the inclusion of this occupation in the COL.

Occupation: Credit and Loans Officers

MASCO 2020(4-Digit Code): 3312

MASCO 2020(6-Digit Code): 3312-08, 3312-10

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

Credit Analyst; Credit Risk Officer

This occupation appears on COL:

2015	Yes	2016	No	2017	No	2018	No	2019	No
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Source of evidence:

Top-down indicators	Passes 2 out of 10 indicators
Bottom-up CfE survey	1 nomination
Consultation	2 nominations

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)	Wage premium growth (3 years)
No	No	No	No	NA	No
Education level decrease (1 year)	Education level decrease (3 years)	Number of vacancies	Vacancy rate	Falling education requirements in job postings	
No	No	Yes	Yes	No	

Occupation Overview:	
Top Skills: 1. Analytical Skills 2. Problem Solving	Top Sectors: 1. Financial and Insurance/Takaful Activities
Top Reasons of Hard-to-Fill: 1. Applicants lack other required skills (e.g. time management, ability to get along with others, teamwork, creativity, problem solving, reading, writing, speaking, maths and logic, etc.) 2. Applicants lack relevant job experience	Top Strategies to Meet Shortages: 1. Increasing worker training 2. Partnerships with education or training providers 3. Outsourcing this job function
Minimum Level of Qualification: 1. Bachelor's Degree/ Graduate Diploma/ Graduate Certificate	Top Field of Study: 1. General Programmes
Bottom-up Evidence:	
<p>This occupation is not included in the COL.</p> <ul style="list-style-type: none"> i. Credit analysts and credit risk officers are the job titles nominated within this job category. ii. The majority of companies reported that vacancies for this job title are for all experience levels, from entry level to senior level. The common time to fill for this occupation is reported to be 5 to 6 months. However, 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 bachelor's degree is required for the vacancies listed. iii. According to the Association of Banks in Malaysia (ABM), the position requires the ability to gauge the outlook of key market trends and spotting opportunities across different markets whilst maintaining governance as required by international standards. Not many applicants have such skills. iv. Most banks under the Association of Islamic Banking and Financial Institutions Malaysia (AIBIM) indicated that this role is critical particularly for talent with experience. The candidate needs to have technical skills in both credit analysis and risk management. Credit risk officers make decisions to ensure the credit quality of the organisation is not compromised. They also hold a role to monitor the bank's risk which directly impact revenue, cash flow and collection capabilities. Currently, banks are also looking for talents with programming skills (SQL, Python) to be able to run financial reports (added advantage). v. The occupation did not pass the top-down analysis and the low number of nominations from bottom-up approach does not justify the inclusion of this occupation in the COL. 	