CRITICAL OCCUPATIONS LIST 2019/2020

TECHNICAL REPORT

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CSC

Critical Skills Monitoring Committee

A COLLABORATION BETWEEN

TalentCorp

ATTRACT • NURTURE • RETAIN

INSTITUT MAKLUMAT DAN ANALISIS PASARAN BURUH

KEMENTERIAN SUMBER MANUSIA

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EXECUTIVE SUMMARY

Published annually since 2015, the Critical Occupations List (COL) is a report commissioned by the Government of Malaysia through the Eleventh Malaysia Plan (11MP) to monitor skills imbalances and to provide a platform for the coordination of human capital development policies. The Critical Skills Monitoring Committee (CSC) – chaired by two agencies under the Ministry of Human Resources (MOHR); Talent Corporation Malaysia Berhad (TalentCorp) and the Institute of Labour Market Information and Analysis (ILMIA) – was mandated to produce the report, leveraging on TalentCorp's relationship with industry players and ILMIA's access to labour market information, with technical support from the World Bank. The CSC has collaborated with Universiti Tunku Abdul Rahman (UTAR) as well as PE Research Sdn Bhd in producing the top-down and bottom-up results, respectively.

The COL defines critical occupations according to three main criteria; skilled, sought-after, and strategic. Through the identification of critical and hard-to-fill occupations, the COL aims to draw the attention of policymakers to mitigate the underlying issues as a way to effectively assist the growth of Malaysia's economy. An occupational shortage list helps the synchronisation of workforce development policies and the needs of the demand side by monitoring the industries, occupations, and the in-demand skills. Not only unique to Malaysia, as many as 16 OECD countries have been producing a shortage list for the reference of their government in mitigating skills gap and other labour-related policy loopholes. Over the years, the COL has also leveraged on the methodologies and applications of these reports to improve the existing approaches.

A rigorous analysis of quantitative and qualitative evidence was conducted by combining these following approaches;

a) Top-down approach

This approach provides the basis for determining whether or not an occupation is sought-after by identifying shortages. It generates objective evidence of the current labour market that is comparable over time and across occupations. This evidence, which draws on multiple quantitative data sources such as Malaysia's labour force survey and administrative data and relies on multiple indicators of whether an occupation is in shortage, provides initial evidence of whether an occupation is sought-after by employers. These indicators can also offer guidance about which occupations are strategic.

b) Bottom-up approach

This approach complements the top-down approach to generate additional evidence. The bottom-up approach functions in building an evidence base directly from stakeholders that, in conjunction with top-down information, allows for a systematic

assessment of which occupations merit inclusion on the COL. The second function is to build contextual knowledge about the occupations and sectors to allow the CSC to better interpret indicators, better communicate decisions, and plan monitoring efforts between COL rounds. The bottom-up approach involves a Call for Evidence (CfE) survey of employers and consultations with employers and industry associations. The CfE asks a wide range of employers about occupations they believe are in shortage to generate as complete a picture as possible of employers' hiring challenges. Consultations are an opportunity to collect information similar to that gathered by the CfE, but also allow for the collection of additional contextual information that can aid in interpretation of the CfE and of the top-down evidence.

c) Dovetailing

A dovetailing process is used to integrate evidence from the top-down and bottom-up approaches to develop the final shortage list. When used together, the top-down and bottom-up components combine objective and contextualised indicators of the degree to which a skilled occupation is sought-after and strategic. The use of both sources of information allows for robust justifications for an occupation's inclusion on the COL.

For the 2019/2020 COL, 58 occupations were included. This represents 12 percent of the 483 non-military 4-digit occupations included in the Malaysian Standard Classification of Occupations 2013. Most of these occupations are high-skilled occupations at the managerial, professional, and associate professional level. However, around 14 percent of the occupations on the 2019/2020 COL are semi-skilled occupations, such as craft and trades workers, and plant and machine operators and assemblers. Three (3) occupations appear on the COL for the first time: Agricultural, Forestry and Livestock Production Managers, Metal Moulder and Coremaker, and Toolmaker and Related Worker. The complete 2019/2020 COL can be found at the end of the Executive Summary.

Over time, the COL has undergone changes to include important and relevant aspects. The evolution of the COL takes into account the expansion of data sources, improvement of calculation of the indicators of shortage, and the expansion of coverage of the stakeholders consulted in the bottom-up process. The evolution of the COL is reflected in the table below.

	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020
Occupations covered	High-skilled (Masco 1-3)	High-skilled (Masco 1-3)	High and semi-skilled (Masco 1-8)	High and semi-skilled (Masco 1-8)	High and semi-skilled (Masco 1-8)
# of top-down indicators	2	6	11	14	14
# of top-down data sources considered	2	2	9	10	10
# of top-down data sources used	2	2	3	4	4
# sectors covered	6	10	18	18	18
Call-for-Evidence (CfE)	Sample of 341	Sample of 678	Sample of 32,000	Sample of 32,000	Sample of 32,000
Consultations	Regulators	Industry associations and regulators	Employers, industry associations, ad regulators	Employers, industry associations, and regulators	Employers, industry associations, and regulators
Dovetailing	More top-down and bottom-up evidence were incorporated with each new COL				
Validation	More stakeholders were engaged with each new COL				

For the past 4 years of publication, the COL has targeted significant policy areas. In essence, the COL aims to mitigate the issues of skills gap that make it possible for an occupation to experience shortage. At the education level, a shortage list such as the COL can be highly useful in guiding appropriate resources to create policy interventions that will generate the missing skills. As a result, the CSC has – over the years – cooperated with many public and private universities in course review exercises that could match with the current needs of the labour-market. Additionally, the COL has been used to inform migration policy to attract high-skilled labour to immediately fill the gaps in the labour market without the time lag involved in developing and delivering training programs.

In other more future-forward aspects, the COL can be used in looking at the emergence of Industry 4.0, which could potentially increase the level of disruption in the labour market. These changes will require Malaysia's workforce development policies to be responsive and flexible as new occupations emerge and new skills are demanded. The COL can introduce this

flexibility in several areas of workforce development policy, and guide decision-making and help policymakers prioritise investments in human capital. Beyond that, the CSC aims to improve the reach of the COL by expanding the report to cover subnational regions. In doing so, the same methodology as the national COL will be applied. This effort could potentially recognise shortages in local labour markets that are not visible at the national level. However, several obstacles will first have to be addressed. These challenges include the potential increase in resources that have to be invested, increasing necessity in gaining comprehensive information on different type of locations, and increasing efforts in identifying and maintaining the relationship with potential subnational-level stakeholders who can be involved in providing information about labour shortages. The table below shows potential future applications of the COL.

Potential Future Applications of the COL

Policy Area	Application
Upskilling and reskilling	• Inform development of TVET and other higher education programming • Inform development of occupational standards and accreditation • Target funding for TVET and higher education programming • Target incentives to businesses for apprentices
Employment services	• Inform career counsellors about occupations in shortage • Target upskilling and reskilling for jobseekers
Immigration	• Target admissions to workers in occupations on the COL

The 2019/2020 Critical Occupations List

MASCO Code	Job Title
1121	Managing Director and Chief Executive
1211	Finance Manager
1212	Human Resource Manager
1213	Policy and Planning Manager
1214	Business Service Manager
1219	Business Services and Administration Manager Not Elsewhere Classified
1221	Sales and Marketing Manager
1311	Agricultural, Forestry and Livestock Production Managers
1321	Manufacturing Manager
1323	Construction Manager
1324	Supply, Distribution and Related Managers
1511	Information and Communications Technology (ICT) Manager
2113	Chemist
2114	Geologist and Geophysicist
2121	Mathematician, Actuary and Statistician
2141	Industrial and Production Engineer
2142	Civil Engineer
2144	Mechanical Engineer
2146	Mining Engineer, Metallurgist and Related Professional
2149	Engineering Professional (Excluding Electrotechnology) Not Elsewhere Classified
2151	Electrical Engineer
2152	Electronic Engineer
2153	Telecommunications Engineers
2166	Graphic and Multimedia Designer
2182	Manufacturing Professional
2212	Specialist Medical Practitioners
2263	Environmental and Occupational Health and Hygiene Professional
2311	University and Higher Education Professional Teacher
2411	Accountant
2412	Financial and Investment Adviser
2413	Financial Analyst
2431	Advertising and Marketing Professional
2434	Communications Technology (ICT) Sales Professional
2511	Systems Analyst
2512	Software Developer
2514	Applications Programmer
2519	Software and Applications Developer and Analyst Not Elsewhere Classified

2521	Database Designer and Administrator
2522	Systems Administrator
2523	Computer Network Professional
2529	Database and Network Professional Not Elsewhere Classified
3112	Civil Engineering Technician
3113	Electrical Engineering Technician
3115	Mechanical Engineering Technician
3119	Physical and Engineering Science Technician Not Elsewhere Classified
3122	Manufacturing Supervisor
3123	Construction Supervisor
3129	Others Supervisor Not Elsewhere Classified
3322	Commercial Sales Agent
3323	Buyer
7211	Metal Moulder and Coremaker
7222	Toolmakers and Related Workers
7233	Agricultural and Industrial Machinery Mechanic and Repairer
7412	Electrical Mechanic and Fitter
8182	Steam Engine and Boiler Operator
8189	Stationary Plant and Machine Operator Not Elsewhere Classified
8332	Heavy Truck and Lorry Driver
8341	Mobile Farm and Forestry Plant Operator

ACKNOWLEDGEMENT

The 2019/2020 Critical Occupations List benefited from fruitful discussions with, and feedback from stakeholders including but not limited to ministries, agencies, industry associations, regulators, employers and is based on a methodology developed in partnership with the World Bank. The Critical Skills Monitoring Committee (CSC) would like to extend its sincere appreciation to these stakeholders for their support and collaboration.

Associations / Companies
Association of Banks in Malaysia (ABM)
Association of Private Hospitals Malaysia (APHM)
Bank Negara Malaysia
Burning Glass International Inc.
Civil Aviation Authority of Malaysia (CAAM)
Construction Industry Development Board (CIDB) Malaysia
Department of Labour of Peninsular Malaysia (JTKSM)
Department of Manpower (JTM)
Department of Occupational Safety and Health (DOSH)
Department of Skills Development (JPK)
Department of Statistics Malaysia (DOSM)
Early Childhood Care and Education Council (ECCE)
Employees Provident Fund (EPF)
Employment Insurance System (EIS), PERKESO
Federation of Malaysian Freight Forwarders (FMFF)
Federation of Malaysian Manufacturers (FMM)
Human Resource Development Fund (HRDF)
Ikhtisas Kelautan Malaysia (IKMAL)
Immigration Department of Malaysia (JIM)
Institute of Labour Market Information and Analysis (ILMIA)
Institute of Quarrying Malaysia
JobsMalaysia, Labour Department Malaysia
Khazanah Research Institute (KRI)
Life Insurance Association of Malaysia (LIAM)
Machinery & Engineering Industries Federation (MEIF)
Machinery And Equipment Manufacturers Association (MEMA)
Majlis Amanah Rakyat (MARA)
Malaysia Aerospace Industry Association (MAIA)
Malaysia Chamber of Mines (MCOM)
Malaysia Digital Economy Corporation (MDEC)
Malaysia External Trade Development Corporation (MATRADE)
Malaysia Investment Development Authority (MIDA)
Malaysia Retail Chain Association (MRCA)
Malaysia Shipowners' Association (MASA)
Malaysian Agricultural Producers Association (MAPA)
Malaysian Association of Amusement Themepark & Family Attractions (MAATFA)
Malaysian Association of Hotel Owners (MAHO)
Malaysian Association of Hotels (MAH)
Malaysian Association of Private Colleges and Universities (MAPCU)

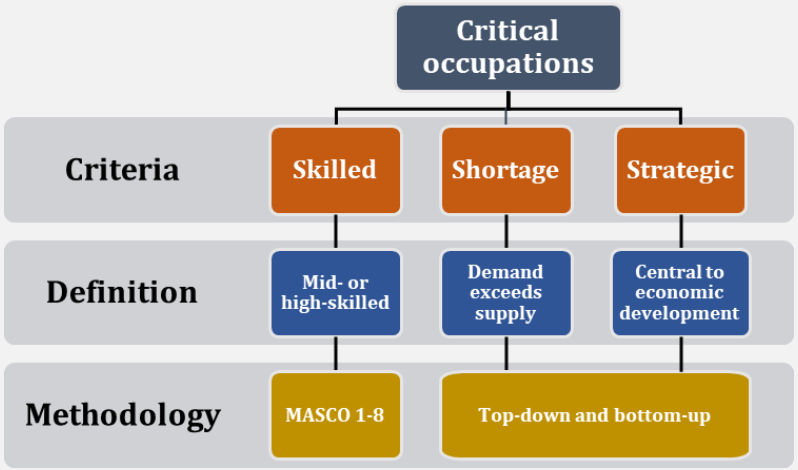
Malaysian Bar Council
Malaysian Communications and Multimedia Commission (MCMC)
Malaysian Employers Federation (MEF)
Malaysian Institute of Accountants (MIA)
Malaysian Institute of Architects (PAM)
Malaysian Institute of Estate Agents (MIEA)
Malaysian Institute of Human Resource Management (MIHRM)
Malaysian Institute of Planners (MIP)
Malaysian Knitting Manufacturers Association (MKMA)
Malaysian Organisation of Pharmaceutical Industries (MOPI)
Malaysian Palm Oil Board (MPOB)
Malaysian Pharmaceutical Society (MPS)
Malaysian Plastics Manufacturers Association (MPMA)
Malaysian Special Tooling and Machining Association (MSTMA)
Malaysian Textile Manufacturers Association (MTMA)
Manipal International University (MIU)
Master Builders Association Malaysia (MBAM)
Ministry of Economic Affairs (MEA)
Ministry of Education Malaysia (Higher Education)
Ministry of Finance (MOF)
Ministry of Home Affairs (MOHA)
Ministry of Human Resources (MOHR)
Ministry of International Trade and Industry (MITI)
Ministry of Youth and Sports (KBS)
National Association of Private Educational Institutions (NAPEI)
National Heart Association of Malaysia (NHAM)
National Institute of Occupational Safety and Health (NIOSH)
Organisation for Economic Co-operation and Development (OECD)
PE Research Sdn Bhd
Policy Division, Ministry of Human Resources (MOHR)
Public Relations Consultants' Association Of Malaysia (PRCA)
Public Services Department (JPA)
Recording Industry Association of Malaysia (RIM)
Talent Corporation Malaysia Berhad (TalentCorp)
Telekom Malaysia (TM)
The Free Industrial Zone, Penang, Companies' Association (FREPENCA)
The Institution of Engineers Malaysia (IEM)
The Land Surveyors Board
The Malaysian Paediatric Association (MPAEDS.MY)
The Malaysian Textile and Apparel Centre (MATAC)
The Marketing Research Society Malaysia (MRSM)
UK Migration Advisory Committee (UKMAC)
Universiti Tunku Abdul Rahman (UTAR)
Waste Management Association of Malaysia (WMAM)
Welding Institute of Malaysia (WIM)
World Bank Group
Yayasan Peneraju Pendidikan Bumiputera

METHODOLOGY FOR THE 2019/2020 COL

What is a critical occupation?

As documented in previous technical reports, occupations are considered critical if they are skilled, sought-after, and strategic. The Critical Occupations List (COL) is primarily concerned with identifying shortages in occupations that are associated with Malaysia's growing knowledge-based economy. To accomplish this, the COL is focused on identifying occupations that are *skilled*. The COL is also interested in determining whether there are mismatches between employers' demand for certain occupations and the supply of the skills associated with these occupations. As a result, the COL seeks to identify shortages in occupations that are *sought-after* by employers. Finally, the COL is designed to be a tool to help policymakers make decisions. Thus, even after identifying shortages in skilled occupations an occupation is only considered to be critical if filling that occupational shortage is consistent with Malaysia's *strategic* economic development objectives. Details as per in **figure 1** below.

Figure 1: Defining critical occupations



Source: Authors

Is the occupation skilled?

Occupations are determined to be *skilled* based on the Malaysian Standard Classification of Occupations list. The COL uses the Malaysian Standard Classification of Occupations (MASCO) 2013 list to determine the skill level of occupations. This list is maintained and regularly updated by the Ministry of Human Resources (MOHR). Eight of the 9 MASCO occupational groupings are semi- or high-skilled. These are:

MASCO 1: Managers
MASCO 2: Professionals
MASCO 3: Technical and Associate Professionals

MASCO 4: Clerical Support Workers
MASCO 5: Service and Sales Workers
MASCO 6: Skilled Agricultural, Forestry, Livestock and Fisheries Workers
MASCO 7: Craft and Related Trades Workers; and
MASCO 8: Plant and Machine Operators and Assemblers.

Elementary Occupations (MASCO 9) are considered to be low- or unskilled. Whereas all of the other occupational groupings require at least secondary education[1], the Elementary Occupations grouping requires only primary education. These occupations are not eligible for inclusion on the COL.

Is the occupation sought-after?

Sought-after occupations are identified using quantitative indicators of shortage and qualitative evidence from employers and other stakeholders. Sought-after means that demand for an occupation or job title exceeds the supply of appropriately qualified workers despite efforts on the part of employers to satisfy their demand and for reasons not easily addressed through changes in employer hiring practices. The top-down approach defines specific indicators of occupations that are sought-after and sets thresholds based on national labour market statistics. The bottom-up approach uses nominations of hard-to-fill occupations in a Call for Evidence Survey (CfE) of employers as the most important indicator of occupations that are sought-after. In order to assess the validity and potential drivers of occupations that are sought-after, additional information is sought in the CfE and in consultations. This additional information includes job requirements, skills needed, desired level of experience, minimum qualification required, reasons why employers believe the occupation is hard-to-fill, and employer responses to hiring difficulties.

Is the occupation strategic?

Strategic means that an occupation is central to Malaysia's economic development objectives. A strategic occupation is one that is closely linked to Malaysia's economic growth and the development of its knowledge-based economy. As a result of the strategic criteria, government programs can use the COL to set priorities and allocate resources. This criterion is more flexible than the skilled and sought-after criteria and draws on evidence from both the top-down and bottom-up approaches. It is designed to ensure that the COL meets the needs of policymakers and Malaysia as a whole. Because the COL is designed to be used by a broad range of agencies and programmes, the strategic criteria is not intended to exclude a large number of occupations for which the skilled and sought-after criteria are strong. Rather, the aim is to ensure that the COL is able to address emerging economic and social needs when the skilled and sought-after tests are passed.

[1] Or at least the Malaysian Skill Certificate (SKM) Levels 1-3.

Top-down methodology

Labour market shortages arise when there is an insufficient supply of appropriately qualified workers willing to work under existing market conditions, particularly at prevailing wages (Shah and Burke 2005; Richardson 2007). Such shortages can be caused by factors including lags in the adjustment of wages, in the adjustment of labour supply, and the lack of labour market information. Given the relationship of shortages to multiple labour market factors, it is necessary to use a methodology to identify shortages that considers as many of these factors as possible including employment, wages, working hours, and vacancies. The top-down approach does this by drawing on multiple data sources and using statistical techniques to provide objective, quantitative evidence of labour market shortage to identify shortage indicators and shortage occupations.

The top-down methodology looks at a range of data sources to define both quantity indicators (for example, employment levels and vacancies) and price indicators (for example, earnings and wage premiums); uses indicator-specific thresholds to define when each indicator is likely to provide evidence of shortage; and employs a "traffic light" approach such that evidence of shortage in a certain percentage of indicators is used as the final gauge of shortage, rather than evidence of shortage in a single indicator. The first step in the top-down approach is to identify data sources with shortage information. Then, a set of shortage indicators is identified in these data sources through a process of testing a number of different indicators and their combinations. A final specification for the top-down methodology emerges from this process. Universiti Tunku Abdul Rahman (UTAR) was engaged to assist the CSC in carrying out the top-down process.

Data sources

The COL 2019/2020 has primarily utilised the following five data sources compiled from the Labour Market Information Data Warehouse and internal TalentCorp database:

1. **Labour Force Survey (LFS).** The COL 2019/2020 utilises the Labour Force Survey (LFS) that is referred as a survey of the Malaysian workforce between 2011 to 2018. The LFS is conducted on a monthly basis at the household level and is representative of citizens and non-citizens at the national, state, and urban and rural levels. The LFS could be used to construct shortage indicators related to employment, working hours, and education level by occupation.

2. **Salaries and Wages Survey (SWS)**. The SWS is an annual survey on the earnings of employees at the household level and is representative of citizens and non-citizens at the national, state, and urban and rural levels from 2011 to 2018. The survey is restricted to only paid employees who have worked for at least 6 hours a day or

minimum of 20 days a month. The SWS offers important data on shortage indicators related to salaries and wage premiums by occupation.

3. **JobsMalaysia database.** JobsMalaysia is a public employment services platform managed by the Ministry of Human Resources (MOHR). JobsMalaysia provides nationwide job matching services to jobseekers and employers with two different administrative datasets; job vacancies and job seekers. These datasets offer important information on labour demand in terms of number of vacancies by occupation and skill level from 2011 to 2018.

4. **Returning Expert Programme database**. TalentCorp's Returning Expert Programme (REP) primarily contains information regarding applications of Malaysians who are currently working abroad to return home under this scheme from 2011 to 2018. The REP offers tax and visa benefits to selected Malaysians who meet educational, salary, and work experience requirements.

5. **Online job posting data.** Online job posting data are collected from one of Malaysia's largest online job matching platforms in Malaysia from May 2016 to December 2018 through Burning Glass Technologies. This data source provides information regarding job vacancy, educational, skills and working experience. This data will be one of the primary sources in analysing labour market on demand perspective and educational changes requirement for hard-to-fill jobs.

The top-down approach requires data to be available for the most recent year of the analysis (2018), as well as previous years to establish trends. Occupation is the unit of analysis classified using the 4-digit Malaysian Standard Classification of Occupations (MASCO) 2013, the latest version of MASCO. The reference population for the top-down approach is all Malaysian and foreign individuals in the working age population[2] who are employed. The 2019/2020 COL includes both high- and semi-skilled occupations, and covers employees, employers, and self-employed.

There is no set rule for the minimum number of observations that must be used for statistical analysis, but the academic literature typically uses between 20 and 50 observations, with 30 being the most frequent. According to Tanis and Hogg (2015), 30 is regarded as a boundary between small and large samples for the purpose of drawing distributions. As a result, 30 is used as the minimum number of observations per occupation when using the LFS and the SWS datasets. It is not necessary to set a minimum sample size for the administrative data, which does not involve sampling.

[2] The working age population is defined as people between the ages of 15 and 64.

Shortage indicators

In general, this stage attempts to define the occupational shortage in detail by identifying potential shortage indicators. The 2019/2020 COL had suggested 3 basic set of indicators; earning-based, volume-based, and employment-based indicators to identify the occupational shortage (**table 1**).

Table 1: Set of shortage methodology indicators

No	Indicators set	Description
1.	Employment-based indicators	Rising employment in an occupation could indicate rising labour demand and provide indication of shortage.
2.	Earning-based indicators	A rise in earning/income in an occupation relative to other occupations could be associated with an increase in demand for labour in an occupation and can be considered to provide an indication of shortage.
3.	Volume-based indicators	Increases in working hours, vacancies and decrease in education required could indicate rising demand and indicate shortage.

An initial list of indicators is compiled with economic rationale for why they are used as indicators of labour shortage. There is a total of 18 indicators constructed from the five selected datasets (**table 2**).

Table 2: Initial indicators for the top-down methodology

Indicators set	Data source	Indicators	Calculating the indicators	Shortage rationale
Employment-based indicators	Labour force Survey (LFS)	1. 1-year employment growth 2. 3-year employment growth	• Employment per occupation is given by the number of weighted observations per occupation. • Once the variable for employment per occupations is generated, the percentage change in employment is calculated with respect to 1 year (2017 and 2018) and 3 years (2015 and 2018).	• An increase in number of employees in an occupation suggests that the demand for that occupation is rising.
Earning-based indicators	Salaries and Wages Survey (SWS)	3. 1-year wage premium growth 4. 3-year wage premium growth	• In this case, the premium per occupation per year are calculated using an OLS regression where the dependent variable is the logarithm of the monthly wage per individual and the independent variables are dummies for each occupation controlling for gender, age, age squared, and the level of education (dummy variables for 7 education categories). • The coefficient of the dummy variables for each occupation represents the wage premium, which is then used to generate the change with respect to 1 year (2017 and 2018) and 3 years (2015 and 2018).	• An increase in wage in an occupation could be associated with increase in demand for labour in an occupation.
Volume-based indicators	Labour force Survey (LFS)	5. 1-year working hours growth 6. 3-year working hours growth	• After generating the number of hours worked per week per individual, the median number of hours worked per week per occupation is generated.	• Longer working hours and higher wages and improved conditions can be likened to a 'first line of defence' for firms experiencing skill shortages. (Healy et al. 2011).

			• The percentage change in median weekly hours worked per occupation is then calculated with respect to 1 year (2017 and 2018) and 3 years (2015 and 2018).	• An increase in number of working hours in an occupation could be caused by existing workers utilised to fill a rise in demand for the labour.
	Labour force Survey (LFS)	7. 1-year education level decrease 8. 3-year education level decrease	• After generating the level of education per individual, the median level of education per occupation is generated. • The percentage change in median level of education per occupation is then calculated with respect to 1 year (2017 and 2018) and 3 years (2015 and 2018).	• A decrease in education level could be linked to strategies that employers take in order to fill vacancies. In particular, an employer might accept workers with a lower level of education for a particular job if the vacancy has been very difficult to fill.
	Online job posting data (JobsMalaysia & Burning Glass)	9. Number of vacancies	• This is the total number of vacancies posted per occupation per year. Burning Glass and Jobs Malaysia were used for high-skilled and semi-skilled respectively.	• Labour shortages determined by taking stock of the number of unfilled vacancies in certain occupations (European Migration Network, 2019) • A large number of vacancies in an occupation is positively associated with rising labour demand.
		10. Vacancy rate (% of employment)	• It is calculated as the number of vacancies as a percentage of total employment per occupation. Burning Glass and JobsMalaysia were used for high-skilled and semi-skilled respectively.	• The main cause of strong increase in labour demand, as evidenced by the increase in the job vacancy rates (Rutkowski, 2007). • The rational is similar to the number of vacancies.
		11.1-year education level decrease	• This is the change in the education for an occupation.	• Similar rational to LFS, education level decrease.

		12. 1-year experience level decrease	• This is the change in the experience level for an occupation.	• A decrease in experience level could indicate employer's strategy in hiring less experienced candidate due to hard to fill vacancy.
		13. Share of vacancies posted > 6 weeks	• Number of jobs posting per occupation divided with vacancies posted per occupation more than 6 weeks.	• The similar rational to number of vacancies.
		14. Absolute change in vacancies hard to fill	• Difference of vacancies posted per occupations more than 6-week 2017 and 2018.	• Difficulties to fill online vacancies reflect labour shortage (Raux, 2018). • An increase in median vacancy duration indicate difficulty in filling the vacancy for employer.
		15. Median vacancy duration	• Median vacancy duration per occupation.	• The same rational as absolute change in vacancies hard to fill.
	Returning Expert Programme database	16. Number of REP applications	• This is the total number of REP applications per occupation per year.	• An increase in number of REP applications in an occupation indicates increase in labour demand (2018/2019 COL).
	Returning Expert Programme database	17. 1-year REP application growth 18. 3-year REP application growth	• This indicator uses the number of REP application per occupation and measures the percentage change with respect to 1 year (2017 and 2018) and 3 years (2015 and 2018).	• The same rational as number of REP application.

Threshold values

The threshold value of an indicator is the value above which the indicator suggests shortage in an occupation. Threshold values are set depending on the distribution of each indicator. The UK's Migration Advisory Committee uses two types of thresholds: the median of the indicator plus 50 percent of the median value and the value of the 75th percentile of the distribution of the indicator's values (MAC 2008 and 2010). An application of the shortage list methodology in Mexico uses the value of the 85th percentile in an effort to offset any errors of inclusion (World Bank 2015).

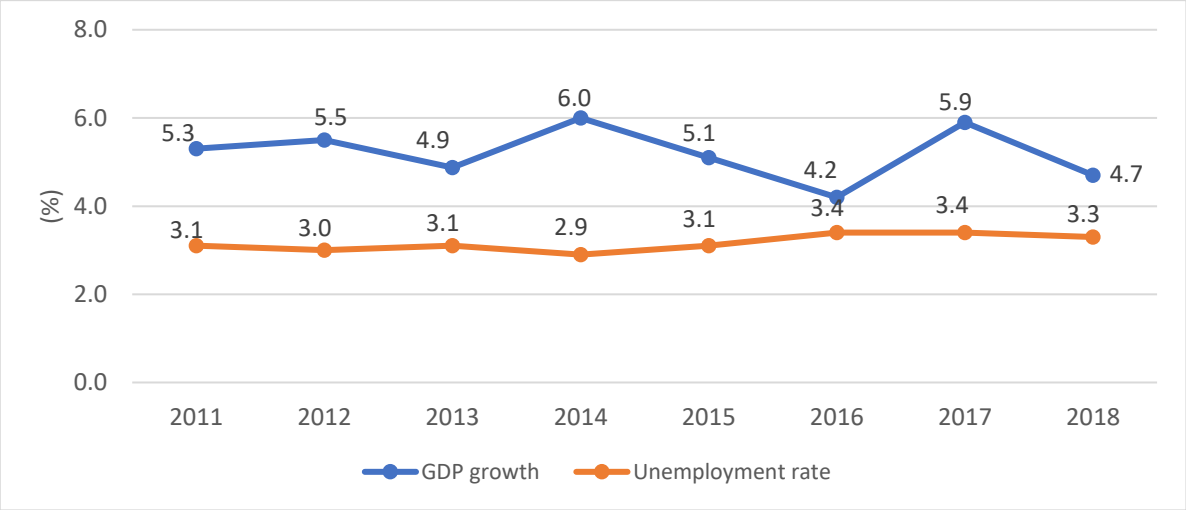
Following similar approach as previous COLs, the 2019/2020 COL considers two threshold scenarios as below:

1. A less restrictive scenario sets low threshold values for the shortage indicators, and thus includes a larger number of occupations that are considered to be in labour shortage for each indicator. The median plus 50 percent (referred to as p50+50%) is the main threshold considered for this scenario.
2. A more restrictive scenario sets high threshold values for the shortage indicators, and thus includes a lower number of occupations that are considered to be in shortage for each indicator. The 75th percentile (referred to as p75) is the main threshold considered for this scenario.

A benchmark period is used to set the threshold values for each shortage indicator. Because economic conditions affect the value of different indicators of shortage, a benchmark period is used to obtain the thresholds values of shortage indicators to which the current period of study can be compared. The benchmark period is a period during which economic growth and employment are strong. This minimises errors of inclusion and has three additional benefits (MAC 2010). First, indicators change along with the economy. That is, when economic growth is weak, fewer occupations are found to be in shortage. Second, indicators change along with skill shortages rather than other types of shortages that are more stable over time. Third, thresholds do not have to be reconsidered for each period for which the COL is undertaken. That is, the appropriateness of using the p50+50% or p75 threshold need only be evaluated for the benchmark period.

The 2019/2020 COL maintains the usage of 2014's benchmark period as previous 2018/2019 COL due to the same reason. **Figure 2** shows that the year 2014 recorded the highest annual gross domestic product (GDP) growth (6.0%) and the lowest unemployment rate (2.9 percent) as compared to the year 2011 and 2018. While economic growth was comparable in 2014 and 2017, the unemployment rate was higher in 2017 than in 2014. This factor qualifies the year 2014 to be selected as benchmark period for this analysis.

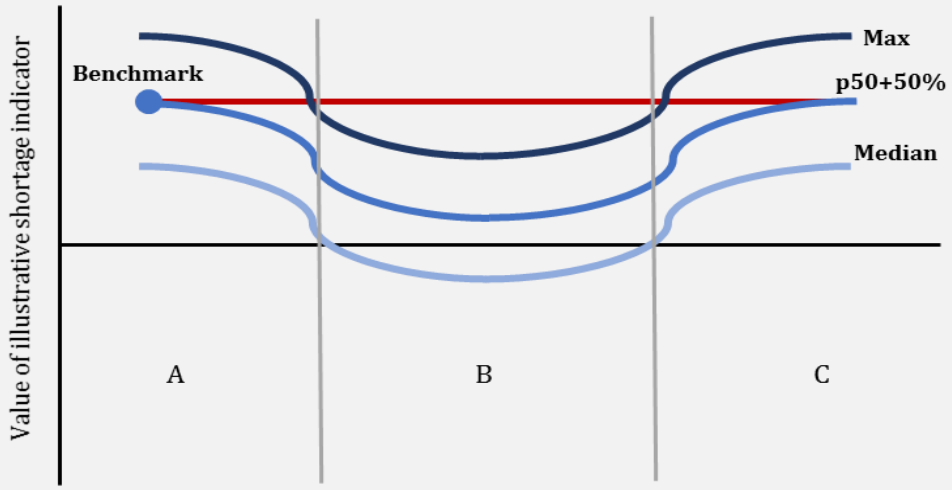
Figure 2: GDP (at constant price) and unemployment rate in Malaysia, 2011 - 2018



Source: Department of Statistics, Malaysia

Figure 3 provides an illustrative example of how the benchmark period and the threshold values interact. In Figure 3, the benchmark period is Period A, a period of high economic growth. The threshold value is set during this period at the blue dot using the p50+50% threshold. This sets the threshold value at its highest historical level. Period B, in contrast, is a period of lower growth. During this period, using the p50+50% threshold means that all values of the illustrative indicator are below the threshold set in the benchmark period (the red line) and thus no occupations are considered to be in shortage for the illustrative indicator. Finally, in Period C stronger growth returns. By the end of Period C occupations with values on the illustrative indicator that lie between p50+50% and the maximum value are considered to be in shortage.

Figure 3: Illustrative example of setting the benchmark period and threshold values



Source: Authors adapted from MAC (2010)

The 2019/2020 COL generally uses the median plus fifty percent rule (p50+50%) to address shortage as the less restrictive scenario. However, in cases where the data distribution indicates a median close to zero or the distribution is not approximately normal with p50+50% and found to be higher than top quartile p75, the 2019/2020 COL adopts the top quartile as the less restrictive scenario. The less restrictive scenario sets low threshold values for the shortage indicators and allows wider space for inclusion in contrast to the more restrictive scenario with limited inclusion. Thus, each threshold value of indicators allows to calculate the number of occupations that possibly exceeds the threshold value to mark shortage based on MASCO 2013.

Intermediate indicators

The initial indicators are evaluated to ensure that information about the shortage is not duplicated. This stage requires two step analysis, namely (1) correlation test and (2) comparison of the lists of occupations in respect to less and more restrictive scenarios. The correlation test revealed that 1-year employment growth has positive and significant correlation with a 3-year employment growth, a 1-year working hour and negative relationship with a 1-year wage premium growth. In other words, an increase in the wage rate could reduce employment and total number of hours worked, and this is found to be consistent with past studies (Hamermesh, 2014). The first correlation test generally indicates the relationship among the shortage indicators is appear to be moderate and weak with coefficient below 0.5 (Gogtay and Thatte, 2017). This indicates that the association between each indicator is weaker as changes in one indicator does not significantly influences the changes of the other shortage indicator. The second test that was performed on each indicator in each dataset to identify appropriate threshold scenario. Based on the **table 3** below, less restrictive scenario (threshold p50+50%) is preferred over more restrictive scenario (p75), with the former being able to gauge larger number of occupations in shortage.

Table 3: Number of occupation list exceeding the shortage threshold

Indicators	Threshold p50 + 50%		Threshold p75		NA
	Yes	**No**	Yes	No	
1-year employment growth	**82**	**156**	38	200	212
3-year employment growth	**75**	**163**	50	188	212
1-year education level decrease	**32**	**212**	32	212	206
3-year education level decrease	**42**	**202**	42	202	206
1-year working hours growth	**43**	**194**	24	213	212
3-year working hours growth	**57**	**181**	39	199	212
1-year wage premium growth	**103**	**23**	97	29	324
3-year wage premium growth	**87**	**39**	39	87	324
Number of REP application	**49**	**-**	49	-	401
1-year REP application growth	**20**	**-**	19	1	430
3-year REP application growth	**20**	**-**	19	1	430

Number of vacancies	**146**	**221**	103	264	83
Vacancy rate[a]	**144**	**216**	83	277	90
Vacancy rate[b]	**77**	**240**	39	278	133
1-year education level decrease (Online)	**65**	**222**	65	222	163
1-year experience level decrease (Online)	**131**	**134**	131	134	185
Share of vacancies posted > 6 weeks	**101**	**176**	85	192	173
Absolute change in vacancies hard to fill	**138**	**176**	72	242	136
Absolute change in median vacancy duration	**127**	**158**	109	176	165

*NA: Data not available

[a] Based on online job posting data

[b] Based on JobsMalaysia data

Shortage occupations

The final step in top-down approach is to combine the intermediate shortage indicators to create a list of shortage occupation. This process requires setting a set of rules that could best reflect the shortage indicators. The 2019/2020 COL adapted the same set of rules as previous COLs, where a minimum of 4 indicators per occupation must be available for an occupation to be considered in shortage. In other word, if an occupation has data available for three or fewer indicators that occupation will be eliminated from the proceeding analysis. Potential lists of shortage occupations were created in a test series of different specifications of indicators. **Table 4** summarises the 18 indicators included at this stage of top-down process and their skills level accordingly. The 2019/2020 COL uses data from Burning Glass and Jobs Malaysia on high-skilled and semi-skilled occupations, respectively based on the analysis of online job postings data in the 2018/2019 COL technical report.

Table 4: Indicators included in the final specification

Indicators set	Data source	Indicators	Skilled included
Employment-based indicators	Labour force Survey (LFS)	1) 1-year employment growth 2) 3-year employment growth	High & semi-skilled
Earning-based indicators	Salaries and Wages Survey (SWS)	3) 1-year wage premium growth 4) 3-year wage premium growth	High & semi-skilled
Volume-based indicators	Labour force Survey (LFS)	5) 1-year working hours growth 6) 3-year working hours growth	High & semi-skilled
	Labour force Survey (LFS)	7) 1-year education level decrease 8) 3-year education level decrease	High & semi-skilled
	Online data (Jobs Malaysia & Burning Glass)	9) Number of vacancies	High & semi-skilled
	Online data	10) Vacancy rate (% of employment)	High & semi-skilled

	(Burning Glass, Jobs Malaysia & Labour force Survey)		
	Returning Expert Programme database	11) Number of REP application 12) 1-year REP application growth 13) 3-year REP application growth	High & semi-skilled
	Online data (Burning Glass)	14) 1- year education level decrease (Online)	High-skilled
	Online data (Burning Glass)	15) 1-year experience level decrease (Online)	High-skilled
	Online data (JobsMalaysia)	16) Share of vacancies posted > 6 weeks	Semi-skilled
	Online data (JobsMalaysia)	17) Absolute change in vacancies hard to fill	Semi-skilled
	Online data (JobsMalaysia)	18) Absolute change in median vacancy duration	Semi-skilled

The baseline specification (Specification 1) has served as the main reference point in comparing several other specifications of indicators. The Specification 1 includes 1 and 3-year employment growth, 1 and 3-year education level decrease, 1-year wage premium growth, number of vacancies, vacancy rate, 1-year education level decrease (online) and 1-year experience level decrease (online). 12 alternative specifications were tested using robustness analysis by adding and dropping indicators in a similar combination to 2018/2019 COL. **Table 5** illustrates the different specification test using a less restrictive scenario. Specification 1 to 8 had applied single threshold value for both high and semi-skilled occupation. However, Specification 9 to 12 had applied disaggregated threshold values respectively for high and semi-skilled occupation due to differences in the labour market response to identical economic condition.

Table 5: Specification tested for top-down analysis

Indicators	Specification											
	1[a]	2[a]	3[a]	4[a]	5[a]	6[a]	7[a]	8[a]	9[b]	10[b]	11[b]	12[b]
1-year employment growth	x	x	x	x	x	x	x	x	x	x	x	x
3-year employment growth	x	x	x	x	x	x	x	x	x	x	x	x
1-year education level decrease	x	x	x	x	x			x	x	x	x	x
3-year education level decrease	x	x	x	x	x			x	x	x	x	x
1-year working hours growth	x	x	x	x		x		x	x	x	x	x
3-year working hours growth	x	x	x	x		x		x	x	x	x	x
1-year wage premium growth	x	x	x	x	x	x	x	x	x	x	x	x
3-year wage premium growth		x	x	x	x	x	x	x	x	x	x	x
Number of REP application			x			x	x					

1-year REP application growth				x		x	x					
3-year REP application growth		x			x	x	x					
Number of vacancies	x	x	x	x	x	x	x	x	x	x	x	x
Vacancy rate	x	x		x	x	x	x	x	x	x	x	x
1-year education level decrease (Online)	x	x	x	x	x	x	x	x	x	x	x	x
1-year experience level decrease (Online)	x	x	x	x	x	x	x	x	x	x		x
Share of vacancies posted > 6 weeks					x			x	x	x	x	x
Absolute change in vacancies hard to fill						x		x	x		x	x
Absolute change in median vacancy duration							x	x	x	x	x	
Total indicators	11	13	12	13	12	14	12	15	15	14	14	14
Comparison		1 vs 2	3 vs 2	4 vs 3	5 vs 4	6 vs 4	7 vs 4	8 vs 4	9 vs 4	10 vs 9	11 vs 10	12 vs 10
Preferred specification	1	2	3	4	4	4	4	4	9	10	10	10

[a] Same threshold value for all occupations.

[b] Separate threshold values for high & mid skilled occupations.

note: The "x" means that the indicator is included in the specification. The black shading indicates where the specification differs from the baseline specification.

Overall, the specification with the following characteristics are preferred over the other in a pairwise comparison: (1) larger list of occupational inclusion, (2) fewer list of dropped occupation (3) reflection of more indicators. **Appendix 1** provides the detailed illustration on the specification selection. The 2019/2020 COL had chosen specification 10 over 12 as it fits the selection criteria. This specification includes: 1 and 3-year employment growth, 1 and 3-year education level decrease, 1 and 3-year wage premium growth, 1 and 3-year working hours growth, number of vacancies, vacancy rate, 1-year education level decrease (online), 1-year experience level decrease (online), the share of vacancy posting, and absolute change in median vacancy duration which treats high and semi-skill occupations separately.

Shortage list

In the final process, the specification 10 seems to be the most suitable combination of the top-down shortage list due to its inclusiveness of 14 indicators with distinct threshold for high and semi-skilled occupations in the less restrictive scenario. **Table 6** summarises the number of occupations that are available to be analysed for each indicator and number of occupations exceeding the threshold. The percentage of occupations exceeding the available threshold per occupation contributes in shortlisting the occupations. The wage indicators (1-year wage premium) recorded higher percentage, followed by 1-year decrease in experience level and absolute change in median vacancy duration.

Table 6: Descriptive statistics for each shortage indicators

Indicators	Threshold	Threshold value for high-skilled occupations	Threshold value for mid-skilled occupations	Number of occupations available	Number of occupations that exceed threshold	Percentage of occupations that exceed threshold per occupation available
1-year employment growth	p50+50%	4.55	13.8	165	56	33.9
3-year employment growth	p50+50%	10.4	27.3	165	63	38.2
1-year education level decrease	p50+50%	0	0	169	27	15.9
3-year education level decrease	p50+50%	0	0	169	36	21.3
1-year working hours growth	p50+50%	2.19	1.98	163	24	14.7
3-year working hours growth	p50+50%	3.56	1.71	163	39	23.9
1-year wage premium growth	p50+50%	1.14	2.22	97	84	86.6
3-year wage premium growth	p50+50%	8.77	9.00	97	34	35.0
Number of vacancies	p50+50%	335.3	880.5	211	78	36.9
Vacancy rate	p50+50%	3.34	0.25	211	67	31.8
1-year education level decrease (Online)	p50+50%	0	0	111	13	11.7
1-year experience level decrease (Online)	p50+50%	0	0	112	71	63.4
Share of vacancies posted > 6 weeks	p50+50%	N/A	0.79	83	19	22.9
Absolute change in median vacancy duration	p50+50%	N/A	-44.3	82	40	48.8

Table 7 below shows the comparison between the high- and mid-skilled occupations of shortage indicators between 2018/2019 COL and 2019/2020 COL. 2019/2020 COL has introduced two new indicators namely; the share of vacancies posted more than six weeks and absolute change in median vacancy duration to gauge a wider spectrum of the labour market imbalances in Malaysia. In addition, 2019/2020 COL had also included mid-skilled occupations to observe the number of vacancies and vacancy rates. The results from the final specification of 2019/2020 COL indicates 54 occupations are in shortage (**Appendix 2**). The skilled dimension of the shortage list seen a 7.3% drop in the high-skilled occupations from 41 occupations to 38 occupations in the 2019/2020 COL. Nevertheless, the mid-skilled occupations recorded a rapid increase of 42% from 12 occupations to 17 occupations during the respective period. Overall, the findings of 2019/2020 COL seem to be consistent with 2018/2019 COL to suggest high-skilled occupational shortage is still severe compared to the mid-skilled occupational shortage in Malaysia.

Table 7: Comparison with previous COL

	2018/2019 COL		2019/2020 COL	
Indicators	**Included**	**Occupation skills**	**Included**	**Occupation skills**
1-year employment growth	Y	High- & Semi-skilled	Y	High & Semi-skilled
3-year employment growth	Y	High- & Semi-skilled	Y	High & Semi-skilled
1-year education level decrease	Y	High- & Semi-skilled	Y	High & Semi-skilled
3-year education level decrease	Y	High- & Semi-skilled	Y	High & Semi-skilled
1-year working hours growth	Y	High- & Semi-skilled	Y	High & Semi-skilled
3-year working hours growth	Y	High & Semi-skilled	Y	High & Semi-skilled
1-year wage premium growth	Y	High & Semi-skilled	Y	High & Semi-skilled
3-year wage premium growth	Y	High & Semi-skilled	Y	High & Semi-skilled
Number of vacancies	Y	High-skilled	Y	High & Semi-skilled
Vacancy rate	Y	High-skilled	Y	High & Semi-skilled
1-year education level decrease (Online)	Y	High-skilled	Y	High-skilled
1-year experience level decrease (Online)	Y	High-skilled	Y	High-skilled
Share of vacancies posted > 6 weeks	N	N/A	Y	Semi-skilled

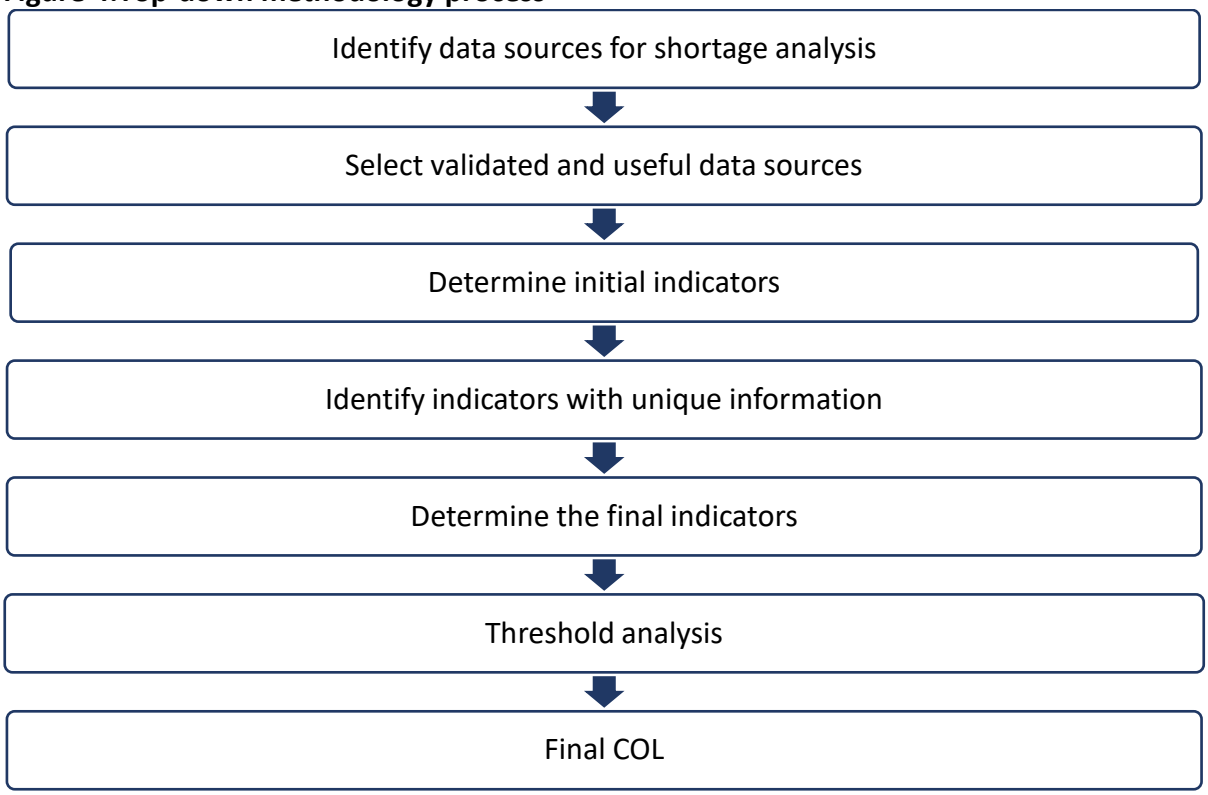
Absolute change in median vacancy duration	N	N/A	Y	Semi-skilled

Note: “Y” for included; “N” for not included

Summarising the top-down process

In summary, the process of developing the shortage list from the top-down approach involves three steps. At first stage, the data source for usable information about occupation shortage is identified. The second stage is where the shortage indicator is selected. At this second stage, threshold values are used to test more and less restrictive scenarios for each indicator using a benchmark period, that will result in a set of intermediate indicators. At the final stage, the intermediate shortage indicators are combined in a variety of specifications to produce one shortage list.

Figure 4:Top-down methodology process



Source: Authors adaptation from COL Report, 2018/2019

Bottom-up methodology

The bottom-up approach comprises a Call-for-Evidence (CfE) survey of employers as well as focus group discussions (FGDs) and consultations with employers and industry associations. The CfE seeks to ask a wide range of employers about occupations they believe are in shortage to generate as complete a picture as possible of employers' hiring challenges. Meanwhile the FGDs and consultations conducted serve to supplement the firm-level data canvassed from the online survey, which provide additional information that can aid in interpretation of the CfE and top-down evidence. PE Research Sdn Bhd, an independent economic consulting firm, was engaged to assist the CSC in carrying out the bottom-up process.

In addition to this, findings from sector-based Environmental Scan and other talents studies as well as examination of administrative data are also incorporated in the COL.

Call-for-Evidence (CfE) survey

The objective of the Call-for-Evidence (CfE) survey is to collect evidence of occupations that employers are believe in shortage across 18 economic sectors in Malaysia. **Appendix 3** shows the 18 sectors and 63 sub-sectors, which is the scope of the 2019 CfE survey.

The sector coverage follows the Malaysia Standard Industrial Classification (MSIC) 2008 in classifying industries. Meanwhile, the occupational description uses the Malaysian Classification of Occupations (MASCO) 2013 to classify occupations found in the survey.

The CfE survey was conducted using an online platform as the main canvassing method. The following tasks were executed:

- Web hosting the COL survey on an online platform;
- Emailing the survey link to companies to complete the survey;
- Following up with companies to ensure response;
- Mapping the job title and key responsibility for each critical job positions identified by the firm at the MASCO 6-digit level;
- Compiling and cleaning the data by PE Research; and
- Reviewing and verifying the job title classification by CSC. Cases of ambiguity or discrepancy are referred to MASCO team for further clarification.

The survey list (sample frame) had 30,018 companies as provided by CSC. Companies for the survey are drawn from several government databases with company contact information that are available publicly or that were compiled by the CSC.

Survey questionnaire

There were three sections to the survey questionnaire:

a) Section 1: Company Background
b) Section 2: Critical Occupations – Employers identified occupations that were critical to the company, the key responsibilities of the occupations, reported on the employees in the positions, experience level needed, time taken to fill vacancies, reasons for defining its criticality, skills needed for the critical jobs reported, strategy used to tackle talent shortage etc.
c) Section 3: Automation – Firms indicated or reported if there was a potential to automate critical jobs and provided suggestions related to solving skills shortages or deficits.

The questionnaire was modified from the CfE 2018/2019 survey with questions on 'skills' for the nominated jobs were added. The CfE 2019/2020 survey questionnaire can be found in **Appendix 4**.

Pilot test results

The main purpose of conducting a pilot test was to get feedback from respondents on the draft of survey questionnaire in terms of its structure, layout, flow and the logic of the questions. Additionally, a pilot test also tests the clarity of the instructions to be measured by the ability of the respondents to follow the directions of the survey. Another objective was to find out the time taken to answer the entire questionnaire, any perceived difficulty with the questions and its comprehension. After obtaining and analysing the results of the pilot test, it was used to improve the final questionnaire.

The pilot test was conducted from 16th till 24th May 2019 with 25 firms. The feedback received from respondents indicated that the questions are straightforward and easy to understand, with the respondents taking an average of 20 minutes to answer. The online questionnaire was also well-structured and user-friendly. The overall status of the firms is shown as below:

Table 8: Overall status of the pilot test

Status	Number of Firms
Responded with Critical Jobs	13
Responded without Critical Jobs	12
Rejected	4
Total	29

Source: Pilot Test, Call for Evidence Survey 2019

Survey findings

At the close of the survey on 22nd October 2019, 5,437 firms responded to the CfE Survey with 996 firms reporting that they had critical occupations. A total of 2,584 occupations at the 6D level of MASCO were nominated by companies. These 6D occupations are from eight major occupational groups. **Figure 5** shows the results graphically.

Figure 5: Final survey status

Figure 6 shows the number of nominations to the COL according to the unit group level (MASCO 4 digit), minor unit level (MASCO 6 digit) and also the number of jobs. It also indicates how many of those are Hard to Fill. Of the 2,584 nominations, 2,325 jobs were Hard to Fill (90%), and 259 were not Hard to Fill (10%) as identified by companies.

Figure 6: Nominations for COL

	1	2	3	4	5	6	7	8	
MASCO	Managers	Professionals	Technicians and Associate Professionals	Clerical support workers	Service & sales workers	Skilled agricultural, forestry, livestock & fishery workers	Craft & related trades workers	Plant & machine operators & assemblers	TOTAL
Unit Groups (4 digit) of occupations were nominated	30	86	50	15	23	8	34	36	282
Hard to Fill	30	85	48	15	21	8	33	35	275
Minor units of occupations (6 digit) were nominated	167	492	174	47	46	18	85	89	1,118
Hard to Fill	159	467	162	42	44	17	82	83	1,056
Number of nominations	606	1,061	343	75	98	32	161	208	2,584
Hard to Fill	528	961	307	63	87	31	152	196	2,325
Not Hard to Fill	78	100	36	12	11	1	9	12	259

The Top 3 occupational groups, MASCO 1 (606), MASCO 2 (1061) and MASCO 3 (343), had the greatest number of nominated jobs for the COL, followed by the last two, MASCO 7 (161) and MASCO 8 (208). MASCO 6 had the least number of nominations for the COL, only 32. The full list of occupations nominated at MASCO 4D in the CfE survey is available in **Appendix 5**.

Consultation with Industry Associations

Focus group discussions (FGDs) and consultations with industry associations and companies were also carried out as part of bottom-up approach. A structured discussion guideline was used during the consultation sessions, enabling the associations and companies to provide insights on global trends, employment challenges and trends affecting their respective industries and the impact of automation. At this session, the team also gathers in-depth information of occupations that have been nominated by stakeholders that could potentially be included in the COL.

As for the consultation sessions, an appointment was made in advance with the person-in-charge. Related associations were contacted with some introductory materials explaining on the COL methodology and objectives of the exercise.

A consultation guide was used and it had three components:

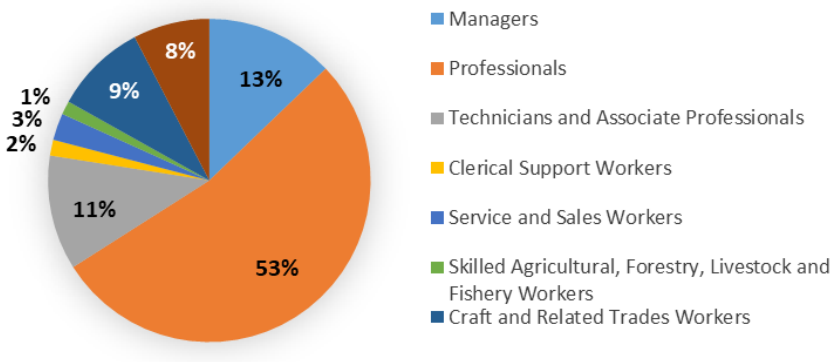
a) Section 1: General Labour Market Trends – industry performance, employment challenges, trends, what is causing changes in demand or supply of talent in the industry;
b) Section 2: Critical Occupations – Firms identified occupations and jobs that were critical in their industry, reasons that the nominated jobs are hard to fill, qualifications or niche skills needed for the critical jobs reported, level of experience that are most sought after, how the industry has been impacted by the shortage, what has the industry done in order to reduce the shortage and suggestions on what the government can do to assist;
c) Section 3: Automation – automation or technology disruption trends, would automation / technology disruptions reduce the number of workers, potential of future jobs creation or skills.

A structured discussion guideline for consultations with both companies and industry associations is included in **Appendix 6**.

Consultation Findings

There were 28 stakeholder consultations conducted for the 2019/2020 COL. The list of associations that took part in the consultation session is shown in **Appendix 7**. These consultations were held between July and September 2019. A total of 444 occupations were nominated for the COL. These nominations were for 133 occupations out of the 480 non-military MASCO 4-digit occupations. The occupations nominated were mainly from the first three occupational group levels, accounting for roughly 77% of nominated occupations, with the Professionals (MASCO 2) alone comprising more than half at 53%. The next three MASCO levels, MASCO 4 to 6, only combined to show 6% or 25 of the nominated occupations while MASCO 8 was of a considerable 9%. **Figure 7** shows these results.

Figure 7: Nominated jobs by occupational groups



The Employment Challenges of Local Industries and Companies

Feedback from the FGDs can be summarised into four main trends that explain the employment challenges faced by local industries and companies. They are: 1) a lack of readiness by local businesses to face increased integration into the global economy; 2) a lack of policy coordination between government and industry in the areas of disruptive technologies and new markets; 3) the changing nature of work and the workforce; and 4) the mismatch in preferences as well as the supply and demand of skills between industry and the local labour market.

a) Local Employers are Unprepared for the Global Economy

Due to increased integration into a globalised world economy, industries in Malaysia are affected and are moving in tandem with global trends for both their respective and complementary industries. This has made them more vulnerable to external shocks in the political and international trade arena. However, traditional employers, especially Small and Medium Enterprises (SMEs), have struggled to adapt to this new reality. Through the globalised economy, companies are now not only facing local but also international competition in the market place for commodities and products, forcing them to optimise costs more than ever. Companies are also forced to focus more on the short-term with shorter product life cycles in rapidly innovating and evolving markets. This affects wage growth as companies need to keep their prices competitive, and as a result lose their ability to attract a new generation of workers with increased salary demands due to the rising cost of living. Increased digitisation, such as the rise of e-commerce platforms, has lowered the barriers to entry for individuals to sell goods and services outside the traditional structure and fixed costs incurred by firms. This has resulted in greater self-employment and entrepreneurship, with individuals opting to start their own business due to lower start-up costs and less traditional employment practices.

b) The Lack of Forward-Thinking Policy to Face Disruption and Capitalise on New Markets

Industry has also mulled over a lack of proactive planning and coordination by the government to help industry face technological disruption and capitalise on new product markets. Employers that still use traditional business practices are unable to compete with new industry players that leverage on new disruptive technologies to either change the nature of the industry, exploit regulatory loopholes or provide more efficient and convenient services to consumers. Uncertainties caused by the slow evolution of regulation and legislation have extended the duration of a disadvantageous playing field for local employers that are still subjected to traditional tax regulations. There seems to be a lack of proactive support from government in promoting the strengths and uniqueness of local products and identifying supply gaps in international markets for local industries to capitalise on. Instead, recent regulatory developments such as increased minimum wage and stricter borrowing criteria have increased the difficulty for companies to do business.

c) The New Workplace and Workforce

Talent retention is also becoming increasingly difficult for companies that are unable to meet the demands for new work patterns and arrangements. With increased participation in the workforce either through a rise in tertiary education rates, market incentives or out of necessity, where single-income households are no longer able to face higher cost of living, there is a need for an increased provision of childcare facilities as well as flexible and remote working opportunities to cope with the challenges of care work and the rise of the gig economy. Currently, some companies are unable to meet these demands due to cost considerations and rigid business arrangements. As a result, the local labour market continues to face brain drain with the emigration of highly-skilled labour due to the increased ability of skilled labour to chase higher wages and better social infrastructure abroad with greater digital and physical connectivity and freedom of movement.

d) The Skills and Preferences Gap between Companies and the Labour Market

Unsurprisingly, the rise of the Fourth Industrial Revolution (IR4.0) is also changing the type of skills sought after by industry to help companies stay competitive. However, associations have cited the lack of required technical skills among graduates and job applicants, associated with the lag in the curricula of courses offered by local Higher Learning Institutions (HLIs) behind current industry practices and a lack of soft skills necessary for employees to succeed in these critical roles. Universities have been unable to keep up with the constantly changing skillset required by industry, either due to the slow, fixed-period revision and accreditation process for university courses, the lack of funding for vocational education institutes to provide advanced machinery adopted by industry, or the lack of consultation and integrated efforts

between industry and HLIs in the process of producing employable and industry-ready graduates. The geographic rigidity of the local labour force has also made recruitment difficult for industries that require workers to engage in frequent travelling and for firms to expand their businesses to different regions within the country and internationally. According to the associations and companies, local employees have been less willing to travel for work, preferring geographic stability and the ability to stay close to family. Lastly, industry is also unable to attract a new generation of workers into jobs that have a reputation of being low-skilled, low-paying and 3D (Dangerous, Dirty and Difficult), especially when once again, entrepreneurship and self-employment are now more easily accessible. Companies then have to cope with the reduced willingness to work in these jobs through a greater reliance on foreign labour.

e) Myths Debunked: The Realities of Current Employment

The FGDs also provided an opportunity to understand the realities of the current labour market, and in the process debunk widely held misconceptions of labour preferences and characteristics of the local labour market enforced either by outdated social knowledge. Table 59 provides a summary of these myths and the actual realities faced by industry.

Table 9: Myths and realities of the local labour force and labour market

Myths	Realities
Workers tend to stay longer with firms to build their own career development path.	Most industry associations reported that they are facing a high attrition rate especially among young workers, new entry-level workers and those who have attended upskilling training.
Workers are changing employers to whoever that offer a higher salary package to facilitate an upward move along the wage distribution.	Workers that join other firms after attending training or upskilling programmes are currently only being offered a slightly higher salary (e.g. additional RM50) by other firms. This phenomenon results in a greater number of workers remaining in the lower end of the wage structure as most of them are at an early career stage. This will widen the gap of the low- to medium-skilled wage levels (changes within wage decile) rather than an upward wage mobility (moving up from a lower wage decile to a higher wage decile). As more job options are available to low and medium skilled workers (where they are able to switch from one industry to another), it can widen the industry's wage distribution.
Given the relatively high unemployment rate among fresh graduates and stiff competition in the labour market, employees tend	Low-paying jobs push many to take up self-employment aided by new entrepreneurial opportunities provided by e-commerce.

to stay longer in their existing companies to remain employed.	
Technology enhances industry competitiveness by creating more well-paid skilled and mid-skilled jobs.	Technological disruption continues to happen over time. Firms usually pinch talent from each other or recruit expatriates as an agile and immediate, short run solution to mitigate their skill gaps. The width of the wage decile for high-skilled workers is expected to grow over time.
Malaysia has a sufficient workforce to support the needs of local industries.	Baby boomers are retiring now and within the next few years as raise the issue sufficient labour supply which in turn leads to lower job vacancies being created.
Human capital development is being carried out through training and upskilling programmes.	Firms view labour as cost rather than resource or capital.
Incentives are given to encourage investment by firms to achieve desired targeted outcomes.	It takes longer than expected to achieve desired outcomes as that is highly dependent on the firm's capacity and readiness.
Country has a sufficient talent pool to support the industries' wide range of needs, especially for STEM related workers.	Graduates do not have the passion to remain in STEM jobs. Millennials prefer glamourous high-paying jobs and flexi working packages. STEM-related jobs usually require a long time (on average 5 years) for an employee to gain promotion. Employees working in the services sector take a shorter time (on average 6 months for retail, hotel, and F&B) to be promoted. This has also created another challenge where employees will not stay with firm for long but become competitors with previous employers as they decide to operate their own business.
Workers should be multidisciplinary and be able to multitask to reduce the challenges faced by firms, reap more opportunities and benefits and enhance a firm's capacity.	Multitasking and a misperception of multidisciplinary study has diluted the core skills that an employee should be specialised in. Specialisation is required where core skills can be applied in wider disciplines.
Four months of industrial training aims to expose students to the working environment.	Six months of industrial training are recommended for students to apply their knowledge and gain practical skills. Industry prefers final semester of the final year instead of first semester of final year students as their interns so that firms can identify suitable candidates to fill up their vacancy and make their mentoring efforts worthwhile.
It is worth investing in higher level tertiary education to get better employment.	Consider the rate of return for tertiary education investment in addition to the challenges that employees face during working life. Tangible benefits are the main concern among

	millennials where long-term opportunity cost is always neglected. Millennials tend to join fast-growing industries and hop from one firm to another due to attractive remuneration or incentives. They are willing to let go their core skills which have already been well-developed. Constantly gaining obsolete skills over a life time of work results in a failure to develop into a high-income worker.

Environmental Scan and other Talent Studies

A series of Environmental Scans includes information about skill needs. Environmental Scans and talent studies have been undertaken in several sectors by different Malaysian agencies. These cover the machinery equipment and advanced engineering sector, the food and beverages sector, the medical devices sector, the pharmaceutical manufacturing sector, the chemical and petrochemical sector, the electrical and electronics sector, the maritime (shipbuilding and ship repair) sector and professional services activities sector as well as digital sector. The studies profile current industry trends, including the current workforce and occupations within the sector; project how workforce supply and demand will evolve; and identify potential skill gaps. The scans also seek to identify in-demand occupations. The CSC considers this information when assessing occupations on the list of nominated occupations.

Dovetailing and Validation

As indicated in the previous technical reports, dovetailing is the process of consolidating and combining evidence from the top-down and bottom-up approaches to make a conclusion on the justification on whether that occupation should be included in the final COL. There are two rounds of dovetailing analysis and a process of validation. This is to ensure all relevant data and information are being captured for the shortlisted occupations.

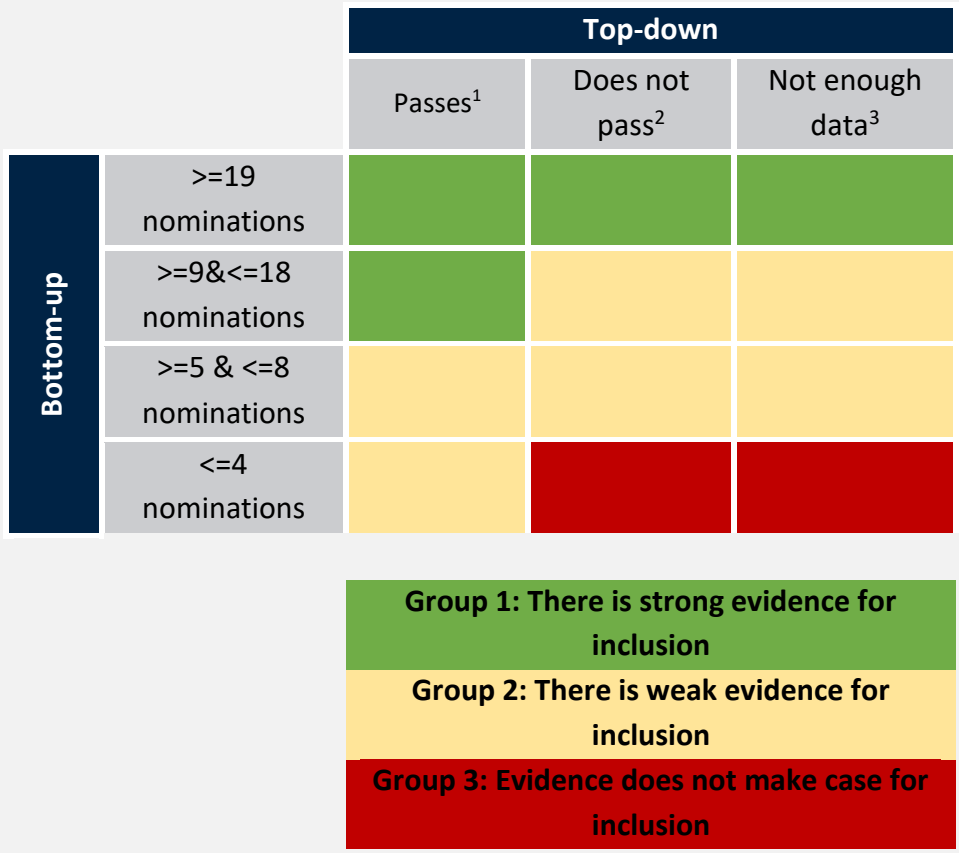
First round of dovetailing

In the first round of dovetailing, all occupations determined to be in shortage by the top-down analysis and all occupations for which a bottom-up nomination was made are reviewed for potential inclusion on the COL. At this stage, occupations are classified into three categories:

Group 1: Strong evidence for inclusion;
Group 2: Weak evidence for inclusion; and
Group 3: Evidence does not make a case for inclusion.

For the 2019/2020 COL, occupations that received 19 or more nominations in the bottom-up process are considered to have strong evidence and are categorised into Group 1 (**figure 8**). Occupations that pass the top-down approach and that received at least 9 nominations in the bottom-up process are also considered to have strong evidence for inclusion and are categorised into Group 1. Occupations that pass the top-down approach but that received fewer than 9 nominations are categorised as having weak evidence for inclusion and are categorised into Group 2. The same is true for occupations that received between 5 and 18 nominations but did not pass the top-down approach or did not have sufficient data from the top-down approach. Occupations for which evidence does not make a case for inclusion that are categorised into Group 3 are those that do not pass the top-down approach or do not have enough data, and that received fewer than or equal to 4 nominations.

Figure 8: Classifying occupations in the first round of dovetailing



[1] >=50% of top-down indicators show evidence of shortage with a minimum of 4 available indicators.
[2] <50% of top-down indicators show evidence of shortage with a minimum of 4 available indicators.
[3] The top-down approach has fewer than 4 indicators for the occupation.
Note: For occupations very close to the threshold between groups, some discretion is used in the classification, especially in the case of particularly strong bottom-up evidence.
Source: Authors

The thresholds of 5, 9, and 19 are set in reference to the total number of respondents and the distribution of the frequency of nominations. Occupations nominated 4 times and fewer were nominated by less than 0.5 percent of total respondents. Occupations receiving 5 or more nominations are in the top 40 percent of occupations by number of nominations. Occupations receiving 9 or more nominations are in the top 25 percent of occupations by number of nominations. Occupations receiving 19 or more nominations are in the top 15 percent of occupations by number of nominations.

The first round of dovetailing results in a preliminary COL. Occupations in Group 1 are generally included in the preliminary COL, based on the strong evidence from both top-down and bottom-up. Occupations in Group 3 are generally not included in the preliminary COL,

again after a discussion of the merits on their inclusion. More time is spent evaluating the evidence for occupations in Group 2 where the evidence for inclusion in the preliminary COL is weak. This is to identify marginal cases for further evidence gathering during the validation stage, and for further evaluation during the second dovetailing stage. The decision on each occupation's inclusion in the preliminary COL is conducted through a rigorous deliberation that captures both the top-down and bottom-up evidence, as well as the team's rationale for recommending its inclusion or exclusion. The outcome of the deliberation process also captures questions that need to be addressed during validation before a decision on the occupation is considered final.

289 four-digit MASCO occupations were reviewed during the first round of dovetailing for the 2019/2020 COL. This represents 64 percent of all non-military 4-digit MASCO occupations. The remaining 161 occupations were not reviewed, including 35 that are unskilled and thus are not eligible for inclusion in the COL. Based on the evidence received, 57 occupations were classified as having strong evidence for inclusion (Group 1), 102 occupations were classified as having weak evidence for inclusion (Group 2), and 291 occupations were classified as not meriting inclusion (Group 3) (**figure 9**).

Figure 9: Classifying occupations in the first round of the COL 2019/2020 dovetailing

		Top-down		
		Passes	Does not pass	Not enough data
Bottom-up	>=19 nominations	5 (1%)	41 (9%)	0 (0%)
	>=9 & <=18 nominations	11 (2%)	25 (6%)	0 (0%)
	>=5 & <=8 nominations	13 (3%)	37 (8%)	1 (0%)
	<=4 nominations	26 (6%)	210 (47%)	81(18%)

57 (12%)	**Group 1: There is strong evidence for inclusion**
102 (23%)	**Group 2: There is weak evidence for inclusion**
291 (65%)	**Group 3: Evidence does not make case for inclusion**

Note: Percentages are out of 450 mid- and high-skilled occupations
Source: Authors

The first round of dovetailing resulted in a total of 84 occupations being included in the 2019/2020 preliminary COL. This includes 51 occupations for which there was strong evidence for inclusion, 29 occupations for which there was weak evidence for inclusion, and 4 occupations for which the initial evidence did not make the case for inclusion. For each of these 4 occupations, the bottom-up evidence through consultation was sufficiently comprehensive and strong to make a compelling case that the shortage reported by respondents is shared by other firms in the same sector.

Validation

A validation process was undertaken after the first round of dovetailing. During validation, the CSC shares the preliminary COL with employers, government agencies, and industry associations. The goal is to seek input on the preliminary list, either affirming the occupations included or suggesting reconsideration. The request was made initially through face-to-face meetings, phone and email based on certain guidelines structure.

During the validation process for the 2019/2020 COL, 42 occupations that required further evidence and input were shared with 55 stakeholders. Having said that, some of the associations validated more than one occupation. Concomitantly, one occupation may also be validated with more than one association and vice versa. The CSC successfully followed-up with 34 stakeholders. The list of stakeholders can be found in **Appendix 8.**

Second round of dovetailing

A second round of dovetailing is conducted for those occupations for which additional information is received during the validation process. The process is the same as in the first round of dovetailing, but also makes use of the information gathered in the validation process. At this stage, if evidence remains inconclusive, the occupation is excluded from the COL on the grounds that a robust case for inclusion did not emerge despite extensive data collection.

The strategic importance of occupations that meet the skilled and sought-after criteria for inclusion in the COL is assessed during the second round of dovetailing. The strategic importance of an occupation is assessed based on a variety of factors including which industries are calling for certain occupations, the degree to which employers are actively seeking to fill shortages, and the potential impact of shortages on the health of businesses and industries. Other factors considered when assessing the strategic importance of skilled and sought-after occupations are:

1. **Diversity of jobs in each 4-digit MASCO occupation**. Only some job titles (six-digit MASCO job titles) are included in the final COL in cases in which nominations are

concentrated on particular job titles and there is evidence that the skill content of the nominated jobs differs from others in the 4-digit MASCO occupation.

2. **Importance to key sectors**. Occupations that are deemed critical by employers in industries in which Malaysia has a strong foundation for new and continued growth.

3. **Automatability of occupations**. Occupations that are deemed more susceptible to automation based on automation-related questions in the CfE and based on evidence from automatability profiles for every MASCO 2013 occupation produced by the CSC in collaboration with the World Bank may be deemed less strategic to fill through the COL. This is because these occupations are likely to be automated in the near future, and policy efforts to fill shortages may not be necessary. The reverse is true for occupations that are less likely to be automatable: these may be strategic to include in the COL.

The second dovetailing stage results in the final COL. The second dovetailing stage is the final stage of identifying critical occupations. The second dovetailing stage resulted in 26 occupations being dropped from the preliminary COL. The final 2019/2020 Critical Occupations List can be found in the next page.

THE 2019/2020 CRITICAL OCCUPATIONS LIST

The 2019/2020 COL has 58 occupations. This is a slight decrease from the 59 occupations listed in the 2018/2019 COL. In the 2019/2020 COL, there are three (3) occupations that had not appeared in any previous editions of the COL (as shown in Table 12). Overall, 25 occupations have appeared in a single COL, 13 occupations have appeared in two (2) COLs, 19 have appeared in three (3) COLs, 11 have appeared in four (4) COLs, and 22 have appeared in all five (5) editions of the COL. Table 12 shows the list of occupations that have appeared in the COL annually for the past 5 editions.

Table 10: 2019/2020 Final Critical Occupations List

MASCO Code	Job Title
1121	Managing Director and Chief Executive
1211	Finance Manager
1212	Human Resource Manager
1213	Policy and Planning Manager
1214	Business Service Manager
1219	Business Services and Administration Manager Not Elsewhere Classified
1221	Sales and Marketing Manager
1311	Agricultural, Forestry and Livestock Production Managers
1321	Manufacturing Manager
1323	Construction Manager
1324	Supply, Distribution and Related Managers
1511	Information and Communications Technology (ICT) Manager
2113	Chemist
2114	Geologist and Geophysicist
2121	Mathematician, Actuary and Statistician
2141	Industrial and Production Engineer
2142	Civil Engineer
2144	Mechanical Engineer
2146	Mining Engineer, Metallurgist and Related Professional
2149	Engineering Professional (Excluding Electrotechnology) Not Elsewhere Classified
2151	Electrical Engineer
2152	Electronic Engineer
2153	Telecommunications Engineers
2166	Graphic and Multimedia Designer
2182	Manufacturing Professional
2212	Specialist Medical Practitioners
2263	Environmental and Occupational Health and Hygiene Professional

2311	University and Higher Education Professional Teacher
2411	Accountant
2412	Financial and Investment Adviser
2413	Financial Analyst
2431	Advertising and Marketing Professional
2434	Communications Technology (ICT) Sales Professional
2511	Systems Analyst
2512	Software Developer
2514	Applications Programmer
2519	Software and Applications Developer and Analyst Not Elsewhere Classified
2521	Database Designer and Administrator
2522	Systems Administrator
2523	Computer Network Professional
2529	Database and Network Professional Not Elsewhere Classified
3112	Civil Engineering Technician
3113	Electrical Engineering Technician
3115	Mechanical Engineering Technician
3119	Physical and Engineering Science Technician Not Elsewhere Classified
3122	Manufacturing Supervisor
3123	Construction Supervisor
3129	Others Supervisor Not Elsewhere Classified
3322	Commercial Sales Agent
3323	Buyer
7211	Metal Moulder and Coremaker
7222	Toolmakers and Related Workers
7233	Agricultural and Industrial Machinery Mechanic and Repairer
7412	Electrical Mechanic and Fitter
8182	Steam Engine and Boiler Operator
8189	Stationary Plant and Machine Operator Not Elsewhere Classified
8332	Heavy Truck and Lorry Driver
8341	Mobile Farm and Forestry Plant Operator

Table 11: Occupations that have appeared in every COL

MASCO Code	Job Title
1211	Finance Managers
1213	Policy and Planning Managers
1214	Business Services Managers
1511	Information and Communications Technology Managers
2114	Geologists and Geophysicists
2121	Mathematicians, Actuaries and Statisticians
2141	Industrial and Production Engineers
2144	Mechanical Engineers
2146	Mining Engineers, Metallurgists and Related Professionals
2149	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified
2151	Electrical Engineers
2152	Electronic Engineers
2182	Manufacturing Professionals
2411	Accountant and Auditor
2413	Financial Analysts
2511	Systems Analysts
2512	Software Developers
2514	Applications Programmers
2519	Software and Applications Developers and Analysts Not Elsewhere Classified
2522	Systems Administrators
2523	Computer Network Professionals
3115	Mechanical Engineering Technicians

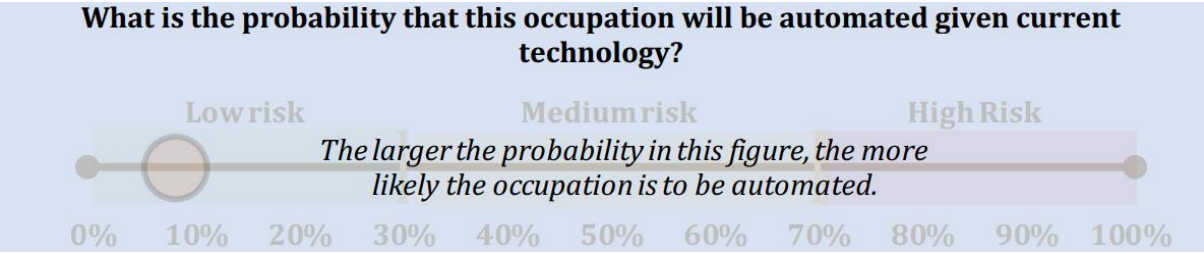
Table 12: Occupations that are new in the COL

MASCO Code	Job Title
1311	Agricultural, Forestry and Livestock Production Managers
7211	Metal Moulders and Coremakers
7222	Toolmakers and Related Workers

AUTOMATABILITY

This section serves as a guide to understand the automatability section in each occupation report. The automatability section describes the probability that the occupation will be automated as well as the importance of 5 types of tasks within an occupation.

Probability of automation. This section reports the probability that the entire occupation will be automated given existing technologies. The higher the probability, the more likely the occupation is to be automated. The probability is based on expert assessments and the skills profiles of the occupations as described in Frey and Osborne (2017).



Tasks. The task description reports how important five types of tasks are for each occupation. These tasks are selected because research has shown them to be related to how susceptible an occupation is to automation. The tasks are:

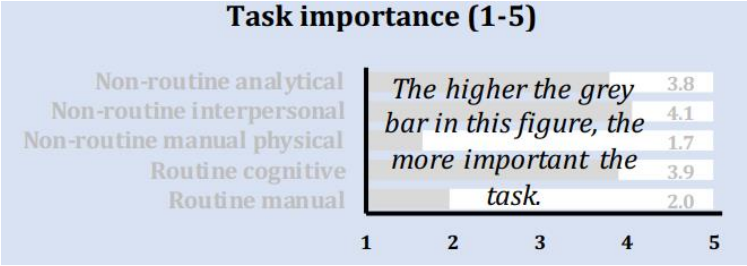
1) non-routine analytical tasks that involve creativity and problem-solving (e.g. forming a medical diagnosis);
2) non-routine interpersonal tasks that involve interacting with other people (e.g. managing others);
3) non-routine manual physical tasks that are physical activities that involve adapting to different situations and recognising language and visual cues (e.g. janitorial services).

These three types of non-routine tasks are more challenging to automate because they cannot be described in simple rules that can be followed by a computer. Though still more challenging to automate, advances in machine learning, artificial intelligence, and robotics mean that automation of these tasks is now a possibility.
The other two types of tasks are:

4) routine manual tasks that involve repeating the same physical procedure (e.g. car assembly);
5) routine cognitive tasks that involve repeating the same analytical procedure (e.g. record keeping).

These two types of routine tasks are less challenging to automate since they can generally be described in simple rules a computer can follow. Each task is assigned a score on a scale from one (1) indicating that the task is not important in the occupation, to five (5) indicating that

the task is extremely important. The score is taken from O*NET, a detailed database of occupational information collected from workers and experts in the United States.[3]



However, the probability of automation for an occupation could also be affected by other factors such as:

- **Transformation by automation.** The impact of automation on occupations may be to transform them, rather than to eliminate them entirely. That is, automation may affect one or a group of the tasks that compose an occupation, eliminating some tasks and making others more important.

- **Constraints to automation.** While automation may be technologically possible, there are other potential barriers to automating occupations and tasks. There are three important barriers: 1) only top-tier firms may be able to access new technologies; 2) the cost of these technologies may be prohibitively expensive; and 3) there may be legal, regulatory, or normative factors that impede the adoption of the technologies.

[3] For additional information on O*NET, see https://www.onetonline.org/

FUTURE APPLICATIONS OF THE COL

Future considerations to improve the COL methodology

Subject to the availability of new data sources and research methodologies, the following examples are some enhancements to be considered to improve the COL's analyses:

i. **Piloting State-Level COLs***:* The production of state-level COLs offers the potential to identify shortages in local labour markets that are not apparent at the national level. This would require location information that allows for identification of relevant localised shortages, and devotion of additional resources in the bottom-up processes.

ii. **Incorporate the use of real-time labour market information***:* real-time information, such as: online job postings, can be used to complement current official datasets by generating new insights in the area of (but not limited to): sector, location, education, and certification. This information can help policymakers to address shortages quickly in an accurate manner.

Potential future usage of the COL in other human capital initiatives

The main purpose of the COL is to be fully utilised for the purpose of coordinating our national human capital policy. The COL can be use in other national human capital initiatives as depicted below:

Policy Area	Application
Upskilling and reskilling	• Inform development of TVET and other higher education programming • Inform development of occupational standards and accreditation • Target funding for TVET and higher education programming • Target incentives to businesses for apprentices
Employment services	• Inform career counsellors about occupations in shortage • Target upskilling and reskilling for jobseekers
Immigration	• Target admissions to workers in occupations on the COL

- **Improve the responsiveness of upskilling and reskilling programs to industry needs**. Policymakers responsible for upskilling and reskilling can look to the COL to understand how demand for occupations is evolving in order to understand which skills should be emphasised. Education policymakers can use the COL in a similar way to inform the development of coursework and target funding for students studying in shortage areas.

- **Improve the efficiency of job matching**. Job counsellors can use the COL to direct jobseekers to upskilling and reskilling programs that train for skills needed in occupations that appear on the COL and can direct jobseekers to jobs in occupations that appear in the COL.

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APPENDIX 1: SPECIFICATION TESTED FOR THE TOP-DOWN ANALYSIS

Specification	Difference	Occupations	Recommendation
Specification 1	• 11 indicators	• Total: 47	• Specification 1 is the initial preferred specification based on analysis of indicators
Specification 2 compared to Specification 1	• Includes: ○ 3-year wage premium growth	• Dropped: 2 • Added: 8 • Differ: 10 • Total: 53	• 8 occupations in COL2 not in COL1. • 2 occupations in COL1 in COL2 • COL2 includes 3 years wage premium growth that may provide additional information on shortage. Thus specification 2 is preferred over specification 1.
Specification 3 compared to Specification 2	• Includes: ○ number of REP	• Dropped: 0 • Added: 2 • Differ: 2 • Total: 55	• All occupations in COL2 is in COL3. • 2 occupations in COL3 is not in COL2 • Thus, COL3 is preferred over COL2
Specification 4 compared to Specification 3	• Includes: ○ REP application growth 1-year	• Dropped: 0 • Added: 0 • Differ: 0 • Total: 55	• All the occupations in the COL 3 is in COL 4 and vice versa. Although COL4 and COL3 seems to be in prefect tie, the former is preferred due to its inclusiveness of additional indicator.
Specification 5 compared to Specification 4	• Includes: ○ REP application 3-years ○ Share of vacancy posted more than 6 weeks	• Dropped: 5 • Added: 9 • Differ: 14 • Total: 59	• 5 occupations in COL4 not in COL5. • 9 occupations in COL5 is not COL4 • Although specification 5 includes several occupations that is not in specification 4, the latter is preferred over the former as

			the former does not includes important indicators of LFS that might be useful for the final results.
Specification 6 compared to Specification 4	• Includes: ○ Absolute change in vacancies hard to fill ○ Number of REP application ○ 1-year REP application growth ○ 1-year REP application growth Excludes: ○ Working hours growth 1 year ○ Working hours growth 3 year	• Dropped: 8 • Added: 24 • Differ: 32 • Total: 71	• 8 occupations in COL4 is not in COL6. • 24 occupations in COL6 is not in COL4 • Although specification 6 includes several occupations that is not in specification 4, the later is preferred over the former as the former does not includes important indicators of LFS that might be useful for the final results.
Specification 7 compared to Specification 4	• Excludes: ○ Education Decrease 1 Year ○ Education Decrease 3 Year ○ Working hours growth 1 year	• Dropped: 7 • Added: 43 • Differ: 50 • Total: 91	• 7 occupations in COL4 not in COL7. • 43 occupations in COL7 is not in COL4 • Although specification 7 includes greater occupations that are not in specification 4, the latter is preferred over the former as the former does not includes important indicators of LFS that might be useful for the final results.

	○ Working hours growth 3 year		
Specification 8 compared to Specification 4	• Includes: ○ Share of vacancies posted more than 6 weeks ○ Absolute change in vacancies hard to fill Absolute change in median vacancy duration	• Dropped: 5 • Added: 3 • Differ: 8 • Total: 53	• 5 occupations in COL4 not in COL8. • 3 occupation in COL8 is not in COL4. COL4 is preferred over COL8
Specification 9 compared to Specification 4	• Includes: ○ Share of vacancies posted more than 6 weeks ○ Absolute change in vacancies hard to fill ○ Absolute change in median vacancy duration	• Dropped: 11 • Added: 8 • Differ: 19 • Total: 52	• 11 occupations in COL4 not in COL9 . • 8 occupations in COL9 is not in COL4 • Specification 9 is preferred due to its advantage of distinct threshold for high-skilled and semi-skilled occupation.
Specification 10 compared to Specification 9	• Includes:	• Dropped: 0 • Added: 3	• All occupations in COL9 is in COL10 • 3 occupations in COL10 is not in COL9.

	○ Share of vacancies posted more than 6 weeks ○ Absolute change in median vacancy duration	• Differ: 3 • Total: 55	• Since COL10 includes 3 additional occupations, COL10 preferred over COL9
Specification 11 compared to Specification 10	• Excludes: ○ Experience Decrease Online	• Dropped: 17 • Added: 0 • Differ: 17 • Total: 38	• 17 occupations in COL10 not in COL11 • All occupations in COL11 in COL10 • COL10 is preferred
Specification 12 compared to Specification 10	• Excludes: ○ Absolute Median Vacancy Duration	• Dropped: 3 • Added: 1 • Differ: 4 • Total: 53	• 3 occupations in COL10 is not in COL12 • 1 occupation in COL12 is not in COL10 • Thus, COL10 preferred.

APPENDIX 2: TOP-DOWN SHORTAGE OCCUPATIONS

MASCO Code	MASCO Job Title	Total indicators available	Number of indicators exceeding threshold	Percentage of indicators passing threshold (%)
1211	Finance Managers	10	5	50
1213	Policy and Planning Managers	4	2	50
2113	Chemists	4	2	50
2133	Environmental Protection Professionals	4	2	50
2143	Environmental Engineers	4	2	50
2149	Engineering Professionals Not Elsewhere Classified	12	6	50
2151	Electrical Engineers	12	6	50
2163	Product and Garment Designers	4	3	75
2164	Town and Traffic Planners	4	3	75
2171	Ships Engineers	4	2	50
2179	Transport Controller Not Elsewhere Classified	4	2	50
2183	Construction Professionals	4	2	50
2265	Dieticians and Nutritionists	4	3	75
2392	Special Needs Teachers	10	5	50
2412	Financial and Investment Advisers	12	7	58
2413	Financial Analysts	4	2	50
2423	Personnel and Careers Professionals	12	7	58
2424	Training and Staff Development Professionals	4	2	50
2432	Public Relations Professionals	12	6	50
2433	Technical and Medical Sales Professionals (Excluding ICT)	4	4	100
2512	Software Developers	4	3	75
2513	Web and Multimedia Developers	4	3	75
2519	Software and Applications Developers and Analysts Not Elsewhere Classified	4	3	75
2521	Database Designers and Administrators	4	3	75
2523	Computer Network Professionals	4	2	50
2529	Database and Network Professionals Not Elsewhere Classified	4	2	50
2712	Restaurant Professionals	4	2	50
3117	Mining and Metallurgical Technicians	4	2	50

3118	Draughtspersons	12	6	50
3311	Securities and Finance Dealers and Brokers	10	6	60
3313	Accounting Associate Professionals	12	6	50
3321	Insurance Agent	12	7	58
3323	Buyers	10	7	70
3343	Administrative and Executive Secretaries	10	8	80
3513	Computer Network and Systems Technicians	4	4	100
3631	Photographers	10	5	50
3632	Interior Designers and Decorators	10	6	60
3641	Chefs	10	6	60
4414	Scribes and Related Workers	4	3	75
4415	Filing and Copying Clerks	10	5	50
5111	Travel Attendants and Travel Stewards	10	6	60
5112	Transport Conductors	6	3	50
5152	Domestic Housekeepers	4	2	50
5241	Fashion and Other Models	4	2	50
5242	Sales Demonstrators	12	6	50
5244	Contact Centre Salespersons	10	5	50
6311	Subsistence Crop Farmers	8	5	63
7113	Stonemasons, Stone Cutters, Splitters and Carvers	4	2	50
7222	Toolmakers and Related Workers	4	2	50
7511	Butchers, Fishmongers and Related Food Preparers	12	6	50
7514	Fruit, Vegetable and Related Preservers	8	5	63
8151	Fibre Preparing, Spinning and Winding Machine Operators	4	2	50
8153	Sewing Machine Operators	6	4	67
8154	Bleaching, Dyeing and Fabric Cleaning Machine Operators	4	3	75

APPENDIX 3: 18 ECONOMIC SECTORS COVERED IN 2019/2020 COL

Sector	Priority Sub-sectors	MSIC
Section A: Agriculture, Forestry and Fishing	1. Crop and animal production, hunting and related service activities	01
	2. Forestry and logging	02
	3. Fishing and aquaculture	03
Section B: Mining and Quarrying	4. Mining of coal and lignite	05
	5. Extraction of crude petroleum and natural gas	06
	6. Mining of metal ores	07
	7. Other mining and quarrying	08
	8. Mining support service activities	09
Section C: Manufacturing	9. Manufacture of food products *(ES conducted by ILMIA in 2018)*	10
	10. Manufacture of textiles	13
	11. Manufacture of wearing apparel	14
	12. Manufacture of leather and related products	15
	13. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	16
	14. Manufacture of coke and refined petroleum products	19
	15. Manufacture of rubber and plastics products	22
	16. Manufacture of electrical equipment	27
	17. Manufacture of motor vehicles, trailers and semi	29
	18. Manufacture of furniture	31
	19. Other manufacturing	32
	20. Manufacture of tobacco products	12
Section D: Electricity, Gas, Steam and Air Conditioning Supply	21. Electricity, gas, steam and air conditioning supply	35
	22. Water collection, treatment and supply	36

Section E: Water Supply; Sewerage, Waste Management and Remediation Activities	23. Sewerage	37
	24. Waste collection, treatment and disposal activities; materials recovery	38
	25. Remediation activities and other waste management services	39
Section F: Construction	26. Construction of buildings	41
	27. Civil engineering	42
	28. Specialised construction activities	43
Section G: Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	29. Wholesale and retail trade and repair of motor vehicles and motorcycles	45
	30. Wholesale trade, except of motor vehicles and motorcycles	46
Section I: Accommodation and Food Service Activities	31. Accommodation	55
Section J: Information and Communication	32. Publishing activities	58
Section K: Financial and Insurance/Takaful Activities	33. Financial service activities, except insurance and pension funding	64
	34. Insurance, reinsurance and pension funding, except compulsory social security	65
Section L: Real Estate Activities	35. Real estate activities	68
Section N: Administrative and Support Service Activities	36. Employment activities	78
	37. Travel agency, tour operator, reservation service and related activities	79
	38. Office administrative, office support and other business support activities	82
Section P: Education	39. Education	85
Section Q: Human Health and Social Work Activities	40. Human health activities	86
	41. Residential care activities	87

Section R: Arts, Entertainment and Recreation	42. Creative, arts and entertainment activities	90
Section S: Other Service Activities	43. Repair of computers and personal and household goods	95
Section H: Transportation and Storage	44. Land transport and transport via pipelines	49
	45. Water transport	50
	46. Air transport	51
	47. Warehousing and support activities for transportation	52
Section J: Information and Communication	48. Motion picture, video and television programme production, sound recording and music publishing activities	59
	49. Programming and broadcasting activities	60
	50. Telecommunications	61
	51. Computer programming, consultancy and related activities	62
	52. Information service activities	63
Section C: Manufacturing	53. Manufacture of chemicals and chemical products	20
	54. Manufacture of basic pharmaceutical products and pharmaceutical preparations	21
	55. Manufacture of computer, electronic and optical products	26
	56. Manufacture of machinery and equipment n.e.c.	28
	57. Manufacture of beverages	11
Section I: Accommodation and Food Service Activities	58. Food and beverage service activities	56
	59. Legal and accounting activities	69
	60. Architectural and engineering activities; technical testing and analysis	71
Section M: Professional, Scientific and Technical Activities	61. Scientific research and development	72
	62. Advertising and market research	73
	63. Veterinary activities	75

APPENDIX 4: CALL-FOR-EVIDENCE (CFE) SURVEY FORM 2019

FOR OFFICE USE
PEID:

TalentCorp ATTRACT • NURTURE • RETAIN

Institute of Labour Market Information and Analysis (ILMIA)
MINISTRY OF HUMAN RESOURCES

PE Research
Planning & Economic Consultants

Call for Evidence (CfE)

SURVEY 2019

Introduction

TalentCorp Malaysia (TalentCorp) and the Institute of Labour Market Analysis (ILMIA) are carrying out a CfE survey of critical occupations in Malaysia. The information will be used to help the Government monitor the labour market and will contribute to human capital development in order to improve Malaysia's economic competitiveness. It is intended to ensure that the labour market is efficient, reduce skills imbalance and enhance skills capability of the workforce as well as improve economic resilience.

Your company's response to this survey will be kept **STRICTLY CONFIDENTIAL** and will be used solely for the purposes and objectives of improving the labour market operations in the Malaysian economy. For this survey, PE Research Sdn Bhd has been appointed to assist in data collection

If you have any questions about this survey, please contact any of the officers listed below:

OFFICERS TO CONTACT				
	Officer	**Designation**	**Tel. No**	**Email**
1.	Nursyazwani binti Zulhaimi	Research, Development and Policy Unit, Talent Corporation Malaysia Berhad	03-7839 7132	nursyazwani.zulhaimi@talentcorp.com.my
2.	Nurul Izzati Kamrulbahri		03-7839 7123	izzati.kamrulbahri@talentcorp.com.my
3.	Nor Wahidah binti Nor Azelan	Assistant Director, ILMIA, Ministry of Human Resources	03-8318 2413	wahidah@mohr.gov.my
4.	Kumaresan A/L Manikam	Statistician, ILMIA, Ministry of Human Resources	03-8318 2418	kumaresan@mohr.gov.my
5.	Jamilah Jawahir Mohd Bakeri	Consultant, PE Research Sdn Bhd	011-1050 3786	col2019@talentcorp.com.my cfe2019@talentcorp.com.my csc2019@talentcorp.com.my
6.	Levi Olivia binti Ahmad Tarmizi		011-1050 1561	

Call for Evidence (CfE)

SURVEY 2019

The main objective of this survey is to collect information on **critical occupations**, as well as identify skills imbalances across key economic sectors.

Talent Corp

CSC

ILMIA

CSC: A Critical Skills Committee (CSC) jointly chaired by **TalentCorp** and **ILMIA**, has been tasked to review the CfE survey and to recommend actions to resolve inefficiencies in skills shortages and deficits.

What is COL?

The primary objective of this survey to develop a **Critical Occupations List (COL)** which will serve as a platform for the coordination of human capital development policies. The need for this survey is clearly stated in the 11th Malaysia Plan. The survey aims is to collect data on critical occupations as well as to identify skills imbalances across key industrial sectors of the Malaysian economy.

How COL is used?

The COL will provide information that is useful for investments into training programmes, design of incentives to enhance training and apprenticeship programmes, and set criteria for skills migration.

In this Form

This form...

SECTION 1: COMPANY BACKGROUND

SECTION 2: CRITICAL OCCUPATIONS

SECTION 3: AUTOMATION

Firms will identify occupations and jobs that are critical to the company, report on the employees in that position, the recruitment and hiring process of those jobs, reasons for defining its criticality, etc.

Firms will indicate/report if there is a potential to automate critical jobs and give suggestions related to resolving the skills shortages or deficits.

SECTION 1 COMPANY BACKGROUND

A NAME OF COMPANY AND POSTAL ADDRESS

Name

Designation

Company Name

Company Address

State

☐ 1	Johor	☐ 5	Negeri Sembilan	☐ 9	Perlis	☐ 13	Sarawak
☐ 2	Kedah	☐ 6	Pahang	☐ 10	Selangor	☐ 14	W.P. Kuala Lumpur
☐ 3	Kelantan	☐ 7	Pulau Pinang	☐ 11	Terengganu	☐ 15	W.P. Labuan
☐ 4	Melaka	☐ 8	Perak	☐ 12	Sabah	☐ 16	W.P. Putrajaya

Office Telephone

Mobile Telephone

Email Address

B MAIN ACTIVITY OF THE COMPANY

Which industrial sector <u>best describe</u> your company's business activities?

☐ A	Agriculture, forestry and fishing	☐ G	Wholesale and retail trade; repair of motor vehicles and motorcycles	☐ M	Professional, scientific and technical activities
☐ B	Mining and quarrying	☐ H	Transportation and storage	☐ N	Administrative and support service activities
☐ C	Manufacturing	☐ I	Accommodation and food service activities	☐ P	Education
☐ D	Electricity, gas, steam and air conditioning supply	☐ J	Information and communication	☐ Q	Human health and social work activities
☐ E	Water supply; sewerage, waste management and remediation activities	☐ K	Financial and insurance/takaful activities	☐ R	Arts, entertainment and recreation
☐ F	Construction	☐ L	Real estate activities	☐ S	Other service activities

Which industrial sub-sector, <u>best describe</u> your company's activities?
Please refer the 2-digit code in **<u>Table 1</u> (Page 2)*

CODE:

Does your company have any **critical occupations**?
Please refer to **Page 3 for the criteria of critical occupations*

☐ Yes ☐ No

Table 1: Malaysia Standard Industrial Classification (MSIC) Sub-sector Code

A. Agriculture, forestry and fishing	21. Manufacture of basic pharmaceutical products and pharmaceutical preparations	**F. Construction**	**J. Information and communication**	**N. Administrative and support service activities**
01. Crops and animal production, hunting and related service activities	22. Manufacture of rubber and plastics products	41. Construction of buildings	58. Publishing activities	77. Rental and leasing activities
02. Forestry and logging	23. Manufacture of other non-metallic mineral products	42. Civil engineering	59. Motion picture, video and television programme production, sound recording and music publishing activities	78. Employment activities
03. Fishing and aquaculture	24. Manufacture of basic metals	43. Specialized construction activities	60. Programming and broadcasting activities	79. Travel agency, tour operator, reservation service and related activities
B. Mining and quarrying	25. Manufacture of fabricated metal products, except machinery and equipment	**G. Wholesale and retail trade; repair of motor vehicles and motorcycles**	61. Telecommunications	80. Security and investigation activities
05. Mining of coal and lignite	26. Manufacture of computer, electronic and optical products	45. Wholesale and retail trade and repair of motor vehicles and motorcycles	62. Computer programming, consultancy and related activities	81. Services to buildings and landscape activities
06. Extraction of crude petroleum and natural gas	27. Manufacture of electrical equipment	46. Wholesale trade, except of motor vehicles and motorcycles	63. Information service activities	82. Office administrative, office support and other business support activities
07. Mining of metal ores	28. Manufacture of machinery and equipment n.e.c.	47. Retail trade, except of motor vehicles and motorcycles	**K. Financial and insurance/takaful activities**	**O. Public administration and defence; compulsory social security**
08. Other mining and quarrying	29. Manufacture of motor vehicles, trailers and semitrailers	**H. Transportation and storage**	64. Financial service activities, except insurance/takaful and pension funding	84. Public administration and defence; compulsory social security
09. Mining support service activities	30. Manufacture of other transport equipment	49. Land transport and transport via pipelines	65. Insurance/takaful, reinsurance/retakaful and pension funding, except compulsory social security	**P. Education**
C. Manufacturing	31. Manufacture of furniture	50. Water transport	66. Activities auxiliary to financial service and insurance/ takaful activities	85. Education
10. Manufacture of food products	32. Other manufacturing	51. Air transport	**L. Real estate activities**	**Q. Human health and social work activities**
11. Manufacture of beverages	33. Repair and installation of machinery and equipment	52. Warehousing and support activities for transportation	68. Real estate activities	86. Human health activities
12. Manufacture of tobacco products	**D. Electricity, gas, steam and air conditioning supply**	53. Postal and courier activities	**M. Professional, scientific and technical activities**	87. Residential care activities
13. Manufacture of textiles	35. Electricity, gas, steam and air conditioning supply	**I. Accommodation and food service activities**	69. Legal and accounting activities	88. Social work activities without accommodation
14. Manufacture of wearing apparel	**E. Water supply; sewerage, waste management and remediation activities**	55. Accommodation	70. Activities of head offices; management consultancy activities	**R. Arts, entertainment and recreation**
15. Manufacture of leather and related products	36. Water collection, treatment and supply	56. Food and beverage service activities	71. Architectural and engineering activities; technical testing and analysis	90. Creative, arts and entertainment activities
16. Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	37. Sewerage		72. Scientific research and development	91. Libraries, archives, museums and other cultural activities
17. Manufacture of paper and paper products	38. Waste collection, treatment and disposal activities; materials recovery		73. Advertising and market research	92. Gambling and betting activities
18. Printing and reproduction of recorded media	39. Remediation activities and other waste management services		74. Other professional, scientific and technical activities	93. Sports activities and amusement and recreation activities
19. Manufacture of coke and refined petroleum products			75. Veterinary activities	**S. Other service activities**
20. Manufacture of chemicals and chemical products				94. Activities of membership organizations
				95. Repair of computers and personal and household goods
				96. Other personal service activities

SECTION 2 CRITICAL OCCUPATIONS

A CRITICAL OCCUPATION IS DEFINED BY THREE SPECIFIC CRITERIA:

In this section, please nominate the jobs that you deem are critical to your company, based on the three criteria: i.e. sought after, strategic and skilled *(see Page 3).*

Please answer the questions to the best of your ability. All questions are mandatory unless otherwise stated.

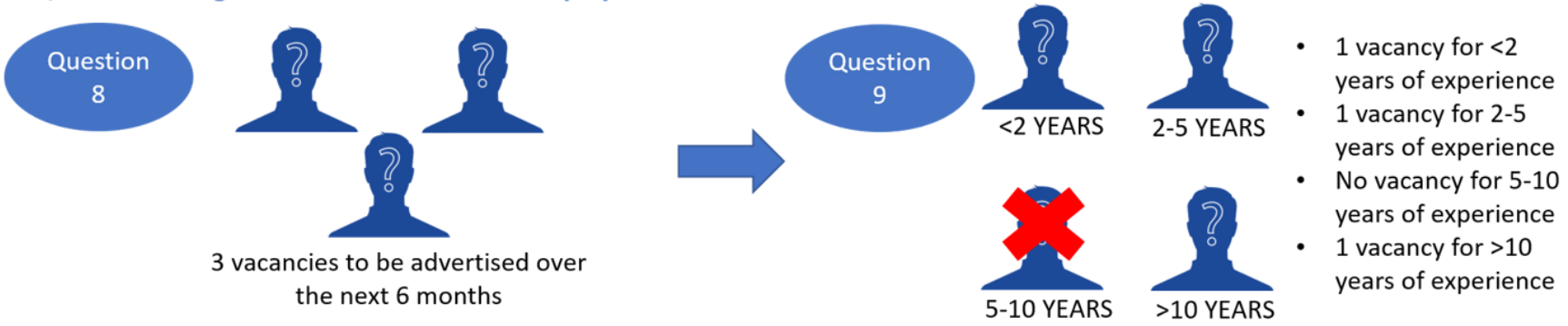
Read the column titles carefully and fill in the details of critical job positions in the table provided below.

ID.	**Q1) Job Title**	**Q2) Job Department**	**Q3) Occupation** ***(Please select 1-8 for each critical job position)*** *1 = Managers* *2 = Professionals* *3 = Technicians & associate professionals* *4 = Clerical support workers* *5 = Service & sales workers* *6 = Skilled agricultural, forestry, livestock & fishery workers* *7 = Craft & related trades workers* *8 = Plant & machine operators & assemblers*	**Q4) Key Responsibility/Job Description**
Example	*Process Engineer*	*Eg: Sales, Support, Operations, Management, Admin, etc*	2	*Designing chemical processes for palm oil refineries*
ID1			Please select here	
ID2			Please select here	
ID3			Please select here	
ID4			Please select here	
ID5			Please select here	
ID6			Please select here	
ID7			Please select here	
ID8			Please select here	
ID9			Please select here	
ID10			Please select here	

Guideline for Question 5 to 9

Let us assume that your company's ideal number of engineers is 10 (Q5) and only 5 positions are filled (Q6). Over the next 6 months, your company intends to employ 3 more employees (Q7) and over the next 6 months you plan to advertise (Q8) the following vacant positions (Q9): 1 vacancy for a position with less than 2 years of experience; 1 vacancy for between 2 and 5 years of experience, and 1 position for more than 10 years of experience.

Example: Process Engineer -10 ideal number of employees with 5 vacancies



- 1 vacancy for <2 years of experience
- 1 vacancy for 2-5 years of experience
- No vacancy for 5-10 years of experience
- 1 vacancy for >10 years of experience

The sum of Question 9 must be less than or equal to the number in Question 8

Planned vacancy advertisements over the next 6 months	Number of employees for the advertised positions
3	3
3	2
3	5

ID.	JOB TITLE	Q5) What is the ideal number of employees needed for this position?	Q6) How many employees are currently employed in this position *(working at least 30 hours a week)?*	Q7) Will you advertise the critical job(s) vacancies over the next 6 months?	Q8) How many vacancies do you intend to advertise over the next 6 months?	Q9) How many employees are required for the advertised positions?			
						< 2 YEARS	2-5 YEARS	5-10 YEARS	> 10 YEARS
Example	*Process Engineer*	*10*	*5*	☑ Yes ☐ No	*3* [a]	*1* [b]	*1* [b]	*0* [b]	*1* [b]
ID1				☐ Yes ☐ No					
ID2				☐ Yes ☐ No					
ID3				☐ Yes ☐ No					
ID4				☐ Yes ☐ No					
ID5				☐ Yes ☐ No					
ID6				☐ Yes ☐ No					
ID7				☐ Yes ☐ No					
ID8				☐ Yes ☐ No					
ID9				☐ Yes ☐ No					
ID10				☐ Yes ☐ No					

Note:

a. In this example (columns 5-8), 10 process engineers are needed ideally but I intend to advertise for only 3 of the 5 vacant positions over the next 6 months.

b. In this example (column 9), 1 vacancy was for a position with less than 2 years of experience; 1 vacancy was for a position with between 2 and 5 years of experience; no vacancies were for positions with between 5 and 10 years of experience, and 1 vacancy for a position with more than 10 years of experience. The sum of Question 9 **must not exceed** the number in Question 8.

ID.	Job title	Q10) What is the average time taken to fill vacancies for this position (in months)?	Q11) What are the top-3 skills that is required for this position? (Please select the skills below from 1-10) *1 = IT skills* *2 = Analytical skills* *3 = Communication skills* *4 = Language skills* *5 = Problem solving* *6 = Numeracy skills* *7 = Literacy skills* *8 = Team working* *9 = Technical skills* *10= Other (Please clarify further for every selection answer "other" below)*		
			TOP 1 SKILL	**TOP 2 SKILL(OPTIONAL)**	**TOP 3 SKILL(OPTIONAL)**
Example	*Process Engineer*	*3*	1 ***Other, please specify:***	2 ***Other, please specify:***	7 ***Other, please specify:***
ID1			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID2			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID3			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID4			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID5			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID6			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID7			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID8			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID9			Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:

Note:

In this example, all vacancies took an average of 3 months to fill

ID	Job title	Q12) Is this position hard-to-fill?	Q13) What are the top-3 reasons that this position is <u>hard to fill</u>? (Please select the reasons below from 1-8) *1 = Too few applicants or no applicant at all* *2 = Applicants lack the required credentials or certification* *3 = Applicants lack relevant job experience,* *4 = Applicants lack the required technical or occupational skills* *5 = 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.)* *6 = Applicants' expected compensation is beyond the market rate* *7 = We cannot afford to pay the market rate for the applicants* *8 = Other (Please clarify further for every selection answer "other" below)*		
			TOP 1 REASON	**TOP 2 REASON(OPTIONAL)**	**TOP 3 REASON(OPTIONAL)**
Example	*Process Engineer*	☑ Yes ☐ No	1 ***Other, please specify:***	5 ***Other, please specify:***	*7* ***Other, please specify:***
ID1		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID2		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID3		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID4		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID5		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID6		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID7		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID8		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID9		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:
ID10		☐ Yes ☐ No	Please select here Other, please specify:	Please select here Other, please specify:	Please select here Other, please specify:

ID.	Job title	Q15) Do you think this position is more or less hard-to-fill now than one year ago?				Q16) What is the minimum level of qualification needed for this position? (Please clarify the "other" response in the column provided below)	
		More hard-to-fill	Neither more nor less hard-to-fill	Less hard-to-fill	Unsure	QUALIFICATION	
Example	*Process Engineer*	☐	☐	☑	☐	*Bachelors*	***Other, please specify:***
ID1		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID2		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID3		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID4		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID5		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID6		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID7		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID8		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID9		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:
ID10		☐1	☐2	☐3	☐4	Please select here:	Other, please specify:

SECTION 3 AUTOMATION

ID.	Job title	Q17) What percentage of the tasks in this occupation could potentially be automated?					Q18) Are you likely to automate the tasks of this occupation in the coming year?	Q19) Please share any comments about this position that planners should know about (Optional)
		0%	Less than 25%	25-50%	51-75%	More than 75%		
Example	*Process Engineer*	☐	☐	☑	☐	☐	☑ Yes ☐ No	
ID1		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID2		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID3		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID4		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID5		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID6		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID7		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID8		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID9		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	
ID10		☐1	☐2	☐3	☐4	☐5	☐ Yes ☐ No	

Automation: "Using machines to replace work previously done by people"

END OF SURVEY

Thank you very much once again for your feedback and participation in this study. If you have any questions, please feel free to contact us at any time.

-THANK YOU-

APPENDIX 5: OCCUPATIONS NOMINATED IN THE CFE SURVEY

CfE Nominations: MASCO 1 – Managers

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
1121	Managing Directors and Chief Executives	101	84	17
1221	Sales and Marketing Managers	67	60	7
1214	Business Services Managers	61	51	10
1211	Finance Managers	54	44	10
1323	Construction Managers	51	43	8
1219	Business Services and Administration Managers, NEC	35	30	5
1511	Information and Communications Technology Managers	30	26	4
1321	Manufacturing Managers	29	25	4
1212	Human Resource Managers	28	21	7
1311	Agricultural, Forestry and Livestock Production Managers	26	26	0
1615	Education Managers	21	20	1
1213	Policy and Planning Managers	17	17	0
1324	Supply, Distribution and Related Managers	12	12	0
1223	Research and Development Managers	11	11	0
1618	Property Managers	10	10	0
1322	Mining Managers	8	8	0
1421	Retail and Wholesale Trade Managers	7	6	1
1617	Legal Managers	6	6	0
1215	Administrative Managers	5	4	1
1222	Advertising and Public Relations Managers	5	5	0
1411	Hotel and Homestay Managers	4	2	2
1623	Security Managers	4	4	0
1619	Professional Services Managers, NEC	3	3	0
1112	Senior Government Officials	2	2	0
1312	Aquaculture and Fisheries Production Managers	2	2	0
1616	Financial and Insurance Services Branch Managers	2	2	0
1622	Personal Care, Cleaning, and Related Services Managers	2	1	1

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
1611	Child Care Service Managers	1	1	0
1612	Health Services Managers	1	1	0
1621	Sport and Recreation Centre Managers	1	1	0
	TOTAL	**606**	**528**	**78**

CfE Nominations: MASCO 2 – Professionals

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
2149	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified	88	80	8
2144	Mechanical Engineers	80	73	7
2411	Accountant and Auditor	64	46	18
2512	Software Developers	60	59	1
2142	Civil Engineers	57	50	7
2141	Industrial and Production Engineers	46	39	7
2431	Advertising and Marketing Professionals	40	37	3
2121	Mathematicians, Actuaries and Statisticians	29	28	1
2182	Manufacturing Professionals	29	26	3
2522	Systems Administrators	29	28	1
2221	Nursing Professionals	28	24	4
2514	Applications Programmers	24	23	1
2146	Mining Engineers, Metallurgists and Related Professionals	23	20	3
2511	Systems Analysts	22	22	0
2166	Graphic and Multimedia Designers	20	18	2
2263	Environmental and Occupational Health and Hygiene Professionals	20	18	2
2151	Electrical Engineers	19	16	3
2311	University and Higher Education Professional Teachers	18	17	1
2342	Early Childhood Educators	18	18	0
2519	Software and Applications Developers and Analysts Not Elsewhere Classified	18	16	2
2211	Generalist Medical Practitioners	16	13	3
2425	Administrative Professionals	16	11	5
2113	Chemists	14	12	2
2152	Electronic Engineers	14	12	2
2171	Ships Engineers	14	14	0

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
2212	Specialist Medical Practitioners	14	14	0
2114	Geologists and Geophysicists	12	12	0
2173	Aircraft Pilots and Related Professionals	11	10	1
2412	Financial and Investment Advisers	11	11	0
2432	Public Relations Professionals	10	9	1
2153	Telecommunications Engineers	9	8	1
2413	Financial Analysts	9	9	0
2423	Personnel and Careers Professionals	8	7	1
2513	Web and Multimedia Developers	8	8	0
2831	Authors and Related Writers	8	8	0
2145	Chemical Engineers	7	7	0
2163	Product and Garment Designers	7	7	0
2381	Vocational Training Officers	7	6	1
2434	Information and Communications Technology (ICT) Sales Professionals	7	6	1
2165	Cartographers and Surveyors	6	6	0
2172	Ships Deck Officers and Pilots	6	5	1
2251	Veterinarians	6	6	0
2262	Pharmacists	6	6	0
2361	Language Teachers	6	5	1
2523	Computer Network Professionals	6	6	0
2844	Film, Stage and Related Directors and Producers	6	6	0
2331	Secondary Education Teachers	5	2	3
2529	Database and Network Professionals, NEC	5	5	0
2712	Restaurant Professionals	5	5	0
2134	Pharmacologists, Pathologists and Related Professionals	4	4	0
2341	Primary School Teachers	4	3	1
2433	Technical and Medical Sales Professionals (Excluding ICT)	4	4	0
2161	Building Architects	3	3	0
2264	Physiotherapists	3	3	0
2266	Audiologists and Speech Therapists	3	3	0
2391	Education Methods Specialists	3	3	0
2399	Teaching Professionals, NEC	3	3	0
2421	Management and Organization Analysts	3	3	0
2426	Research and Development Professionals	3	3	0
2521	Database Designers and Administrators	3	3	0

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
2133	Environmental Protection Professionals	2	2	0
2174	Air Traffic Controllers	2	2	0
2179	Transport Controllers Not Elsewhere Classified	2	2	0
2183	Construction Professionals	2	1	1
2267	Optometrists and Ophthalmic Opticians	2	2	0
2351	Music Teachers	2	2	0
2611	Lawyers	2	2	0
2912	Taxation and Excise Officials Professionals	2	2	0
2131	Biologists, Botanists, Zoologists and Related Professionals	1	1	0
2132	Farming, Forestry and Fisheries Advisers	1	1	0
2175	Train / Locomotive Controllers	1	1	0
2222	Midwifery Professionals	1	1	0
2265	Dieticians and Nutritionists	1	1	0
2268	Occupational Therapists	1	1	0
2321	Vocational Education Teachers	1	1	0
2352	Arts Teachers	1	1	0
2393	Information Technology Trainers	1	1	0
2424	Training and Staff Development Professionals	1	1	0
2619	Legal Professionals, NEC	1	1	0
2711	Hotel Professionals	1	1	0
2821	Economists	1	1	0
2823	Philosophers, Historians and Political Scientists	1	1	0
2824	Psychologists	1	1	0
2832	Journalists	1	1	0
2833	Translators, Interpreters and Other Linguists	1	1	0
2261	Dentists	1	0	1
	TOTAL	**1061**	**961**	**100**

CfE Nominations: MASCO 3 – Technicians and Associate Professionals

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
3322	Commercial Sales Agents	39	36	3
3115	Mechanical Engineering Technicians	35	34	1
3122	Manufacturing Supervisors	32	28	4
3119	Physical and Engineering Science Technicians, NEC	31	29	2
3112	Civil Engineering Technicians	27	22	5
3123	Construction Supervisors	22	19	3

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
3113	Electrical Engineering Technicians	13	12	1
3129	Other Supervisors, NEC	12	9	3
3323	Buyers	11	11	0
3111	Chemical and Physical Science Technicians	10	7	3
3118	Draughtspersons and Surveying Technician	7	7	0
3512	Information and Communications Technology User Support Technicians	7	5	2
3313	Accounting and Auditing Associate Professionals	6	6	0
3641	Chefs	6	6	0
3257	Environmental and Occupational Health Inspectors and Associates	5	5	0
3311	Securities and Finance Dealers and Brokers	5	5	0
3332	Conference and Event Agents	5	4	1
3131	Power Production Plant Operators	4	3	1
3144	Fishery Technicians	4	4	0
3321	Insurance Agents	4	4	0
3341	Administrative Associate Professionals	4	0	4
3411	Legal and Related Associate Professionals	4	4	0
3114	Electronics Engineering Technicians	3	3	0
3312	Credit and Loans Officers	3	3	0
3623	Fitness and Recreation Instructors and Program Leaders	3	3	0
3632	Interior Designers and Decorators	3	3	0
3712	Taxation and Excise Officials Associate Professionals	3	3	0
3121	Mining Supervisors	2	2	0
3132	Incinerator and Water Treatment Plant Operators	2	1	1
3133	Chemical Processing Plant Controllers	2	2	0
3134	Petroleum and Natural Gas Refining Plant Operators	2	2	0
3151	Aircraft Technicians	2	2	0
3152	Ship / Marine Technicians	2	2	0
3222	Midwifery Associate Professionals	2	2	0
3256	Medical Assistants	2	2	0
3259	Health Associate Professionals, NEC	2	2	0
3315	Valuers and Loss Assessors	2	2	0
3343	Administrative and Executive Secretaries	2	1	1

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
3511	Information and Communications Technology Operation Technicians	2	2	0
3139	Process Control Technicians, NEC	1	1	0
3153	Train/ Locomotive Technicians	1	0	1
3154	Motor Vehicles Technicians	1	1	0
3211	Medical Imaging and Therapeutic Equipment Technicians	1	1	0
3241	Veterinary Technicians and Assistants	1	1	0
3333	Employment Agents and Contractors	1	1	0
3334	Real Estate and Property Agents	1	1	0
3513	Computer Network and Systems Technicians	1	1	0
3522	Telecommunications Engineering Technicians	1	1	0
3611	Social Work Associate Professionals	1	1	0
3622	Sports Coaches, Instructors and Officials	1	1	0
	TOTAL	**343**	**307**	**36**

CfE Nominations: MASCO 4 – Clerical support workers

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
4321	Stock Clerks	13	13	0
4111	General Office Clerks	11	8	3
4311	Accounting and Bookkeeping Clerks	10	8	2
4224	Receptionists	8	6	2
4221	Travel Consultants and Clerks	6	6	0
4322	Production Clerks	6	5	1
4416	Personnel Clerks	5	3	2
4222	Contact Centre Information Clerks	3	3	0
4323	Transportation Clerks	3	1	2
4419	Clerical Support Workers Not Elsewhere Classified	3	3	0
4121	Secretaries (General)	2	2	0
4313	Payroll Clerks	2	2	0
4211	Bank Tellers and Related Clerks	1	1	0
4225	Enquiry Clerks	1	1	0
4312	Statistical, Finance and Insurance Clerks	1	1	0
	TOTAL	**75**	**63**	**12**

CfE Nominations: MASCO 5 – Service and Sales Workers

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
5414	Security Guards	20	16	4
5131	Waiters	13	13	0
5142	Beauticians and Related Workers	10	10	0
5121	Cooks	6	6	0
5111	Travel Attendants and Travel Stewards	5	5	0
5152	Domestic Housekeepers	5	4	1
5223	Shop Sales Assistants	5	4	1
5311	Child Care Workers	5	5	0
5211	Stall and Market Salespersons	4	4	0
5231	Cashiers and Ticket Clerks	4	2	2
5153	Building Caretakers	3	3	0
5169	Personal Services Workers Not Elsewhere Classified	3	2	1
5312	Teachers' Aides	3	3	0
5242	Sales Demonstrators	2	2	0
5244	Contact Centre Salespersons	2	2	0
5113	Travel Guides	1	1	0
5132	Bartenders	1	1	0
5141	Hairdressers	1	1	0
5151	Cleaning and Housekeeping Supervisors in Offices, Hotels and Other Establishments	1	1	0
5165	Driving Instructors	1	1	0
5321	Health Care Assistants	1	1	0
5411	Fire-Fighters	1	0	1
5412	Police Officers	1	0	1
	TOTAL	**98**	**87**	**11**

CfE Nominations: MASCO 6 – Skilled Agricultural, Forestry, Livestock and Fishery Workers

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
6111	Field Crop Growers	18	18	0
6113	Gardeners, Horticultural and Nursery Growers	5	5	0
6121	Livestock and Dairy Producers	2	2	0
6211	Skilled Forestry and Related Workers	2	1	1
6221	Fishery and Aquaculture Producers	2	2	0
6131	Mixed Crop and Animal Producers	1	1	0

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
6222	Skilled Inland and Coastal Waters Fishery Workers	1	1	0
6223	Skilled Deep-Sea Fishery workers	1	1	0
	TOTAL	**32**	**31**	**1**

CfE Nominations: MASCO 7 – Craft and Related Trades Workers

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
7412	Electrical Mechanics and Fitters	39	36	3
7233	Agricultural and Industrial Machinery Mechanics and Repairers	20	20	0
7231	Motor Vehicle Mechanics and Repairers	12	12	0
7621	Tailors, Dressmakers, Furriers and Hatters	9	9	0
7212	Welders and Flame Cutters	7	6	1
7411	Building and Related Electricians	7	6	1
7132	Spray Painters and Varnishers	6	5	1
7211	Metal Moulders and Coremakers	6	6	0
7115	Carpenters and Joiners	5	5	0
7126	Plumbers and Pipe Fitters	5	5	0
7222	Toolmakers and Related Workers	5	5	0
7119	Building Frame and Related Trades Workers, NEC	4	4	0
7322	Printers	4	4	0
7213	Sheet-Metal Workers	3	3	0
7223	Metal Working Machine Tool Setters and Operators	3	3	0
7123	Plasterers	2	2	0
7131	Painters and Related Workers	2	2	0
7239	Machinery Mechanics and Repairers, NEC	2	2	0
7323	Print Finishing and Binding Workers	2	2	0
7413	Electrical Line Installers and Repairers	2	1	1
7613	Woodworking-Machine Tool Setters and Operators	2	1	1
7622	Garment Pattern-Makers and Cutters and Other Material Related	2	2	0
7121	Roofers	1	0	1
7124	Insulation Workers	1	1	0
7214	Structural-Metal Preparers and Erectors	1	1	0

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
7224	Metal Polishers, Wheel Grinders and Tool Sharpeners	1	1	0
7232	Aircraft Engine Mechanics and Repairers	1	1	0
7313	Jewellery and Precious-Metal Workers	1	1	0
7314	Potters and Related Workers	1	1	0
7321	Prepress Workers	1	1	0
7516	Tobacco Preparers and Tobacco Products Makers	1	1	0
7624	Upholsterers and Related Workers	1	1	0
7633	Product Graders and Testers (Excluding Foods and Beverages)	1	1	0
7634	Fumigators, Pest and Weed Controllers	1	1	0
	TOTAL	**161**	**152**	**9**

CfE Nominations: MASCO 8 – Plant and Machine Operators and Assemblers

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
8341	Mobile Farm and Forestry Plant Operators	37	37	0
8189	Stationary Plant and Machine Operators Not Elsewhere Classified	35	33	2
8182	Steam Engine and Boiler Operators	20	18	2
8332	Heavy Truck and Lorry Drivers	11	9	2
8183	Packing, Bottling and Labelling Machine Operators	10	10	0
8211	Mechanical Machinery Assemblers	8	6	2
8142	Plastics Products Machine Operators	7	7	0
8331	Bus and Tram Drivers	7	6	1
8121	Metal Processing Plant Operators	5	5	0
8221	Machine-Tool Setter-Operators	5	5	0
8322	Car, Taxi and Van Drivers	5	5	0
8122	Metal Finishing, Plating and Coating Machine Operators	4	4	0
8131	Chemical Products Plant and Machine Operators	4	3	1
8132	Photographic Products Machine Operators	4	4	0
8342	Earth-Moving and Related Plant Operators	4	4	0
8113	Well Drillers and Borers and Related Workers	3	3	0
8141	Rubber Products Machine Operators	3	3	0

MASCO 4D	Description	Nominations	Hard to Fill	Not Hard to Fill
8152	Weaving and Knitting Machine Operators	3	3	0
8181	Glass and Ceramics Plant Operators	3	3	0
8344	Lifting Truck Operators	3	3	0
8114	Cement, Stone and Other Mineral Products Machine Operators	2	2	0
8143	Paper Products Machine Operators	2	2	0
8151	Fibre Preparing, Spinning and Winding Machine Operators	2	2	0
8153	Sewing Machine Operators	2	2	0
8154	Bleaching, Dyeing and Fabrics Cleaning Machine Operators	2	2	0
8161	Food and Related Products Machine Operators	2	2	0
8171	Pulp and Papermarking Plant Operators	2	2	0
8172	Wood Processing Plant Operators	2	0	2
8321	Motorcycle Drivers	2	2	0
8343	Crane, Hoist and Related Plant Operators	2	2	0
8351	Ships Deck Crews and Related Workers	2	2	0
8156	Shoemaking and Related Machine Operators	1	1	0
8173	Wood Products Machine Operators	1	1	0
8212	Electrical and Electronic Equipment Assemblers	1	1	0
8219	Assemblers Not Elsewhere Classified	1	1	0
8311	Locomotive Engine Drivers	1	1	0
	TOTAL	**208**	**196**	**12**

APPENDIX 6: CONSULTATION DATA COLLECTION FORM

FOR OFFICE USE
PEID:

TalentCorp ATTRACT • NURTURE • RETAIN

Institute of Labour Market Information and Analysis (ILMIA)
MINISTRY OF HUMAN RESOURCES

PE Research
Planning & Economic Consultants

Call for Evidence (CfE)

SURVEY 2019

Introduction

TalentCorp Malaysia (TalentCorp) and the Institute of Labour Market Analysis (ILMIA) are carrying out a CfE survey of critical occupations in Malaysia. The information will be used to help the Government monitor the labour market and will contribute to human capital development in order to improve Malaysia's economic competitiveness. It is intended to ensure that the labour market is efficient, reduce skills imbalance and enhance skills capability of the workforce as well as improve economic resilience.

Your company's response to this survey will be kept **STRICTLY CONFIDENTIAL** and will be used solely for the purposes and objectives of improving the labour market operations in the Malaysian economy. For this survey, PE Research Sdn Bhd has been appointed to assist in data collection

If you have any questions about this survey, please contact any of the officers listed below:

OFFICERS TO CONTACT				
	Officer	**Designation**	**Tel. No**	**Email**
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6.	Levi Olivia binti Ahmad Tarmizi		011-1050 1561	

Call for Evidence (CfE)

SURVEY 2019

The main objective of this survey is to collect information on **critical occupations**, as well as identify skills imbalances across key economic sectors.

Talent Corp

CSC

ILMIA

CSC: A Critical Skills Committee (CSC) jointly chaired by **TalentCorp** and **ILMIA**, has been tasked to review the CfE survey and to recommend actions to resolve inefficiencies in skills shortages and deficits.

What is COL?

The primary objective of this survey to develop a **Critical Occupations List (COL)** which will serve as a platform for the coordination of human capital development policies. The need for this survey is clearly stated in the 11th Malaysia Plan. The survey aims is to collect data on critical occupations as well as to identify skills imbalances across key industrial sectors of the Malaysian economy.

How COL is used?

The COL will provide information that is useful for investments into training programmes, design of incentives to enhance training and apprenticeship programmes, and set criteria for skills migration.

In this Form

This form...

SECTION 1: COMPANY BACKGROUND

SECTION 2: CRITICAL OCCUPATIONS

Firms will identify occupations and jobs that are critical to the company, report on the employees in that position, the recruitment and hiring process of those jobs, reasons for defining its criticality, etc.

SECTION 3: AUTOMATION

Firms will indicate/report if there is a potential to automate critical jobs and give suggestions related to resolving the skills shortages or deficits.

A	ORGANISATION NAME AND POSTAL ADDRESS		
Company Name			
Address			

B	CONTACT PERSON		
Please provide information of the person in charge, if questions about your data arise			
Name			
Designation			
Email			
Office telephone		Mobile telephone	

SECTION 1 GENERAL LABOUR MARKET TRENDS

A **INDUSTRY TRENDS**

1) How has your industry been performing in the past year? Past few years? Is your industry affected by macro-economic or global trends? In what way?
(other trends: economic slowdown, big data, automation, IR 4.0, IT, etc.)

2) Does your industry face any employment challenges?
(e.g. Challenges to match skills and capabilities to the supply of jobs, time taken to hire new employee etc.)

3) What were the most significant employment trends in your industry in 2018?
(e.g. Focus on upskilling, retaining current employees etc.)

4) Are these (employment) trends causing a temporary change in demand or supply of talent in your Industry?

SECTION 2 CRITICAL OCCUPATIONS

A CRITICAL OCCUPATION IS DEFINED BY THREE SPECIFIC CRITERIA:

5) **In this section, please nominate occupations that is critical to your industry. Critical as defined by "industry specific skills" that is "of strategic importance to your industry" and "skills that are hard to find". Which of those jobs are hard to find?**
Read the column titles carefully and fill in details of critical job positions in the table below.

ID.	**Job Title**	**6) Why are these jobs to be hard to fill? Are there specific reasons for the lack of professionals in this industry?** *(e.g. Not enough applicants, applicants lack credentials or certificates, relevant job experience, expected compensation is beyond the market rate, etc.)*	**7) What are the specific qualifications or niche skills needed those jobs? Are the skills hard to get?** *(e.g. ACCA, CFA, Actuaries papers, how long does it take to get them, etc)*
ID11			
ID12			
ID13			
ID14			
ID15			
ID16			
ID17			
ID18			

ID.	Job Title	8) What level of experience are most sought after for this hard to fill occupation?	9) How has your industry been impacted by the critical shortage?	10) What has industry done to reduce the shortage? Anything the government can do?
ID10				
ID11				
ID12				
ID13				
ID14				
ID15				
ID16				
ID17				
ID18				

SECTION 3 AUTOMATION

11) Are there major automation/technology disruption trends in your industry?

12) Would automation/technology disruption trends lead to a reduction in the number of workers?

☐ Yes ☐ No

If yes, what percentage of reduction is most likely next 3 years? Do you think new jobs would be created? What kinds of new jobs or skills?

APPENDIX 7: STAKEHOLDERS THAT TOOK PART IN CONSULTATION

No.	Associations / Companies
1.	Association of Banks Malaysia (ABM)
2.	Waste Management Association of Malaysia (WMAM)
3.	Early Childhood Care and Education Council (ECCE)
4.	Association of Private Hospitals Malaysia (APHM)
5.	Federation of Malaysian Freight Forwarders (FMFF)
6.	Malaysian Palm Oil Board (MPOB)
7.	Malaysian Institute of Accountants (MIA)
8.	Pertubuhan Arkitek Malaysia (PAM)
9.	Malaysian Retail Chain Association (MRCA)
10.	Malaysian Chamber of Mines (MCOM)
11.	Recording Industry Association of Malaysia (RIM)
12.	Federation of Malaysian Manufacturers (FMM)
13.	Machinery & Engineering Industries Federation (MEIF)
14.	Life Insurance Association of Malaysia (LIAM)
15.	Malaysian Association of Amusement Themepark and Family Attractions (MAATFA)
16.	Malaysian Plastic Manufacturers Association (MPMA)
17.	Master Builders Association Malaysia (MBAM)
18.	Malaysian Association of Hotel Owners (MAHO)
19.	Malaysia Digital Economy Corporation (MDEC)
20.	Malayan Agricultural Producers Association (MAPA)
21.	The Free Industrial Zone, Penang, Companies' Association (FREPENCA)
22.	The Institute of Engineers Malaysia (IEM)
23.	Malaysian Textile Manufacturers Association (MTMA)
24.	Malaysian Institute of Estate Agents (MIEA)
25.	Malaysian Organisation of Pharmaceutical Industries (MOPI)
26.	Malaysian Association of Private Colleges and Universities (MAPCU)

**Two other stakeholders include the key players in information and communication as well as oil and gas industries.*

APPENDIX 8: STAKEHOLDERS THAT TOOK PART IN VALIDATION

No.	Associations / Companies
1.	National Association of Private Educational Institutions (NAPEI)
2.	Malaysian Bar Council
3.	Malaysia Aerospace Industry Association (MAIA)
4.	National Heart Association of Malaysia (NHAM)
5.	Department of Occupational Safety and Health (DOSH)
6.	Malaysian Knitting Manufacturers Association (MKMA)
7.	Machinery and Equipment Manufacturers Association (MEMA)
8.	Malaysian Special Tooling and Machining Association (MSTMA)
9.	Welding Institute of Malaysia (WIM)
10.	Malaysian Plastics Manufacturers Association (MPMA)
11.	Malaysian Institute of Human Resource Management (MIHRM)
12.	Public Relations Consultants' Association of Malaysia (PRCA)
13.	CIDB Malaysia
14.	Malaysian Organisation of Pharmaceutical Industries (MOPI)
15.	Malaysian Pharmaceutical Society (MPS)
16.	The Land Surveyors Board
17.	Civil Aviation Authority of Malaysia (CAAM)
18.	Ikhtisas Kelautan Malaysia (IKMAL)
19.	Malaysia Shipowners' Association (MASA)
20.	The Malaysian Paediatric Association (MPAEDS.MY)
21.	Malaysian Institute of Planners (MIP)
22.	Institute of Quarrying Malaysia
23.	Federation of Malaysian Manufacturers (FMM)
24.	The Marketing Research Society Malaysia (MRSM)
25.	Malaysian Association of Hotels (MAH)
26.	Master Builders Association Malaysia (MBAM)
27.	National Institute of Occupational Safety and Health (NIOSH)
28.	Malaysian Institute of Accountants (MIA)
29.	Malaysian Association Hotel Owners (MAHO)
30.	The Malaysian Textile and Apparel Centre (MATAC)
31.	Malaysian Textile Manufacturers Association (MTMA)

**Three of the stakeholders include key players from the aviation, information and communication as well as water supply; sewerage, waste management and remediation activities industries.*