CRITICAL OCCUPATIONS LIST 2020/2021
TECHNICAL REPORT

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CSC

Critical Skills Monitoring Committee

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EXECUTIVE SUMMARY

The Critical Skills Monitoring Committee (CSC) was established as part of the efforts under the 11th Malaysia Plan to monitor skills imbalances across the Malaysian economy. The CSC is jointly led by Talent Corporation Malaysia, or TalentCorp (an agency under the Ministry of Human Resources) and the Institute for Labour Market Information and Analysis, or ILMIA (an agency under the Department of Statistics Malaysia) and is mandated to develop a Critical Occupations List (COL) on an annual basis since 2015 to serve as a platform for the coordination of human capital development policies.

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. This is not unique to Malaysia; as many as 16 OECD countries have been producing a shortage list for the reference of their governments 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.

The methodology for creating the COL combines rigorous analysis of quantitative and qualitative evidence that were collected through the 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 collects evidence of the current labour market that is comparable over time and across occupations. The approach draws on multiple quantitative data sources such as Malaysia's labour force survey, Malaysia's salaries and wages survey and online job posting data and relies on multiple indicators to evaluate whether an occupation is in shortage. It 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 by generating additional evidence of sought-after occupations. The bottom-up approach serves two functions. The first is to build 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 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.

The **2020/2021 COL** is the **6th edition** of the study. The CSC has collaborated with Frost & Sullivan Perunding Strategi Sdn Bhd to carry out the 2020/2021 COL, as well as the development of an online COL dashboard. A total of **42 occupations were included** in the 2020/2021 COL, which represents 9 per cent of the 451 non-military 4-digit occupations included in the Malaysian Standard Classification of Occupations (MASCO) 2020. Most of these occupations are skilled occupations at the managerial, professional, and associate professional level. Only around 12 per cent of the occupations on the 2020/2021 COL are semi-skilled occupations, such as craft and trades workers, and plant and machine operators and assemblers. Seven occupations (mostly digital occupations) appear on the COL for the first time: Nursing Professionals, Web and Multimedia Developers, Data Professionals, Cybersecurity Professionals, Animation and Visual Effects Professionals, Digital Games and eSports Professionals, and Creative Content Designers Professionals. The complete 2020/2021 COL can be found at the end of the Executive Summary.

Over the years, the COL has undergone several improvements to include important and relevant aspects, as well as incorporate lessons learnt from the previous rounds of the COL. 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	2020/2021
Occupations covered	Skilled (MASCO 1-3)	Skilled (MASCO 1-3)	Skilled and semi-skilled (MASCO 1-8)	Skilled and semi-skilled (MASCO 1-8)	Skilled and semi-skilled (MASCO 1-8)	Skilled and semi-skilled (MASCO 1-8)
# of top-down indicators	2	6	11	14	14	11
# of top-down data sources considered	2	2	9	10	10	5
# of top-down data sources used	2	2	3	4	4	3
# sectors covered	6	10	18	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	Sample of 32,000
Consultations	Regulators	Industry associations and regulators	Employers, industry associations, and regulators	Employers, industry associations, and 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 5 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 skilled labour to immediately fill the gaps in the labour market without the time lag involved in developing and delivering training programmes.

Based on consultations with members of the industry through the bottom-up evidence gathering process, the following recommendations are proposed to further enhance the utility of COL in fulfilling the near and long-term skills requirements of businesses operating in Malaysia:

Outline of Recommendations by Action Areas

Action Area	Recommendations
1. Industry alignment	1.1 Introduction of minor specialisation in education syllabus with focus on industry relevant subjects 1.2 Critical occupations list driven industry academia engagements
2. Predictive information	2.1 Workforce demand study every 3 years at job title level 2.2 Establish a unified future skills list to draw a distinction between shortage and strategic focus
3. Overseas skilled workers	3.1 Develop a skills short supply list updated every 6 months or shorten the COL process 3.2 FastTrack visa for skills in short supply
4. Regional focus	4.1 Regionally focused education projects/initiatives 4.2 Establish regional critical occupations working group
5. Information processes	5.1 Adoption of the Malaysia Standard Industrial Classification (MSIC) classification across education statistical data collection process 5.2 Integration of human capital information databases
6. Outreach and awareness	6.1 Awareness initiative for sectors that are perceived to be unfavorable 6.2 Integrated and interactive online occupational information portal

The 2020/2021 Critical Occupations List

MASCO Code	Job Title
1121	Managing Director and Chief Executives
1211	Finance Managers
1212	Human Resource Managers
1213	Policy and Planning Managers
1214	Business Service Managers
1221	Sales and Marketing Managers
1222	Advertising and Public Relations Managers
1511	Information and Communications Technology (ICT) Managers
2113	Chemists
2121	Mathematicians, Actuaries and Statisticians
2141	Industrial and Production Engineers
2142	Civil Engineers
2144	Mechanical Engineers
2182	Manufacturing Professionals
2212	Specialist Medical Practitioners
2221	Nursing Professionals
2263	Environmental and Occupational Health and Hygiene Professionals
2411	Accountants and Auditors
2412	Financial and Investment Advisers
2426	Research and Development Professionals
2431	Advertising and Marketing Professionals
2511	Systems Analysts
2512	Software Developers
2513	Web And Multimedia Developers
2514	Applications Programmers
2519	Software and Applications Developers and Analysts Not Elsewhere Classified
2522	Systems Administrators
2523	Computer Network Professionals
2524	Data Professionals
2531	Cybersecurity Professionals
2541	Animation and Visual Effects Professional
2542	Digital Games and eSports Professionals
2543	Creative Content Designers Professionals
3115	Mechanical Engineering Technicians
3119	Industrial and Production Technicians
3122	Manufacturing Supervisors
3123	Construction Supervisors
7212	Welders and Flame Cutters

MASCO Code	Job Title
7233	Agricultural and Industrial Machinery Mechanics and Repairers
7412	Electrical Mechanics and Fitters
8182	Steam Engine and Boiler Operators
8332	Heavy Truck and Lorry Drivers

ACKNOWLEDGEMENT

Associations / Companies
Actuarial Society of Malaysia
Animation Society of Malaysia (ANIMAS)
Association of Banks in Malaysia (ABM)
Association of Consulting Engineers Malaysia (ACEM)
Associations of Islamic Banking and Financial Institutions Malaysia (AIBIM)
Association of Private Hospitals of Malaysia (APHM)
Central Bank of Malaysia (Bank Negara Malaysia)
Chemical Industries Council of Malaysia (CICM)
Coca Cola Malaysia
Collaborative Research in Engineering, Science and Technology Centre (CREST)
Construction Industry Development Board (CIDB) Malaysia
Department of Labour of Peninsular Malaysia (JTKSM)
Department of Manpower (JTM)
Department of Skills Development (JPK)
Department of Statistics Malaysia (DOSM)
Early Childhood Care and Education Council (ECCE)
Economic Planning Unit (EPU)
Employees Provident Fund (EPF)
Employment Insurance System (EIS), PERKESO
Federation of Malaysian Freight Forwarders (FMFF)
Federation of Malaysian Fashion, Textiles and Apparels (FMFTA)
Federation of Malaysian Manufacturers (FMM)
Federation of Malaysian Manufacturers (FMM) Sabah
Frost and Sullivan Perunding Strategi Sdn Bhd
Human Resource Development Corporation Berhad (HRD Corp)
Ikhtisas Kelautan Malaysia (IKMAL)
Institute of Labour Market Information and Analysis (ILMIA)
Jabatan Pendidikan Politeknik dan Kolej Komuniti (JPPKK)
Life Insurance Association of Malaysia (LIAM)
Malaysian Association of Themepark and Family Attractions (MATFA)
Malaysian Association of Hotels (MAH)
Malaysia Aerospace Industry Association (MAIA)
Malaysian Agricultural Producers Association (MAPA)
Malaysian Association of Private Colleges and Universities (MAPCU)
Malaysian Association of Pharmaceutical Suppliers (MAPS)
Malaysia Automation Technology Association (MATA)

Associations / Companies
Master Builders Association Malaysia (MBAM)
Malaysia Chamber of Mines (MCOM)
Malaysian Communications and Multimedia Commission (MCMC)
Malaysia Digital Economy Corporation Sdn Bhd (MDEC)
Malaysian Employers Federation (MEF)
Machinery and Engineering Industries Federation (MEIF)
Machinery and Equipment Manufacturers Association (MEMA)
Malaysia Investment Development Authority (MIDA)
Malaysia Nurses Association (MNA)
Malaysia Rail Industry Corporation (MARIC)
Malaysian Textile Manufacturers Association (MTMA)
Malaysian Integrated Chip Designer Association (MICDA)
Malaysian Oil and Gas Services Council (MOGSC)
Malaysian Organisation of Pharmaceutical Industries (MOPI)
Malaysian Petrochemicals Association (MPA)
Malaysian Photovoltaic Industry Association (MPIA)
Malaysian Rubber Products Manufacturers' Association (MRPMA)
Malaysia Software Testing Board (MSTB)
Malaysian Special Tooling and Machining Association (MSTMA)
Malaysian Textile Manufacturers Association (MTMA)
Ministry of Finance (MOF)
Ministry of Higher Education (MOHE)
Ministry of Human Resources (MOHR)
Ministry of International Trade and Industry (MITI)
Ministry of Science, Technology, and Innovation (MOSTI)
Ministry of Youth and Sports (KBS)
National Association of Private Educational Institutions (NAPEI)
Petroliam Nasional Berhad (PETRONAS)
Public Relations and Communications Association of Malaysia (PRCA Malaysia)
Real Estate and Housing Developers' Association (REHDA)
Sarawak Chamber of Commerce and Industry (SCCI)
Talent Corporation Malaysia Berhad (TalentCorp)
The Electrical and Electronics Association of Malaysia (TEEAM)
Malaysian Textile and Apparel Centre (MATAC)
The National Tech Association of Malaysia (PIKOM)
Welding Institute of Malaysia (WIM)
World Bank Group

METHODOLOGY FOR THE 2020/2021 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. The details are illustrated in **figure 1** below.

Figure 1: Defining critical occupations
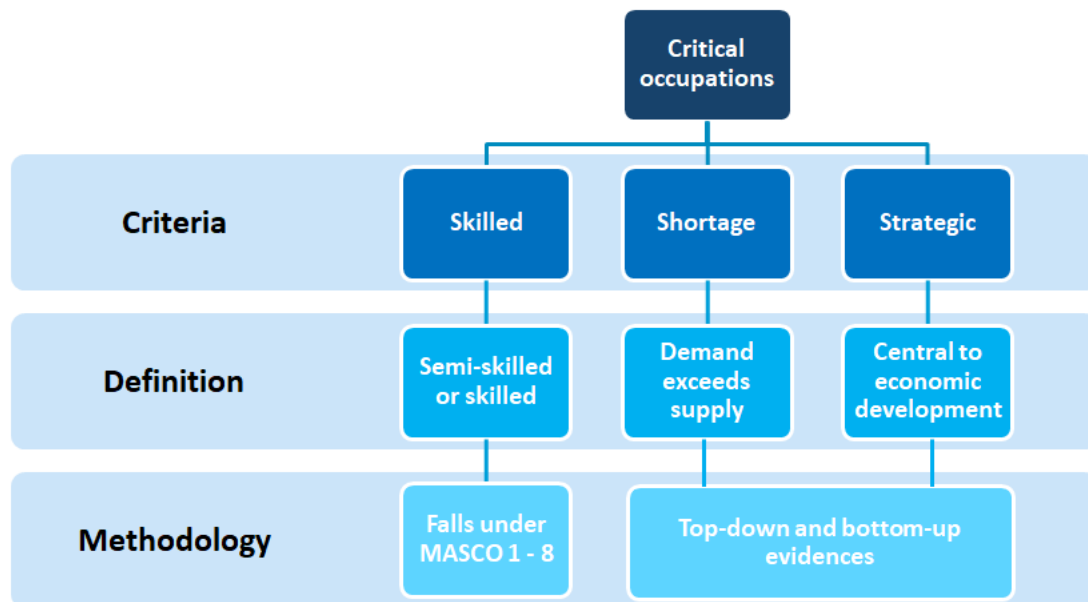
Is the occupation skilled?

Occupations are determined to be *skilled* based on the Malaysian Standard Classification of Occupations list. The 2020/2021 COL uses the Malaysian Standard Classification of Occupations (MASCO) 2020 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 major groups are semi-skilled or 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
MASCO 8: Plant and Machine Operators and Assemblers

Elementary Occupations (MASCO 9) are considered to be low- or unskilled. While all of the other occupational groups require at least a secondary education or at least the Malaysian Skill Certificate (SKM) Levels 1-3, the Elementary Occupations group requires only primary education. Hence, these occupations are not eligible for inclusion in 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.

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. Frost & Sullivan was engaged to assist the CSC in carrying out the top-down process.

Data sources

The COL 2020/2021 has primarily utilised the following three data sources compiled from the Labour Market Information Data Warehouse and internal TalentCorp database:

1. **Labour Force Survey (LFS).** The COL 2020/2021 utilises the Labour Force Survey (LFS) that is referred as a survey of the Malaysian workforce between 2011 to 2019. 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 2019. 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. **Online job posting data.** Online job posting data are collected from one of Malaysia's largest online job matching platforms in Malaysia from April 2016 to December 2018 through Burning Glass Technologies. Data point from July 2019 to September 2020 is collected through Job Market Insights (JMI) from ILMIA. 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 unit of analysis classified uses the 4-digit Malaysian Standard Classification of Occupations (MASCO), and the latest version being MASCO 2020. However, for LFS and SWS, the occupations were already mapped to MASCO 2013 instead of MASCO 2020 as the surveys were conducted before MASCO 2020 is available. Remapping to MASCO 2020 for all data will be extremely time consuming. Hence, the top-down analysis for LFS and SWS is done based on MASCO 2013 and later mapped to MASCO 2020 where applicable. Besides that, there is a data gap for year 2019 where the data for the Online Job Posting is only available for Q3 and Q4 of 2019, and due to the different source of data and way of data classifications by Burning Glass Technologies and JMI, some of the indicators are not comparable across the years.

The top-down approach requires data to be available for the most recent year of the analysis (2019), as well as previous years to establish trends. The reference population for the top-down approach is all Malaysian and foreign individuals in the working age population[1] who are employed. The 2020/2021 COL includes both skilled 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.

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[1] 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 2020/2021 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 are a total of 18 indicators constructed from the three 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 (2018 and 2019) and 3 years (2016 and 2019) prior to the year of analysis.	• An increase in number of employees in an occupation suggests that the demand for that occupation is rising.
		3) 1-year working hours growth 4) 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. • The percentage change in median weekly hours worked per occupation is then calculated with respect to 1 year (2018 and 2019) and 3 years (2016 and 2019) prior to the year of analysis.	• An increase in the median number of hours worked per week in an occupation could be linked to the use of the existing labour force for longer hours in order to fill a rise in demand for the labour force.
		5) 1-year education level decrease 6) 6) 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 (2018 and 2019) and	• A decrease in the education level in an occupation could be linked to strategies that employers take in order to fill vacancies. • In particular, an employer

Indicators set	Data source	Indicators	Calculating the indicators	Shortage rationale
			3 years (2016 and 2019) prior to the year of analysis.	might accept workers with a lower level of education for a particular job if the vacancy has been very difficult to fill.
Earning-based indicators	Salaries and Wages Survey (SWS)	7) 1-year wage premium growth 8) 3-year wage premium growth	• The premiums 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 (2018 and 2019) and 3 years (2016 and 2019) prior to the year of analysis.	• An increase in wage in an occupation could be associated with increase in demand for labour in an occupation.
Volume-based indicators	Online Job Posting Data (Burning Glass & JMI)	9) Number of vacancies	• This is the total number of vacancies posted per occupation in Q3 and Q4. • As compared to previous COLs, instead of using annual data, only data in Q3 and Q4 would be taken into consideration due to data availability issue in 2019.	• A large number of vacancies in an occupation are positively associated with rising labour demand.

Indicators set	Data source	Indicators	Calculating the indicators	Shortage rationale
		10) Vacancy rate (% of employment)	• This indicator requires merging the vacancies dataset with the employment variable from the LFS by occupation. • It is calculated as the number of vacancies as a percentage of total employment per occupation.	• The rationale is the same as the number of vacancies indicator, but this indicator controls for the level of employment in each occupation.
		11) 1-year education level decrease	• This is the change in the median level of education required for an occupation.	• Similar rational to LFS, education level decrease.

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 per cent 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 2020/2021 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 per cent (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 2020/2021 COL maintains the usage of 2014's benchmark period as previous 2020/2021 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%) 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 - 2020
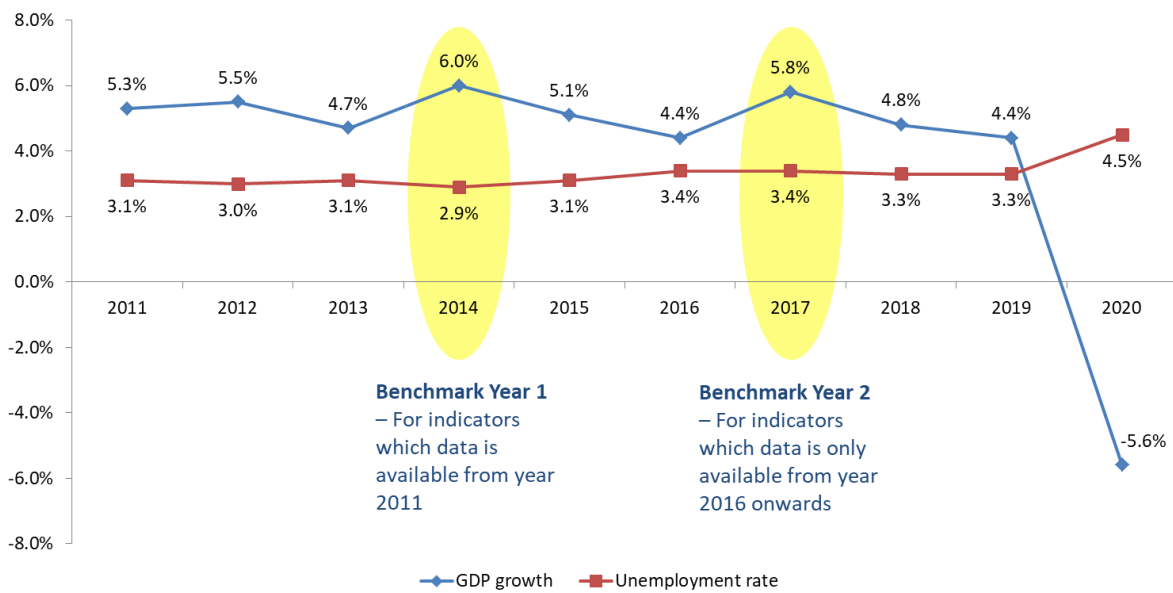
Source: Author's illustration based on data from Department of Statistics Malaysia

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, there is a stronger growth returns in Period C. 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
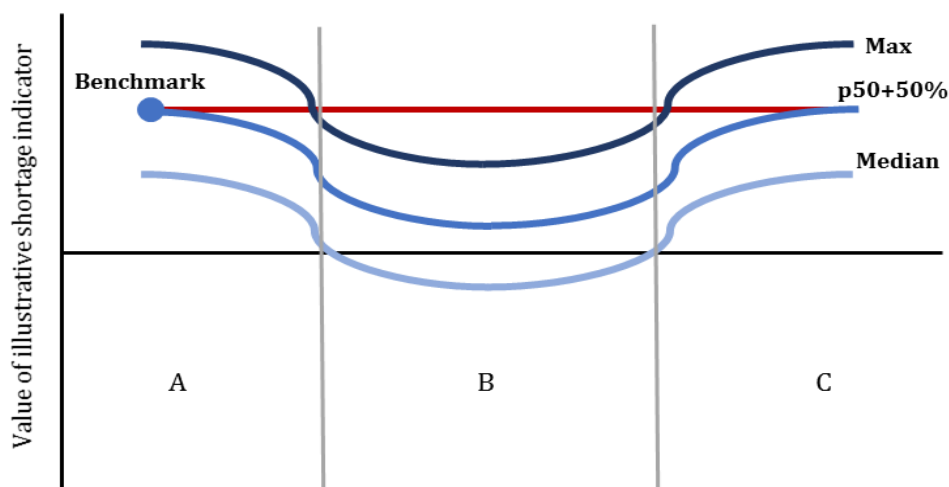
Source: Author's illustration, adapted from MAC (2010)

The 2020/2021 COL generally uses the median plus fifty per cent 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 2020/2021 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 2020.

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 indicated the relationship among most of the shortage indicators appears to be weak or very weak, with none of the data sets showing strong correlation. This means that none of the indicator significantly influences the changes of the other shortage indicator. Hence, all initial indicators were being included in the top-down analysis.

Table 3: Correlation matrix of the initial indicators

	1-year employment growth	3-year employment growth	1-year working hours growth	3-year working hours growth	1-year education level decrease(LFS)	3-year education level decrease (LFS)	1-year wage premium growth	3-year wage premium growth	Number of vacancies	Vacancy rate	1-year education level decrease (Online)
1-year employment growth	1										
3-year employment growth	0.5636	1									
1-year working hours growth	0.1840	0.1423	1								
3-year working hours growth	-0.0406	0.0855	0.3780	1							
1-year education level decrease	-0.0585	0.0008	-0.0679	-0.0091	1						

	1-year employment growth	3-year employment growth	1-year working hours growth	3-year working hours growth	1-year education level decrease(LFS)	3-year education level decrease (LFS)	1-year wage premium growth	3-year wage premium growth	Number of vacancies	Vacancy rate	1-year education level decrease (Online)
(LFS)											
3-year education level decrease (LFS)	-0.0466	0.0452	-0.0768	-0.0102	0.4285	1					
1-year wage premium growth	0.0517	0.0846	-0.0317	-0.0103	0.0804	-0.0263	1				
3-year wage premium growth	-0.0538	-0.0948	0.0569	0.1223	0.0310	0.1146	0.2984	1			
Number of vacancies	0.0931	0.2983	-0.0386	0.0128	0.0514	0.0531	-0.0330	-0.0963	1		
Vacancy rate	0.0650	0.0563	-0.1148	0.0830	0.0486	0.0686	0.0028	-0.0647	0.3232	1	
1-year education level decrease (Online)	-0.0587	-0.1496	-0.0389	-0.1190	0.1306	0.0426	0.0763	-0.0676	-0.1017	0.0702	1

General rule of thumb for interpreting the strength of a relationship: r < 0.3 = none or very weak; 0.3 < r <0.5 = weak; 0.5 < r < 0.7 = moderate; r > 0.7 = strong

The second test was performed on each indicator in each dataset to identify appropriate threshold scenario. Based on the **table 4** 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 4: Number of occupation list exceeding the shortage threshold

Indicators	Threshold p50 + 50%		Threshold p75		NA
	Yes	No	Yes	No	
1-year employment growth	105	144	44	205	202
3-year employment growth	70	184	32	222	197
1-year education level decrease (LFS)	16	233	16	233	202
3-year education level decrease (LFS)	17	237	17	237	197
1-year working hours growth	29	220	29	220	202
3-year working hours growth	29	223	29	223	199

1-year wage premium growth	41	87	28	100	323
3-year wage premium growth	47	105	50	102	299
Number of vacancies	339	107	204	242	5
Vacancy rate[a]	205	54	97	162	192
1-year education level decrease (Online)	37	72	37	72	342

[a] Based on online job posting 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 2020/2021 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 5** summarises the 11 indicators included at this stage of top-down process and their skills level accordingly.

Table 5: 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	Skilled & semi-skilled
	Labour force Survey (LFS)	3) 1-year working hours growth 4) 3-year working hours growth	Skilled & semi-skilled
	Labour force Survey (LFS)	5) 1-year education level decrease 6) 6) 3-year education level decrease	Skilled & semi-skilled
Earning-based indicators	Salaries and Wages Survey (SWS)	7) 1-year wage premium growth 8) 3-year wage premium growth	Skilled & semi-skilled
Volume-based indicators	Online Job Posting Data (Burning Glass & JMI)	9) Number of vacancies	Skilled & semi-skilled

Indicators set	Data source	Indicators	Skilled included
	Online Job Posting Data (Burning Glass & JMI)	10) Vacancy rate (% of employment)	Skilled & semi-skilled
	Online Job Posting Data (Burning Glass & JMI)	11) 1-year education level decrease	Skilled & 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 and 3-year working hours growth, 1-year wage premium growth, number of vacancies, vacancy rate, and 1-year education level decrease (online). 6 alternative specifications were tested using robustness analysis by adding and dropping indicators in a similar combination to 2019/2020 COL. **Table 6** illustrates the different specification test using a less restrictive scenario. Specification 1 to 5 had applied single threshold value for both skilled and semi-skilled occupation. However, Specification 6 had applied disaggregated threshold values respectively for skilled and semi-skilled occupation due to differences in the labour market response to identical economic condition.

Table 6: Specification tested for top-down analysis

Indicators	Specification					
	1 [a]	2 [a]	3 [a]	4 [a]	5 [a]	6 [b]
1-year employment growth	x	x	x	x	x	x
3-year employment growth	x	x	x	x	x	x
1-year education level decrease (LFS)	x	x	x			x
3-year education level decrease (LFS)	x	x	x			x
1-year working hours growth	x	x		x		x
3-year working hours growth	x	x		x		x
1-year wage premium growth	x	x	x	x	x	x
3-year wage premium growth		x	x	x	x	x
Number of vacancies	x	x	x	x	x	x
Vacancy rate	x	x	x	x	x	x
1-year education level decrease (Online)	x	x	x	x	x	x
Total indicators	10	11	9	9	7	11
Comparison		1 vs 2	3 vs 2	4 vs 2	5 vs 2	6 vs 2
Preferred specification	1	2	2	2	2	6

[a] Same threshold value for all occupations.

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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 is 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. The 2020/2021 COL had chosen Specification 6 over Specification 2 as it fits the selection criteria. The Specification 6 includes: 1 and 3-year employment growth, 1 and 3-year education level decrease, 1 and 3-year working hours growth, 1 and 3-year wage premium growth, number of vacancies, vacancy rate, and 1-year education level decrease (online), which treats skilled and semi-skill occupations separately.

Shortage list

In the final process, the Specification 6 seems to be the most suitable combination of the top-down shortage list due to its inclusiveness of 11 indicators with distinct threshold for skilled and semi-skilled occupations in the less restrictive scenario. **Table 7** 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 number of vacancies recorded higher percentage, followed by vacancy rate and 1-year employment growth.

Table 7: Descriptive statistics for each shortage indicators

Indicators	Threshold	Threshold value for skilled occupations	Threshold value for semi-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%	5.30	7.21	249	103	41.37
3-year employment growth	p50+50%	18.53	16.98	254	67	26.38
1-year education level decrease	p50+50%	0	0	249	16	6.43
3-year education level decrease	p50+50%	0	0	254	17	6.69
1-year working hours growth	p50+50%	0	0	249	29	11.65
3-year working hours growth	p50+50%	0	0	252	29	11.51
1-year wage premium growth	p50+50%	7.78	7.73	128	39	30.47
3-year wage premium growth	p50+50%	21.71	25.48	173	67	38.73
Number of vacancies	p50+50%	33.00	4.50	424	315	74.29
Vacancy rate	p50+50%	101.17	4.55	424	183	43.16
1-year education level decrease (Online)	p50+50%	0	0	109	37	33.94

Table 8 below shows the comparison between the skilled and semi-skilled occupations of shortage indicators between the 2019/2020 COL and the 2020/2021 COL. The 2020/2021 COL had included semi-skilled occupations to observe the education level decrease for online job posting. The results from the final specification of the 2020/2021 COL indicate 49 occupations are in shortage (**Appendix 1**). The shortage list from top-down analysis saw a 9.2% decrease in shortage occupations from 54 occupations in 2019/2020. The decrease is mainly driven by the reductions of shortage occupations in the skilled occupations. Overall, the findings of the 2020/2021 COL seem to be consistent with the 2019/2020 COL to suggest skilled occupational shortage is still severe compared to the semi-skilled occupational shortage in Malaysia.

Table 8: Comparison with previous COL

Indicators	2019/2020 COL		2020/2021 COL	
	Included	Occupation skills	Included	Occupation skills
1-year employment growth	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
3-year employment growth	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
1-year education level decrease	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
3-year education level decrease	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
1-year working hours growth	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
3-year working hours growth	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
1-year wage premium growth	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
3-year wage premium growth	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
Number of vacancies	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
Vacancy rate	Yes	Skilled & Semi-skilled	Yes	Skilled & Semi-skilled
1-year education level decrease (Online)	Yes	Skilled	Yes	Skilled & Semi-skilled
1-year experience level decrease (Online)	Yes	Skilled	No	N/A
Share of vacancies	Yes	Semi-skilled	No	N/A

posted > 6 weeks				
Absolute change in median vacancy duration	Yes	Semi-skilled	No	N/A

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, which 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
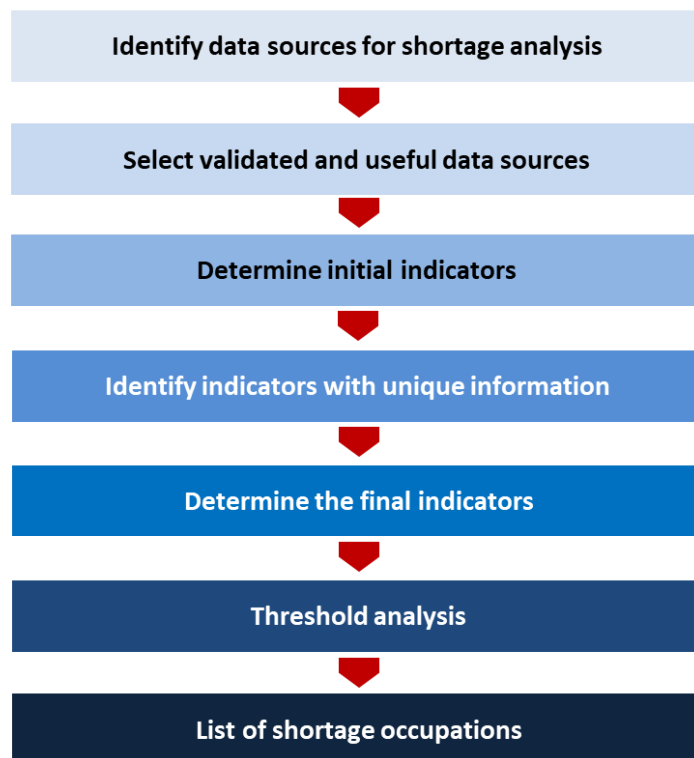
Source: Author's adaptation from previous COL Reports

Bottom-up methodology

The bottom-up approach includes a Call-for-Evidence (CfE) survey of employers as well as focus group discussions (FGDs) and consultations with employers and industry associations. The CfE is used to ask a wide range of employers about occupations that they consider being critical. The definition of a critical occupation (the said occupation must be hard-to-fill, has strategic importance to the industry, and require specific industry skills and experience) is

being introduced to the employers before the survey begins, and the employers are able to list down the occupations, job descriptions, and other details regarding the occupation that they consider to be critical. This CfE survey helps to generate a clearer picture of the labour market to further understand the issues on ground and the employment challenges that the employers face. Meanwhile the FGDs and consultations conducted serve to supplement the firm-level data canvassed from the online survey, which provides additional information that can aid in interpretation of the CfE and top-down evidence. Frost & Sullivan, a strategy and management 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 consider to be critical across 18 economic sectors in Malaysia. **Appendix 2** shows the 18 sectors and 63 sub-sectors, which is the scope of the 2021 CfE survey.

The sector coverage follows the Malaysia Standard Industrial Classification (MSIC) 2008 in classifying industries. Meanwhile, the classification of the occupations found in the CfE survey is based on the occupational description used in the Malaysian Classification of Occupations (MASCO) 2020.

The CfE survey was conducted using an online platform as the main data collection tool. The following tasks were executed:
- Web hosting the COL survey on an online platform;

- Emailing the survey link to companies across entire Malaysia to complete the survey;

- Following up with the companies to ensure complete response;

- Mapping the job title and key responsibility for each critical job positions identified by the firm/companies at the MASCO 6-digit level;

- Data collection, compiling, and cleaning; quality assurance check and due diligence on cleaned data completed by Frost & Sullivan; 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 32,171 companies as provided by CSC. Companies for the survey are drawn from several government databases with company contact information that are publicly available or that were compiled by the CSC and Frost & Sullivan.

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 CfE survey questionnaire was modified from the CfE 2019/2020 survey with questions added on 'company size' for the responded employers, and 'budgeted maximum monthly salary', 'total number of employees required by next year', 'top-3 skills required', 'minimum level of qualification', and 'field of studies / education required' for the nominated jobs.

The CfE 2020/2021 survey questionnaire can be found in **Appendix 3**.

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:-

- The structure, layout, flow and the logic of the questions;
- The clarity of the instructions and the ability of the respondents to follow the directions of the survey;
- 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 findings from the pilot test will be used to improve the final questionnaire before the full-swing survey begins. The pilot test was conducted from 26 February till 9 March 2021 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 25 minutes to answer. The online questionnaire was also well-structured and user-friendly. The overall status of the firms is shown in the following table:

Table 9: Overall status of the pilot test

Status	Number of Firms
Responded with Critical Jobs	6
Responded without Critical Jobs	19
Rejected	98
Unable to contact / provide P.I.C. contact details due to COVID-19 pandemic "Work-From-Home"	177
Total	300

Source: Pilot Test, Call for Evidence (CfE) Survey 2020/2021

Due to the COVID-19 pandemic that hit across entire Malaysia, the Government of Malaysia had imposed a "Movement Control Order" (MCO) across all of the states in Malaysia to curb the spread and transmission of the virus. Most of the companies were ordered to reduce workforce in workplaces, if not have all of most of their employees to work-from-home (WFH). This had subsequently possessed additional hurdle for the fieldwork team to reach out to the right personnel to get responses for the CfE survey.

Survey findings

At the close of fieldwork on 31st May 2021, 5,078 firms responded to the CfE Survey with 1,359 firms reporting that they had critical occupations. A total of 1,428 nominations of occupations considered to be critical by the companies. These occupations that are nominated can be segregated into MASCO 4D and 6D unit group across all eight (8) major occupational groups. **Figure 5** shows the results graphically.

Figure 5: Final survey status

Total Firms Responded 5,078 firms → Firms with critical occupations 1,359 firms → Nomination of critical occupations 1,428 occupations

Figure 6 shows the breakdown of the 5,078 firms by States in Malaysia, and by economic industry sectors. Soft quota was set to ensure that there is sufficient representation of companies from all the states and federal territories in Malaysia, and across all 18 economic industry sectors. The soft quota set for the CfE survey is based on establishments profile published by the Department of Statistics Malaysia (DOSM).

Figure 6: Breakdown of firms responded to the CfE survey, by State and by Industry Sector

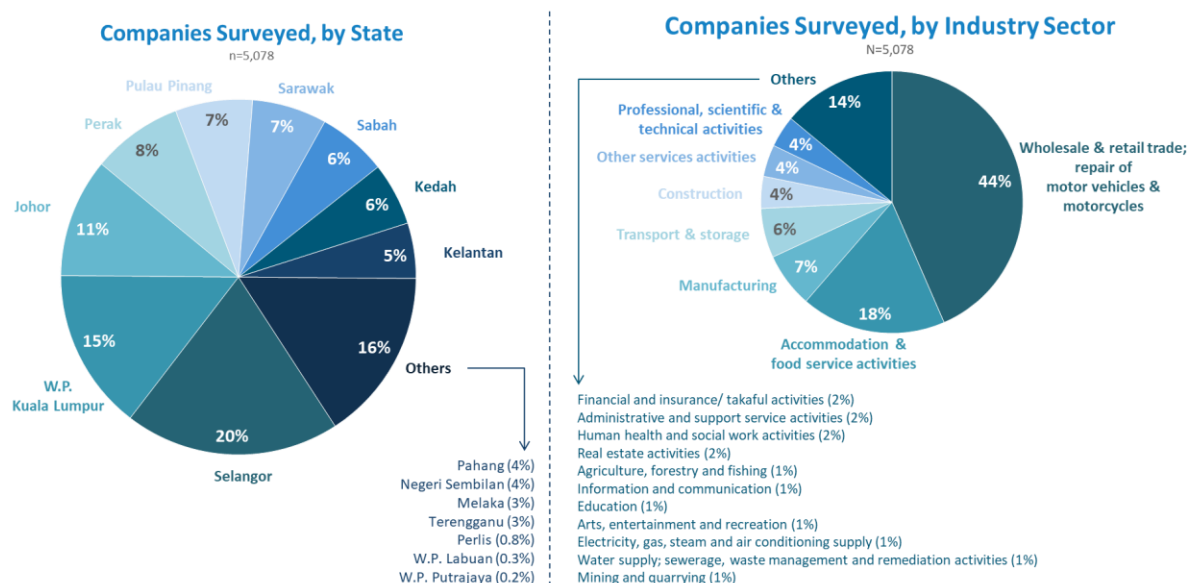
Table 10 shows the number of nominations to the COL according to the unit group level (MASCO 4 digit), minor unit level (MASCO 6 digit) and also the number of jobs that are hard to fill. Out of all the 1,428 nominations, 1,336 jobs were Hard to Fill (94%), and 92 were not Hard to Fill (6%) as identified by the companies. Besides, from the 1,428 nominations, there are 188 occupations were nominated at MASCO 4D unit group, or 479 occupations were nominated at MASCO 6D unit group level.

Table 10: Nominations for COL from CfE survey

	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	TOTAL
Number of nominations	**133**	**489**	**200**	**86**	**322**	**2**	**77**	**119**	**1,428**
Hard-to-fill	119	467	183	75	304	2	74	112	1336
Not Hard-to-fill	14	22	17	11	18	0	3	7	92
Unit groups (4D) of occupations were nominated	**21**	**63**	**36**	**14**	**17**	**2**	**14**	**21**	**188**
Minor unit groups (6D) of occupations were nominated	**62**	**183**	**84**	**33**	**35**	**2**	**32**	**48**	**479**

At MASCO 4D unit group level, the top 3 occupational groups with the largest number of nominated occupations for the COL are MASCO 1 (21 nominations), MASCO 2 (63 nominations) and MASCO 3 (36 nominations), whereas MASCO 6 had the least number of nominations for the COL (only 2 nominations).

Consultation with Industry Associations

Besides from the CfE survey, as part of the bottom-up approach, focus group discussions (FGDs) and consultations with industry associations and companies were also carried out. A structured discussion guide was developed and used during the consultation sessions, enabling the associations and companies to provide insights on global trends on the specific industry and labour market, employment challenges, critical occupations nominations for the specific industry, and the impact of automation. At this session, the CSC and Frost & Sullivan team also gathered in-depth information of occupations that have been nominated by stakeholders that could potentially be included in the COL.

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

A consultation guide was used and it comprised of four (4) components:

a) Section 1: General Industry and Labour Market Trends – impact of COVID-19 pandemic, industry performance, local and global emerging trends in the industry, key employment trends, employment challenges faced by the industry;
b) Section 2: Critical Occupations – Firms identified and nominated occupations and jobs that are critical in their industry, reasons that the nominated jobs are hard to fill, specific qualification/competencies/niche skills required, duration and venue to acquire such qualification or skills, level of experience that are most sought after, how the industry was impacted by the shortages, measures taken by the industry to reduce the shortages, and suggestions on what the government can do to assist;
c) Section 3: Automation and Technology Disruption – understanding emerging technology trends in the industry, how automation or technology disruptions may reduce the number of workers or risk of occupations being automated, and potential of future jobs or skills creation;
d) Section 4: Feedback on Previous COL – trace awareness and utilization of COL, and the industries' point of view on the previous COL and suggestions for improvement.

The structured discussion guide for consultations with both industry associations and companies is included in **Appendix 4**.

Consultation Findings

Frost & Sullivan and the CSC engaged and conducted almost 50 consultations with 43 stakeholders (industry associations and companies) for the 2020/2021 COL. These consultations were held between March and June 2021. The list of associations that took part in the consultation session is shown in **Appendix 5**.

A total of 342 occupations were nominated for the COL. The key occupational groups with most nomination from the consultation sessions are the (MASCO 2) Professionals (56%), followed by (MASCO 1) Managers (19%), (MASCO 3) Technicians & Associate Professionals (10%), and (MASCO 7) Craft & Related Trade Workers (10%). There were no occupation nominations from (MASCO 4) Clerical Support Workers and (MASCO 6) Skilled Agriculture, Forestry, Livestock & Fishery Workers occupational groups. Meanwhile, the occupational groups with lowest number of nominations from the consultations are (MASCO 8) Plant & Machine Operators & Assemblers (5%) and (MASCO 5) Services & Sales Workers (1%).

The results of the nominated jobs by occupational groups from the consultations are illustrated in **Figure 7**.

Figure 7: Nominated jobs by occupational groups
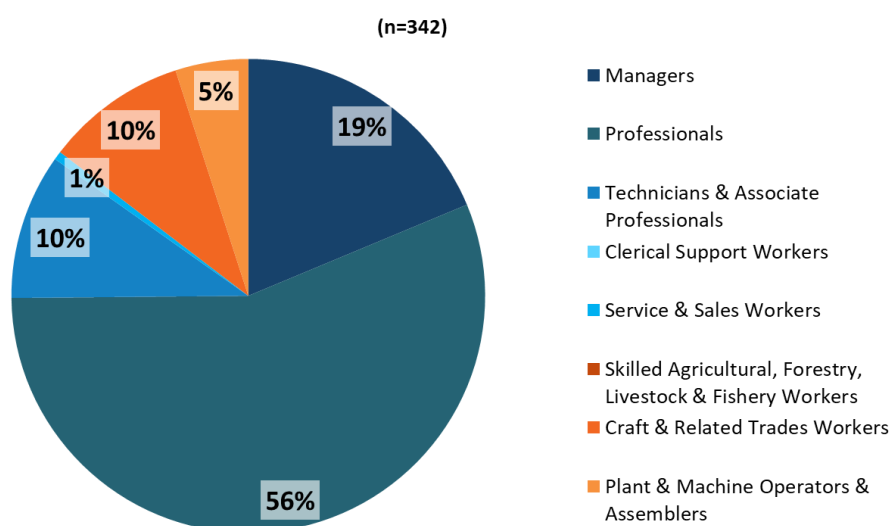
Employment Challenges faced by the Local Industries and Companies

From the FGDs and consultations with the industry associations, organisations, and companies, it is understood that the local industries and companies are facing several employment challenges today. The COVID-19 pandemic has placed the industries and companies under the magnifying glass, where some of these challenges are more obvious now than ever and are taking a toll on the companies. The feedback from the FGDs and consultations can be summarised into four (4) main employment challenges that faced by the local industries and companies.

a) Increased Digitalisation and Competition

The COVID-19 pandemic has become a catalyst to push the companies to adopt digitalisation and automation. As a result, industries and companies are forced to adopt

digitalisation and automation into most of their business operations and processes as the Government of Malaysia imposes the "Movement Control Order" (MCO), where the economic sectors are not able to operate at full capacity, as people are forced to stay at home to reduce the transmission and spread of the coronavirus. While some companies are able to turn to digitalisation and automation to keep their business running with lesser human intervention, many other companies and business that are still running on the traditional practices or those with heavy reliance on human capital faced great difficulty in this period. Many of the industries and companies cited to have lack of talents with the required IT and digital skills to help manoeuvre the company towards digitalisation and competition. Furthermore, digitalisation also help to reduce barriers to entry, in turn has caused greater competition for the companies, both from local and international markets with the rise of e-commerce platform, allowing more individuals to sell goods and services outside the traditional business format. This has resulted in greater self-employment and entrepreneurship, as individuals get to enjoy the flexibility and not bound by the traditional employment practices.

b) Skill Gap between Industry Practices and Graduates

There is lack of quick integration, proactive planning and coordination by the government, learning institutions and universities, and the industries to ensure education syllabus are developed and updated to cater the future demands. Learning institutions and universities are not able to keep up with the fast-changing innovative industries to ensure graduates are equipped with skills required for the future, i.e. technical skills, digital skills, and soft skills. The industries and companies mentioned that there is high possibility that some of the skills that the current graduates learnt during their tertiary education have become obsolete by the time they enter the labour market. Therefore, there should be greater leverage on predictive analysis in the emerging skills or new disruptive technologies that the industries may rely on in the future, so that the learning institutions and universities can modify their existing education syllabus to better equip the students, and increase the employability of the students when they graduate at the end of their tertiary studies.

c) Difficulties in Talent Retention

Currently, most of the companies are unable to retain talents as they start to demand for new work patterns and arrangements, especially for companies with traditional employment practices and inflexible business arrangements. With increased participation in the workforce either through a rise in tertiary education rates, market incentives or out of necessity, talents now have tendency to demand or compare employee benefits and opportunities offered to them. Some companies face high attrition rate as workers tend to look out for better opportunities (career growth, higher pay, better culture, etc.). 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 demand higher wages and better opportunities in other countries.

d) The Reputation of Certain Industries and Jobs

According to the industry associations and companies, there are certain occupations in certain industries are generally more hard-to-fill as some industries are not viewed as a priority or the "first choice" by the applicants. For instance, for an engineering role, most graduates or talents will give priority or preference towards oil and gas industry or manufacturing industry, as compared to the theme park / tourism attraction industry. Some of the industries face great employment challenges as there are just too few to no applicants for the job roles advertised as these graduates and talents have stereotypes towards certain industries or jobs. Besides, some industries are also unable to attract a new generation of workers into jobs that have a reputation of being low-skilled, low-paying and 3D (Dirty, Dangerous and Difficult), especially when entrepreneurship and self-employment are now more easily accessible than ever. The industry associations and companies have also cited that the local employees have been less willing to travel for work, preferring geographic stability and the ability to stay close to family. Hence, to cope with the reduced willingness to work in these jobs from the local employees, the companies are forced to rely more on foreign labour to sustain their business.

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 determination about whether the evidence recommend that an occupation be included in the final COL. There are two rounds of dovetailing analysis and a validation phase, which the process is illustrated in **Figure 8**. This process is to ensure all relevant data and information are being captured for the shortlisted occupations, and the coherence of top-down and bottom-up evidence as well as the plausibility of the case are being properly evaluated.

Figure 8: Process to develop the final Critical Occupations List
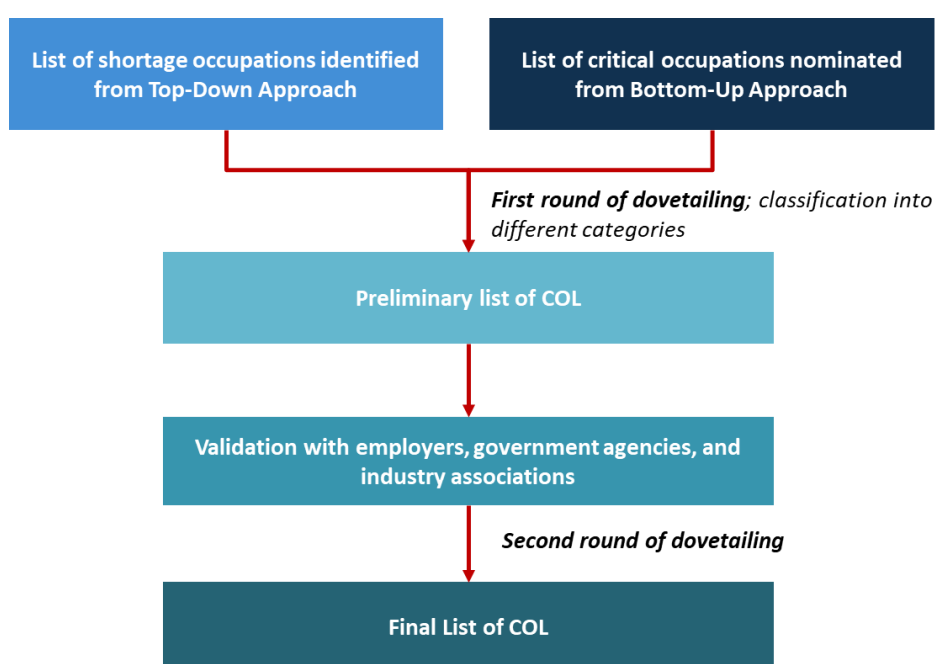
First round of dovetailing

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 for further scrutinisation:

Group 1: There is strong evidence for inclusion
Group 2: There is weak evidence for inclusion
Group 3: Evidence does not make a case for inclusion

For the 2020/2021 COL, occupations that received 15 or more nominations in the bottom-up process are considered to have strong evidence and are categorised into Group 1 (**Table 11**). Occupations that pass the top-down approach and that received at least 8 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 8 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 14 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.

Table 11: Classifying occupations in the first round of dovetailing

Classification of Occupations		Top-Down			
		Passed[1]	Do Not Passed (moderate)[2]	Do Not Passed (low)[2]	Insufficient evidence[3]
Bottom-Up	High (≥ 15 nominations)	🟩	🟩	🟩	🟩
	Moderate (8-14 nominations)	🟩	🟨	🟨	🟨
	Low (5-7 nominations)	🟨	🟨	🟨	🟨
	Very low (1-4 nominations)	🟨	🟥	🟥	🟥
	Not nominated (N/A)	🟨	🟥	🟥	🟥

Group 1: There is strong evidence for inclusion
Group 2: There is weak evidence for inclusion
Group 3: Evidence does not make case for inclusion

[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.

The thresholds of 5, 8, and 15 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 per cent of total respondents. Occupations receiving 5 or more nominations are in the top 40 per cent of occupations by number of nominations. Occupations receiving 8 or more nominations are in the top 25 per cent of occupations by

number of nominations. Occupations receiving 15 or more nominations are in the top 15 per cent 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.

A total of 226 four-digit MASCO occupations were reviewed during the first round of dovetailing for the 2020/2021 COL. This represents 50 per cent of all non-military 4-digit MASCO occupations. The remaining 225 occupations that were not nominated in the bottom-up approach and did not pass the top-down approach, were not reviewed. Based on the evidence received, 37 occupations were classified as having strong evidence for inclusion (Group 1), 81 occupations were classified as having weak evidence for inclusion (Group 2), and 333 occupations were classified as not meriting inclusion (Group 3) (**Table 12**).

Table 12: Classifying occupations in the first round of the COL 2020/2021 dovetailing

Classification of Occupations		Top-Down				
		Passed	Do Not Passed (moderate)	Do Not Passed (low)	Insufficient evidence	Total
Bottom-Up	High (≥ 15 nominations)	7 (2%)	20 (4%)	3 (1%)	2 (0%)	**32** (7%)
	Moderate (8-14 nominations)	5 (1%)	9 (2%)	6 (1%)	7 (2%)	**27** (6%)
	Low (5-7 nominations)	4 (1%)	11 (2%)	3 (1%)	8 (2%)	**26** (6%)
	Very low (1-4 nominations)	14 (3%)	58 (13%)	9 (2%)	41 (9%)	**122** (27%)
	Not nominated (N/A)	19 (4%)	69 (15%)	19 (4%)	137 (30%)	**244** (54%)
	Total	**49** (11%)	**167** (37%)	**40** (9%)	**195** (43%)	**451** (100%)

Group 1: There is strong evidence for inclusion	37 (8%)
Group 2: There is weak evidence for inclusion	81 (18%)
Group 3: Evidence does not make case for inclusion	333 (74%)

Note: Percentages are calculated out of 451 skilled and semi-skilled occupations

Upon the completion of 1 week thorough dovetailing process by the CSC members and F&S consultants, out of the 451 skilled and semi-skilled occupations in MASCO 2020 (at 4 digit level), 31 of them are included in COL 2020/2021 and another 28 would require further validation by the industry.

Validation

A validation process was undertaken after the first round of dovetailing, to further assess the 28 occupations that fall within the borderline category. The F&S consultants categorised these 28 occupations by sectorial demand, and subsequently approached several industry associations that are related to the occupations to get their feedback on whether in their view those occupations should be included in the final COL and the reasons thereof. The requests were made through emails and phone calls. 11 industry associations/ organisations participated in the validation phase, with many of the stakeholders validated more than one occupation.

Desk research was also conducted to identify relevant industry reports that can support the inclusion or exclusion of those occupations in the final COL. The list of stakeholders and sources of information utilized in validation is listed in **Appendix 6.**

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 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 another 11 occupations being added to the final 2020/2021 COL, making it a total of 42 critical occupations. The final 2020/2021 COL is listed in the next page.

THE 2020/2021 CRITICAL OCCUPATIONS LIST

The 2020/2021 COL consists of 42 critical occupations. This represents a 28 per cent decrease from the 58 occupations listed in the 2019/2020 COL. The decrease is mainly driven by the COVID-19 pandemic which has resulted in significantly negative impact on the global economy. Many sectors are seeing hiring freeze and some are even going through retrenchment during this unprecedented time to survive.

Nonetheless, the pandemic has also created strong demand for selected jobs. In the 2020/2021 COL, there are seven (7) critical occupations that appear in the COL for the first time (as shown in Table 14). Most of these critical occupations are digital related jobs, which the surge in demand is accelerated by the pandemic.

A total of 16 critical occupations (38%) in the 2020/2021 COL have appeared in all six (6) editions of the COL. Table 15 shows the list of occupations that have appeared in the COL annually.

Table 13: 2020/2021 Final Critical Occupations List

MASCO Code	Job Title
1121	Managing Director and Chief Executives
1211	Finance Managers
1212	Human Resource Managers
1213	Policy and Planning Managers
1214	Business Service Managers
1221	Sales and Marketing Managers
1222	Advertising & Public Relations Managers
1511	Information and Communications Technology (ICT) Managers
2113	Chemists
2121	Mathematicians, Actuaries & Statisticians
2141	Industrial and Production Engineers
2142	Civil Engineers
2144	Mechanical Engineers
2182	Manufacturing Professionals
2212	Specialist Medical Practitioners
2221	Nursing Professionals
2263	Environmental and Occupational Health and Hygiene Professionals
2411	Accountants and Auditors
2412	Financial and Investment Advisers
2426	Research & Development Professionals
2431	Advertising & Marketing Professionals
2511	Systems Analysts

MASCO Code	Job Title
2512	Software Developers
2513	Web And Multimedia Developers
2514	Applications Programmers
2519	Software and Applications Developers and Analysts Not Elsewhere Classified
2522	Systems Administrators
2523	Computer Network Professionals
2524	Data Professionals
2531	Cybersecurity Professionals
2541	Animation and Visual Effects Professional
2542	Digital Games & eSports Professionals
2543	Creative Content Designers Professionals
3115	Mechanical Engineering Technicians
3119	Industrial & Production Technicians
3122	Manufacturing Supervisors
3123	Construction Supervisors
7212	Welders and Flame Cutters
7233	Agricultural and Industrial Machinery Mechanics and Repairers
7412	Electrical Mechanics and Fitters
8182	Steam Engine and Boiler Operators
8332	Heavy Truck and Lorry Drivers

Table 14: Occupations that are new in the COL

MASCO Code	Job Title
2221	Nursing Professionals
2513	Web And Multimedia Developers
2524	Data Professionals
2531	Cybersecurity Professionals
2541	Animation and Visual Effects Professional
2542	Digital Games & eSports Professionals
2543	Creative Content Designers Professionals

Table 15: Occupations that have appeared in every COL

MASCO Code	Job Title
1211	Finance Managers
1213	Policy and Planning Managers
1214	Business Service Managers
1511	Information and Communications Technology (ICT) Managers
2121	Mathematicians, Actuaries & Statisticians
2141	Industrial and Production Engineers
2144	Mechanical Engineers
2182	Manufacturing Professionals
2411	Accountants and Auditors
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

REGIONAL VACANCIES DISTRIBUTION

Distributions of vacancies by regions provide insights on the differences in human capital requirements across the country. The analysis is grouped by industries and type of occupation across five regions as illustrated in Figure 99.

Figure 9: Geographical grouping
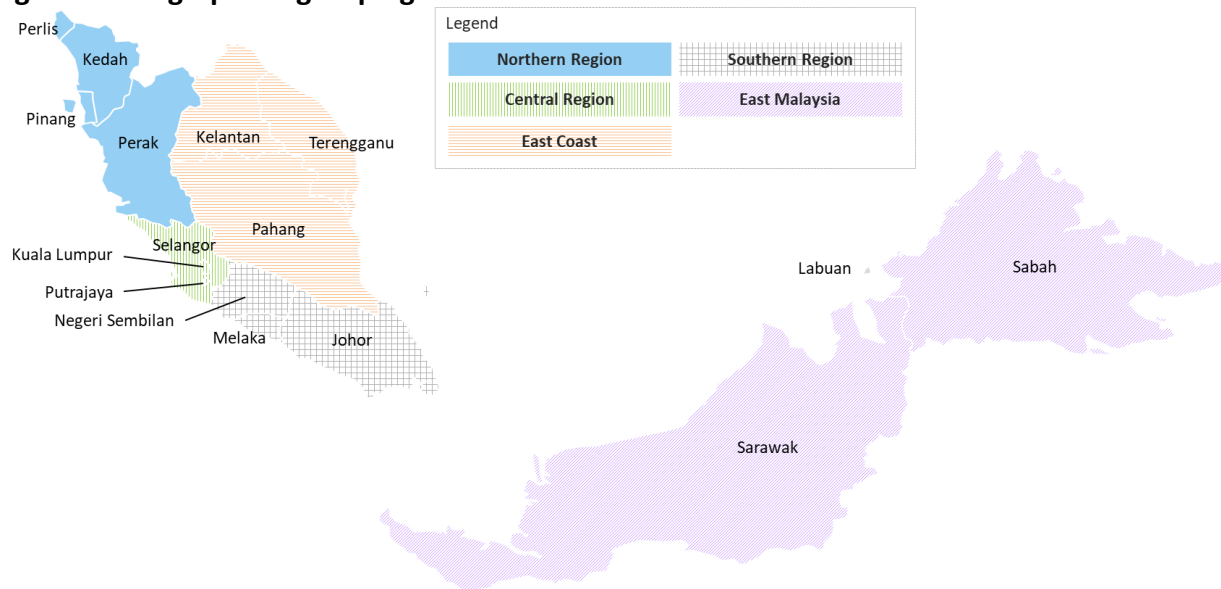
Note: Illustration sourced from Frost & Sullivan

Northern region highlights

The electrical and electronics industries located in Penang and Kedah is a major employment driver in the region. As the industry moves towards newer technologies such as the shift towards Gallium Nitride materials in semiconductor production, education and training providers will need to adapt to the changing industry needs. The transformation of the Penang economy towards greater services-based activities has seen an increasing demand for testing and software engineers. The increase in software-based technologies is driven by growth in shared services-based industries and an expansion of the electronics value chain in the region.

Within the region the highest critical occupation vacancies are noted in the professionals and services and sales workers category. At 4-digit MASCO level, the highest proportion of vacancies is in business and administration professionals, sales workers, and science and engineering associate professionals. Within the region, wholesale, retail and related repair services, manufacturing, and accommodation and food industries accounts for the largest share vacancies.

Central region highlights

The highest share of critical occupation vacancies when compared to the rest of the country is located within the central region. The majority vacancies are for managers, professionals, technicians, clerical support workers, and service and sales workers. At 2-digit MASCO level,

the highest proportion of vacancies is in business and administration professionals, sales workers, and science and engineering professionals. Within the central region, the professionals' category accounts for the largest share of vacancies.

The wholesale, retail and related repair services sector accounts for the largest share of critical skills vacancies in the central region. This is followed by the manufacturing, and accommodation and food services sector.

East coast highlights

The predominant category of vacancies within the east coast region is in the service and sales workers, and craft and related trade workers categories. At 2-digit MASCO level, the highest proportion of vacancies is in sales workers, business and administration professionals, and professional services workers. The predominant vacancies within the region are from the wholesale, retail and related repair services sector. The east coast region faces difficulties in filling vacancies in higher skill categories such as managerial position as potential candidates prefer to be located in larger cities.

Southern region highlights

The southern region critical occupation vacancies are predominantly in the category of professionals, and service and sales workers. At 2-digit MASCO level, the highest proportion of vacancies is in business and administration professionals, sales workers, and stationary plant and machine operators. Wholesale, retail and related repair services and manufacturing activities account for the largest share of vacancies within the region. The southern region faces more severe brain drain effects as compared to other regions in Malaysia due to its proximity with Singapore where companies are able to offer more attractive remuneration packages. The COVID-19 pandemic has temporarily slowed down this trend however it is expected to continue when travel restrictions are lifted.

East Malaysia highlights

Skills requirements of industries in this region are predominantly within semi-skilled and below categories. Vacancies in higher skilled categories namely professional and mangers are difficult to fill especially in the manufacturing sector as candidates prefer to be located in larger cities. The 3D (dirty, dangerous, and difficult) perception of certain occupations in manufacturing and agriculture related sectors continues to be a factor leading difficulties in getting local candidates to fill vacancies. Services based skill vacancies in the information technology industry are noted to be in short supply.

Compliance related skills are noted to be in short supply in this region leading to hard-to-fill vacancies for Department of Environment competent persons, and Department of Occupational Safety and Health certified persons. Increase in the intake and output of the said certifications is required to ease the shortages.

Call for evidence survey statistics indicate that the predominant shortages are in the professionals and service and sales workers categories. At 4-digit MASCO level, the highest proportion of vacancies is in business and administration professionals, sales workers, and

personal services workers. Majority of vacancies in the region originate from the wholesale, retail and related repair services, manufacturing, and accommodation and services sectors.

Occupation vacancies – job category by region distribution

Critical occupation vacancies within regions are predominantly in the category of professionals in the northern, central, and southern region. Largest proportion of critical occupation vacancies in the east coast and East Malaysia is in the category of sales and services workers. Refer to Table 166.

Table 16: Vacancies distribution – job category within regions at 1-digit level

Job Category	Northern Region	Central Region	East Coast	Southern Region	East Malaysia
1 Managers	7%	12%	10%	6%	8%
2 Professionals	33%	43%	21%	34%	26%
3 Technicians & Associate Professionals	14%	14%	12%	14%	15%
4 Clerical Support Workers	6%	6%	6%	2%	9%
5 Service & Sales Workers	25%	16%	36%	21%	27%
6 Skilled Agriculture, Forestry, Livestock & Fishery Workers	1%	0%	0%	0%	0%
7 Craft & Related Trade Workers	5%	3%	9%	8%	6%
8 Plant & Machine Operators & Assemblers	10%	6%	5%	15%	8%
Sub-total	100%	100%	100%	100%	100%

When compared across regions, the largest proportion of vacancies of critical occupations is in the central region for categories that include managers, professionals, technicians and association professionals, clerical support workers, and service and sales workers. Refer to Table 17.

Table 17: Vacancies distribution – job category across regions at 1-digit level

Job Category	Northern Region	Central Region	East Coast	Southern Region	East Malaysia	Sub-Total
1 Managers	12%	50%	12%	11%	14%	100%
2 Professionals	16%	47%	7%	16%	13%	100%
3 Technicians & Associate Professionals	17%	38%	10%	17%	19%	100%
4 Clerical Support Workers	17%	40%	12%	5%	27%	100%
5 Service & Sales Workers	19%	27%	18%	16%	21%	100%
6 Skilled Agriculture, Forestry, Livestock & Fishery Workers	100%	0%	0%	0%	0%	100%
7 Craft & Related Trade Workers	14%	22%	19%	26%	18%	100%
8 Plant & Machine Operators & Assemblers	20%	26%	7%	30%	17%	100%

Detailed MASCO 4 digit distribution is included in ***Error! Reference source not found.***.

Occupation vacancies industry by region distribution

Across the country, the majority of critical occupation vacancies originate from three industries that include wholesale, retail and related repair services, manufacturing, and accommodation and food services industries as illustrated in Table 18.

Table 18: Vacancies distribution – industry within regions

Industry	Northern Region	Central Region	East Coast	Southern Region	East Malaysia
A - Agriculture, forestry and fishing	6%	0%	4%	6%	6%
B - Mining and quarrying	0%	1%	2%	0%	2%
C - Manufacturing	15%	12%	10%	21%	14%
D - Electricity, gas, steam and air conditioning supply	0%	2%	0%	3%	2%
E - Water supply; sewerage, waste management and remediation activities	4%	1%	0%	0%	0%
F - Construction	4%	9%	4%	6%	4%
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	37%	29%	57%	34%	31%
H - Transportation and storage	4%	6%	2%	6%	7%
I - Accommodation and food service activities	14%	11%	11%	11%	14%
J - Information and communication	0%	4%	1%	0%	1%
K - Financial and insurance/takaful activities	0%	4%	0%	1%	0%
L - Real estate activities	3%	2%	0%	1%	4%
M - Professional, scientific and technical activities	2%	5%	1%	1%	1%
N - Administrative and support service activities	1%	1%	2%	0%	3%
P - Education	0%	2%	3%	1%	1%
Q - Human health and social work activities	3%	5%	1%	4%	1%
R - Arts, entertainment and recreation	0%	1%	0%	0%	0%
S - Other service activities	5%	6%	3%	6%	7%
	100%	100%	100%	100%	100%

50%   50%   50%   50%   50%

In 15 out of 18 industries, the critical occupation vacancies are predominantly in the central region as illustrated in Table 19. Vacancies that are more prevalent in the northern region include agriculture, forestry and fishing, and water supply, sewerage, waste management and remediation. The majority of mining and quarrying industry vacancies have been reported in the east Malaysia region.

Table 19: Vacancies distribution – industry within regions

Industry	Northern Region	Central Region	East Coast	Southern Region	East Malaysia	Sub-Total
A - Agriculture, forestry and fishing	29%	2%	13%	27%	29%	100%
B - Mining and quarrying	0%	23%	31%	0%	46%	100%
C - Manufacturing	19%	32%	8%	25%	17%	100%
D - Electricity, gas, steam and air conditioning supply	4%	52%	0%	26%	19%	100%
E - Water supply; sewerage, waste management and remediation activities	63%	38%	0%	0%	0%	100%
F - Construction	10%	56%	7%	15%	11%	100%
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	18%	30%	19%	17%	16%	100%
H - Transportation and storage	15%	39%	4%	18%	24%	100%
I - Accommodation and food service activities	21%	32%	11%	16%	21%	100%
J - Information and communication	4%	78%	4%	4%	11%	100%
K - Financial and insurance/takaful activities	3%	86%	0%	10%	0%	100%
L - Real estate activities	25%	36%	0%	11%	28%	100%
M - Professional, scientific and technical activities	12%	67%	2%	10%	10%	100%
N - Administrative and support service activities	14%	32%	18%	0%	36%	100%
P - Education	5%	48%	24%	10%	14%	100%
Q - Human health and social work activities	14%	54%	4%	22%	6%	100%
R - Arts, entertainment and recreation	0%	100%	0%	0%	0%	100%
S - Other service activities	15%	38%	6%	19%	22%	100%

50%   50%   50%   50%   50%

Detailed MSIC 2 digit distribution is included in *Error! Reference source not found.*.

DEMAND AND SUPPLY ESTIMATES

Estimates of *critical occupation* vacancies in 2021 and 2022 illustrate the near-term demand by qualification level and industries at 1-digit MISC classification. Demand figures were captured via the call for evidence survey and extrapolated based on the Department of Statistics figures on total number of companies. Projections of supply of fresh graduates that addresses the less than 2 year demand category is calculated using data sets from the Ministry of Higher Education, Ministry of Human Resources, and Department of Skills Development.

Tracer study data from 2010 to 2018 is used to develop a mapping of fields of study to industries; 2019 tracer study data was not utilized due to incomplete MISC classifications. Supply data is based on intake statistics into education institutions and discounted for dropout rates.

The figure below illustrates the methodology used in the demand and supply estimates.

Figure 10: Demand and supply estimates methodology
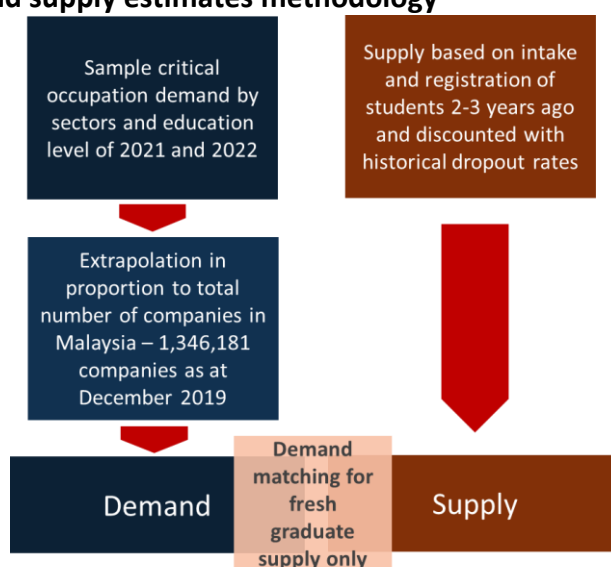
Note: Illustration sourced from Frost & Sullivan

Caveats and Assumptions

The following caveats and assumptions are applicable to the demand and supply estimates:
- Mapping of supply to demand uses the available tracer study data which is based on historical trends and differ from current trends.
- Statistical significance is based on the call for evidence survey carried out as part of this study.
- Demand estimates represent only *Critical Occupation* quantities.
- Supply estimates are only possible for fresh graduates which maps directly to the demand for less than 2 years category.
- Assumptions that all current employable supply is already absorbed by the industry.

- Given the current economic uncertainty due to the COVID-19 pandemic it will be difficult for companies to estimate long term manpower demand. Therefore, the demand estimates was limited to a two year horizon.
- Supply estimates is based on education intake data with assumptions that tertiary education takes 3 years to completion while TVET education takes 2 year to completion; estimates discounts dropout rates.

Critical occupations vacancies by level of education

Critical occupation vacancies are predominantly in categories with fewer than 2 years of experience and with qualification level of SKM 4 and STPM and below as illustrated in Table 20. The indicators are in line with the broad feedback captured from members of the industry where due to the difficulties in obtaining experienced hires, the strategy has shifted to getting less experience hires and conduct in-house training to address skills required. The aggregated figures skew towards STPM and below qualifications is largely due to industries such as manufacturing which account for the majority of vacancies in the level of education.

Table 20: Critical occupation vacancies by level of education, 2021

2021 number of vacancies	Years of Experience				Total
	< 2 years	2 - 5 years	6 -10 years	>10 years	
Total Critical Occupation Demand	**118,892**	**43,835**	**6,620**	**2,147**	**171,494**
PhD/ Doctoral Degree	-	179	-	-	179
Master's Degree/ Postgraduate Diploma/ Postgraduate Certificate	89	179	179	45	492
Bachelor's Degree/ Graduate Diploma/ Graduate Certificate	3,981	9,930	4,965	2,013	20,889
Advanced Diploma/ SKM Level 5	179	1,342	89	-	1,610
Diploma/ SKM Level 4	25,675	12,122	939	45	38,781
SKM Level 3	4,518	268	-	-	4,786
SKM Level 1 & 2	805	358	-	-	1,163
STPM and below	83,645	19,457	447	45	103,594

2022 number of vacancies	Years of Experience				Total
	< 2 years	2 - 5 years	6 -10 years	>10 years	
Total Critical Occupation Demand	**86,686**	**31,424**	**4,141**	**1,248**	**123,499**
PhD/ Doctoral Degree	-	180	-	-	180
Master's Degree/ Postgraduate Diploma/ Postgraduate Certificate	91	182	182	45	500
Bachelor's Degree/ Graduate Diploma/ Graduate Certificate	2,245	5,600	2,800	1,135	11,780
Advanced Diploma/ SKM Level 5	198	1,483	99	-	1,779
Diploma/ SKM Level 4	20,115	9,497	736	35	30,383
SKM Level 3	2,962	176	-	-	3,138
SKM Level 1 & 2	471	209	-	-	680
STPM and below	60,605	14,098	324	32	75,059

Note: Illustration sourced from Frost & Sullivan

Critical occupation vacancies education level distributed by industries

With reference to Table 21, Vacancies for SKM level 2 and below education are largely from the manufacturing industry. Vacancies with demand for SKM level 4 and 3 are predominantly from the wholesale and retail trade related economic activities. Majority demand for SKM level 5 education vacancies is in the human health and social work activities predominantly for nursing roles. Bachelor's degree and above education level vacancies are predominantly in economic activities in the information and communication, human health and social workers, and education.

Table 21: Critical occupation vacancies level of education distributed by industries, 2021 - 2022

2021 number of vacancies	PhD and equivalent	Master's Degree and equivalent	Bachelor's Degree and equivalent	Advanced Diploma/ SKM Level 5	Diploma/ SKM Level 4	SKM Level 3	SKM Level 1 & 2	STPM and below
Overall	100%	100%	100%	100%	100%	100%	100%	100%
A - Agriculture, forestry and fishing	0%	0%	0%	0%	0%	0%	19%	13%
B - Mining and quarrying	0%	9%	0%	0%	0%	0%	0%	0%
C - Manufacturing	0%	9%	13%	11%	8%	16%	46%	41%
D - Electricity, gas, steam and air conditioning supply	0%	0%	3%	6%	0%	7%	23%	0%
E - Water supply; sewerage, waste management and remediation activities	0%	0%	0%	0%	2%	0%	0%	0%
F - Construction	0%	18%	6%	3%	5%	19%	0%	6%
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	0%	0%	7%	6%	44%	57%	0%	22%
H - Transportation and storage	0%	9%	2%	0%	3%	0%	0%	3%
I - Accommodation and food service activities	0%	9%	3%	0%	5%	0%	0%	9%
J - Information and communication	0%	0%	43%	0%	1%	0%	0%	0%
K - Financial and insurance/takaful activities	0%	0%	6%	0%	1%	0%	0%	0%
L - Real estate activities	0%	0%	1%	0%	6%	0%	0%	1%
M - Professional, scientific and technical activities	0%	0%	5%	3%	1%	0%	0%	0%
N - Administrative and support service activities	0%	0%	0%	0%	1%	1%	12%	0%
P - Education	100%	18%	2%	0%	0%	0%	0%	0%
Q - Human health and social work activities	0%	27%	3%	56%	21%	0%	0%	0%
R - Arts, entertainment and recreation	0%	0%	0%	0%	1%	0%	0%	0%
S - Other service activities	0%	0%	6%	17%	1%	0%	0%	4%

2022 number of vacancies	PhD and equivalent	Master's Degree and equivalent	Bachelor's Degree and equivalent	Advanced Diploma/ SKM Level 5	Diploma/ SKM Level 4	SKM Level 3	SKM Level 1 & 2	STPM and below
Overall	100%	100%	100%	100%	100%	100%	100%	100%
A - Agriculture, forestry and fishing	0%	0%	0%	0%	0%	0%	19%	13%
B - Mining and quarrying	0%	9%	0%	0%	0%	0%	0%	0%
C - Manufacturing	0%	9%	13%	11%	8%	16%	46%	41%
D - Electricity, gas, steam and air conditioning supply	0%	0%	3%	6%	0%	7%	23%	0%
E - Water supply; sewerage, waste management and remediation activities	0%	0%	0%	0%	2%	0%	0%	0%
F - Construction	0%	18%	6%	3%	5%	19%	0%	6%
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	0%	0%	7%	6%	44%	57%	0%	22%
H - Transportation and storage	0%	9%	2%	0%	3%	0%	0%	3%
I - Accommodation and food service activities	0%	9%	3%	0%	5%	0%	0%	9%
J - Information and communication	0%	0%	43%	0%	1%	0%	0%	0%
K - Financial and insurance/takaful activities	0%	0%	6%	0%	1%	0%	0%	0%
L - Real estate activities	0%	0%	1%	0%	6%	0%	0%	1%
M - Professional, scientific and technical activities	0%	0%	5%	3%	1%	0%	0%	0%
N - Administrative and support service activities	0%	0%	0%	0%	1%	1%	12%	0%
P - Education	100%	18%	2%	0%	0%	0%	0%	0%
Q - Human health and social work activities	0%	27%	3%	56%	21%	0%	0%	0%
R - Arts, entertainment and recreation	0%	0%	0%	0%	1%	0%	0%	0%
S - Other service activities	0%	0%	6%	17%	1%	0%	0%	4%

Note: Illustration sourced from Frost & Sullivan

Mapping of supply to demand

Supply and demand estimates indicate no shortages at an aggregated level across different categories of qualifications. Mapping of supply to demand grouped by industries and level of education indicates potential shortages in 9 out of 18 industries as illustrated in Table 22. The mapping of supply to demand is based on historical tracer study data that provides for the closest to reality depiction of the like preferences of graduates. Various factors influence the supply and demand mismatch including perception of certain industries as being 3D (Dirty, Dangerous, and Difficult), awareness, and trending preferences.

Table 22: Supply versus demand for < 2 years of experience by level of qualification and industries

2021 Critical occupation demand vs supply	PhD and equivalent	Master's Degree and equivalent	Bachelor's Degree and equivalent	Advanced Diploma/ SKM Level 5	Diploma/ SKM Level 4	SKM Level 3	SKM Level 1 & 2	STPM and below	Shortage
Overall supply vs demand									
Supply	2,649	11,784	71,287	1,191	55,255	19,785	21,685	162,246	Sufficient
Demand	-	89	3,981	179	25,675	4,518	805	83,645	
Supply minus demand									
A - Agriculture, forestry and fishing	34	170	1,026	8	1,096	475	297	- 9,701	Shortage
B - Mining and quarrying	3	2	162	2	147	47	51	381	Sufficient
C - Manufacturing	52	641	4,227	- 107	3,008	1,894	2,372	- 20,997	Shortage
D - Electricity, gas, steam and air conditioning supply	8	149	661	- 74	1,502	1,360	1,615	13,686	Shortage
E - Water supply; sewerage, waste management and remediation activities	4	50	270	3	- 446	119	130	930	Shortage
F - Construction	31	413	3,898	29	2,535	427	1,448	4,933	
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	5	115	1,324	- 52	- 13,353	- 518	2,423	- 4,193	Shortage
H - Transportation and storage	7	93	1,223	22	713	654	716	2,139	Sufficient
I - Accommodation and food service activities	7	48	1,820	33	2,694	2,804	3,073	13,871	Sufficient
J - Information and communication	52	541	- 3,676	143	3,112	1,288	1,412	10,566	Shortage
K - Financial and insurance/takaful activities	22	564	4,466	102	2,123	332	364	2,676	Sufficient
L - Real estate activities	11	135	875	10	- 1,766	168	184	347	Shortage
M - Professional, scientific and technical activities	395	1,611	7,107	228	2,775	768	842	6,165	Sufficient
N - Administrative and support service activities	34	426	3,291	59	2,164	489	451	4,067	Sufficient
P - Education	1,701	5,243	13,065	83	3,836	444	487	3,194	Sufficient
Q - Human health and social work activities	43	334	2,177	- 828	- 4,516	443	486	3,454	Shortage
R - Arts, entertainment and recreation	7	75	1,450	36	1,530	475	521	3,897	Sufficient
S - Other service activities	55	682	7,032	- 116	9,320	3,330	3,649	23,235	Shortage

2022 Critical occupation demand vs supply	PhD and equivalent	Master's Degree and equivalent	Bachelor's Degree and equivalent	Advanced Diploma/ SKM Level 5	Diploma/ SKM Level 4	SKM Level 3	SKM Level 1 & 2	STPM and below	Shortage
Overall supply vs demand									
Supply	2,557	12,512	65,077	434	52,991	35,244	14,723	162,980	Sufficient
Demand	-	91	2,245	198	20,115	2,962	471	60,605	
Supply minus demand									
A - Agriculture, forestry and fishing	33	180	968	3	1,059	846	223	- 5,938	Shortage
B - Mining and quarrying	3	4	179	1	141	83	35	383	Sufficient
C - Manufacturing	50	683	4,795	- 171	3,458	4,229	1,661	- 9,120	Shortage
D - Electricity, gas, steam and air conditioning supply	7	158	790	- 93	1,472	2,826	1,122	13,861	Shortage
E - Water supply; sewerage, waste management and remediation activities	4	53	262	1	- 294	212	88	947	Shortage
F - Construction	29	443	4,027	- 23	2,746	1,767	983	6,608	Shortage
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	5	122	1,709	- 85	- 9,814	2,149	1,645	2,037	Shortage
H - Transportation and storage	7	100	1,241	8	872	1,164	486	3,050	Sufficient
I - Accommodation and food service activities	6	53	1,896	12	2,906	4,995	2,087	16,488	Sufficient
J - Information and communication	50	575	- 250	52	3,024	2,295	959	10,614	Shortage
K - Financial and insurance/takaful activities	21	599	4,483	37	2,106	591	247	2,701	Sufficient
L - Real estate activities	10	144	846	4	- 1,254	299	125	637	Shortage
M - Professional, scientific and technical activities	382	1,710	6,862	50	2,732	1,368	572	6,231	Sufficient
N - Administrative and support service activities	33	453	3,036	21	2,138	922	319	4,173	Sufficient
P - Education	1,635	5,570	12,067	30	3,702	791	330	3,334	Sufficient
Q - Human health and social work activities	41	361	2,175	- 964	- 2,926	789	330	3,520	Shortage
R - Arts, entertainment and recreation	7	80	1,323	13	1,507	846	354	3,914	Sufficient
S - Other service activities	53	724	6,887	- 241	9,032	5,931	2,478	24,479	Shortage

Note: Illustration sourced from Frost & Sullivan

RECOMMENDATIONS

Recommendations outlined below addresses the study requirements of enhancing utility of the COL in fulfilling the near- and long-term skills requirements of businesses operating in Malaysia. The findings were developed based on consultations with members of the industry through the bottom-up evidence gathering process.

Framework

COL is an integral part of the human capital development ecosystem in Malaysia and multiple factors in addition to the list influences the supply of talents; therefore, recommendations were developed taking a broad view of the human capital development ecosystem. The list aims to facilitate the process of addressing near and long-term skills requirements of businesses operating in Malaysia. Focus is given towards addressing areas of improvement in process, coordination, and information. Recommendations are grouped into six action areas as illustrated in Figure 11.

Figure 11: Recommendations framework
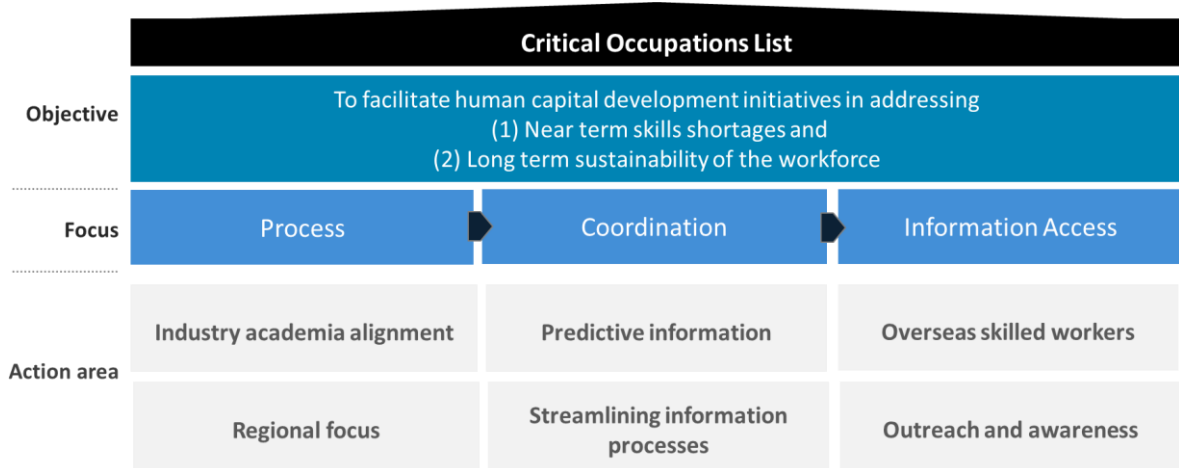
Note: Illustration sourced from Frost & Sullivan

Detailed recommendations

Within the six action areas a total of 12 recommendations were developed as illustrated in Figure 12 and outlined in further detail in the sub-sections that follow.

Figure 12: Recommendations by action areas

1.1 Introduction of minor specialisation in education syllabus with focus on industry relevant subjects	**1** Industry alignment
1.2 Critical occupations list driven industry academia engagements	
2.1 Workforce demand study every 3-years at job title level	**2** Predictive information
2.2 Establish a unified future skills list to draw a distinction between shortage and strategic focus	
3.1 Develop a skills short supply list updated every 6 months or shorten the COL process	**3** Overseas skilled workers
3.2 FastTrack visa for skills in short supply	
4 Regional focus	4.1 Regionally focused education projects
	4.2 Establish regional critical occupations working group
5 Information processes	5.1 Adoption of MSIC classification across education statistical data collection process
	5.2 Integration of human capital information databases
6 Outreach and awareness	6.1 Awareness initiative for sectors that are perceived to be unfavorable
	6.2 Integrated and interactive online occupational information portal

Note: Illustration sourced from Frost & Sullivan

1.1 Introduction of minor specialisation in education syllabus focused on industry relevant subjects

Overview

Misalignment of fresh graduate skills to industry requirements is often highlighted as a key human capital challenge. The misalignment in skills is further expressed in the evidence of the *call-for-evidence* survey where the second highest factor contributing to occupations being hard to fill is the *lack of required credentials or certification*. Among other skills related challenges include the *lack of required technical or occupational skills.*

From a supply perspective, the focus of tertiary and vocational programmes is the development of *foundation skills* of the respective study disciplines. In addition, educational courses are designed in a manner that allows for students to have foundational skills suitable for as broad a career option as possible and thus would lack focus in specific industries. In addition, limitations of credit hours within the current education system does not allow for a syllabus to have strong focus on a specific industry's requirement.

The introduction of minor specialisation in education courses guided by industry needs is seen as a strategy to develop graduates with better industry readiness. For instance, if the current industry requirements are for a pharmacist to have skills in commercial aspects of a business, the introduction of minor in *business administration* may be considered.

Implementation

A targeted approach is proposed for this recommendation where the introduction of minor specialisation in education programmes is guided by the skills requirements of the COL. The facilitation process may be led by TalentCorp involving the Ministry of Higher Education, industry representatives, and a select number of education institutions of choosing by the industry.

Potential Stakeholders

TalentCorp, Ministry of Higher Education, Ministry of Human Resources, Ministry of Youth and Sports, Industry Associations, and Education Advisory Panels.

Output
Minor specialisation introduced in education courses that relates to the requirements of job titles that fall within the COL.

Outcome
Reduction in number of job titles under within the COL.

1.2 Critical occupations list driven industry academia engagements

Overview
Industry advisory panel is a group comprised of members of the industry and skills development experts that partake in the process of contributing inputs to the development and update of education syllabus. The initiative is typically initiated as part of the curriculum development process where every institution would establish the panel in collaboration with members of the industry. The level of participation and quality of industry representation vary across panels.

Implementation
Due to the decentralised nature of *advisory panels,* initiatives to improve the level of industry and academia alignment need to be done on a targeted basis. The most effective advisory panels are comprised of representatives from industry associations, prominent business leaders and human capital specialist from the industry. The proposed recommendations involve targeted facilitation of engagements between education institutions hand-picked by the industry and comprehensive representation from prominent members of the industry. The engagements will be focused on improving key aspects of the education syllabus specifically for critical occupations where there is insufficient supply or demonstrate skills misalignment.

Potential Stakeholders
TalentCorp, Ministry of Higher Education, Ministry of Human Resources, Industry Associations, and Education Advisory Panels.

Output
Updated syllabus resulting from the engagements carried out as part of this recommendation.

Outcome
Reduction in number of job titles under within the COL.

2.1 Workforce demand study every 3-years at job title level

<u>Overview</u>

The lack of national level predictive data sets on employment demand has led to a situation where supply fluctuates from having oversupply to shortages. Due to the lack of reliable predictive information, education providers have relied on in house research and anecdotal information on demand. This has led to a situation of recurring mismatch in demand and supply, for instance the nursing field had faced shortages around in 2012 and in 2019 the situation had turned around where there was a situation of shortages. (Eduspiral, 2021) (Teh, 2019)

The need for predictive information to plan for supply had been outlined by the supply side in past *human capital scans* engagements. This is to enable the education providers to better react to occupations that have been identified as having shortages in the COL; for instance, if a job title such as *rubber technologist* is identified it is imperative to establish the demand to avoid a situation where significant oversupply is created.

Through this engagement, it is noted that the economic planning unit is in the process of developing a demand projection data set. Demand projections were also developed as part of the 2021 COL with a 1-year demand outlook. At this juncture, the research suggests that demand projections at job title level updated on a regular intervals, and made available to the public in particular to education providers will be beneficial to reduce the demand and supply mismatch in the long term.

<u>Implementation</u>

To conduct a regular survey in 3-year intervals with the purpose of projecting demand for occupations in detail over a 10-year period. The projected demand will be updated every 3-years to reflect current trends in employment. The occupational demand projection information shall be made available to education providers and members of the industry.

The sampling and research methods shall be modelled upon established methods such as a similar initiative in the United States where a demand projection is conducted as part of its *Occupational Employment Statistics* (OES) programme of the *US Bureau of Labour Statistics* (BLS). The information based on the case study of *O*NET* – an online database of occupational information of the United States – is published at 6-digit job title level as illustrated in Figure 13.

Figure 13: Job title level demand projections – case study of the O*NET statistics from the OES programme
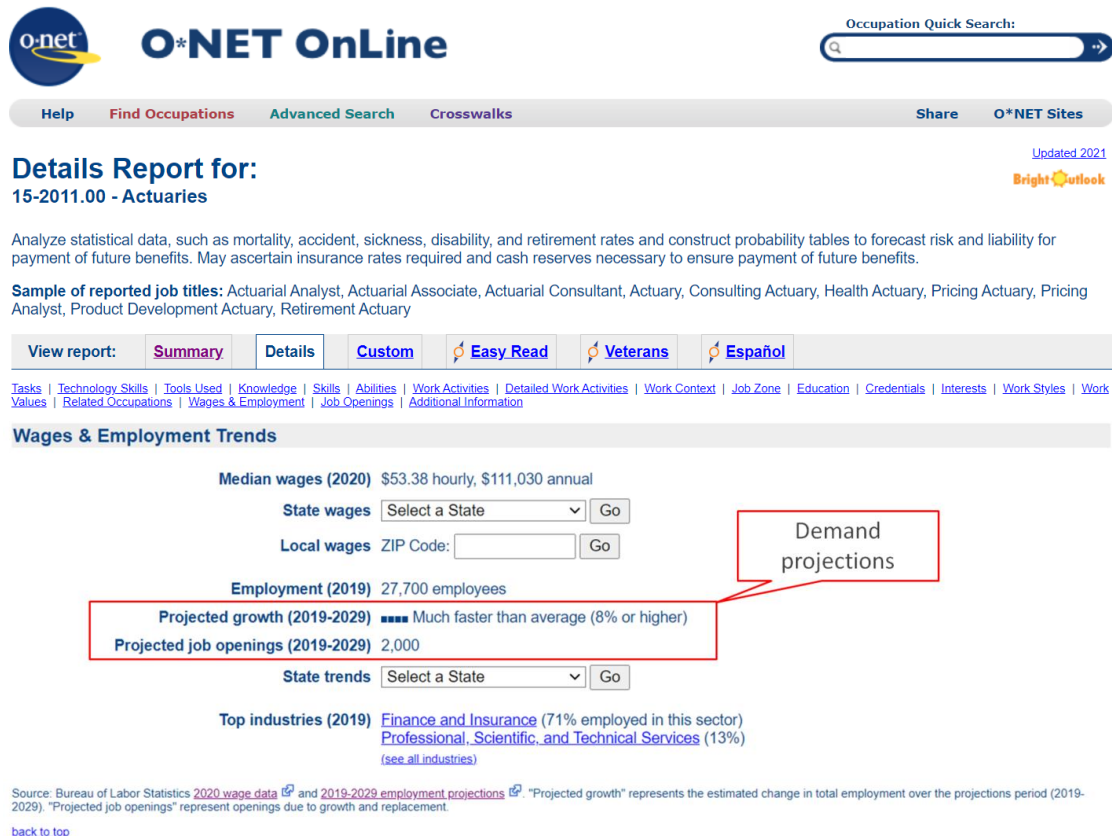
Note: Illustration adapted from https://www.onetonline.org/help/online/ and edited by Frost & Sullivan

The implementation of this survey should take into consideration where possible harmonization and integration with other manpower studies carried out on a regular basis to reduce redundancies and survey fatigue among respondents.

Potential Stakeholders
Department of Statistics, TalentCorp, Ministry of Human Resources, , Economic Planning Unit.

Output
Detailed demand projections at a 6-digit job title level updated on a 3-year interval with outlook over a 10-year horizon.

Outcome
Reduction in demand and supply mismatch of qualifications and a reduction in the number of critical occupations.

2.2 Establish a unified future skills list to draw a distinction between shortage and strategic focus

Overview
Two categories of human capital requirements have emerged as part of the engagements of this study. The first category reflects job titles that are at present considered to be hard-to-fill while the second category are job titles with skills that are considered to be strategic for the medium-to-long term development of the industry. Hard-to-fill job titles are required immediately by companies while job titles with strategic skills are those required for the industry to expand in the medium-to-long term for instance.

Within the present structure of the *critical occupations*, job titles are qualified based on three criteria that include hard-to-fill, strategic importance, and skilled. There exists a gap in the identification of medium to long term skills requirements; there are limited instances where medium to long term skills are mapped out in the form of *industry skills framework and environmental scans*.

The creation of a medium to long term skills list enables education providers to plan for the medium to long term skills requirements as a new course will take around 2 to 3 years before the first batch graduates are available. In addition, the separation by time horizon allows for a more targeted approach in the provision of work visas where near term shortages may be treated differently from longer term requirements.

A breakdown of skills requirements by time horizon is observed in the Australian case study where visa qualification criteria is guided by *short-term skilled occupation list,* and *medium and long-term strategic skills list*.

Implementation
Establish a separate list that defines the *medium and long-term strategic skills* requirements based on an integration of data sets captured as part of the *industry skills frameworks* and *human capital scan studies* developed to date. This separate categorisation is to be taken into consideration in the development of the Labour Market Information Analytics Platform (LMIAP) proposed under the 12th Malaysia plan. LMIAP is a platform that integrates traditional labour market data with emerging types of data into a single platform. LMIAP has analytics capabilities and is aimed at aiding policy making processes.

The COL in its current form shall represent the short-term skills requirement and complement the proposed *medium and long-term strategic skills* list that is to be based upon current and future industry skills frameworks.

Potential Stakeholders
TalentCorp, Department of Skills Development, and Policy Division (MASCO) of Ministry of Human Resources, Human Resource Development Corporation, Department of Statistics, Economic Planning Unit.

Medium to long term skills list that are strategic to the development of businesses in Malaysia.

Outcome
Increase in the supply of future skills by 3 to 5 years' time.

3.1 Develop a skills short supply list updated every 6 months or shorten the COL process

Overview
A key application of the COL is in the qualification of job titles that are entitled for employment passes. This applies to the hiring of foreign skilled workforce or expatriates. In principle, the COL outlines job titles that are already considered to be facing shortages and should be qualifying criteria for employment passes. However, the current process of applying for work visas requires jobs to be advertised on the MYFutureJobs portal and if the vacancy cannot be filled within 30 days, companies may proceed to the next stage of employment passes.

This creates redundancy in the qualifying process of visa applications as one of the main functions of the COL is to support the employment pass qualification process. The key limitation of applying the COL in substituting the MYFutureJobs advertisement process is the *timeliness* of the information. The time taken for the COL study in its current form to complete is around 8 months and before a new list is made available the data may be as old as 12 months. Given the fast-changing trends in the business environment, the information is considered to be too old to determine the employment pass qualification as shortages may have already been addressed over the period of one year.

As such, the time taken to develop a national skills shortage list needs to be reduced. Based on the examples of good practices in Australia, the skills shortage list similar to the Malaysian COL is updated on a bi-annual basis with simplified research processes.

Implementation
Enhance the critical skills shortage list process where it is updated on a bi-annual basis through a survey of job advertisers. The survey may be integrated as part of the current critical occupations process or replace the current approach.

The simplified research process may be based upon best practices adopted in Australia where the skills shortage list is updated based on the *survey of employers who recently advertised* (SERA) method. The survey captures inputs from employers that have advertised vacancies in the past six months and further validates the occupation shortages by identifying jobs that remain vacant after four to six weeks. The information is further validated with other pre-existing data sets of skills shortages. (OECD, 2021) The SERA method survey may be administered through MYFutureJobs or done in collaboration with established private sector job recruitment portals that enables a wider and more presentative coverage of the job market.

<u>Potential Stakeholders</u>
Social Security Organisation (SOCSO), TalentCorp, and Ministry of Human Resources.

Approving agencies (Ministry of Home Affairs, Malaysian Investment Development Authority, Multimedia Development Corporation, Public Service Department, Central Bank of Malaysia, Securities Commission Malaysia, Malaysia Global Innovation & Creativity Centre, and East Coast Economic Region Development Council).

<u>Output</u>
Improved *timeliness* of information of skills shortages in Malaysia (bi-annual update).

<u>Outcome</u>
Reduction in redundancies in employment passes approval process and improvements in the utility of the *critical occupations list.*

3.2 Fast Track for visa for skills in short supply

<u>Overview</u>
As outlined in *recommendation 3.1*, the *critical occupations list* is not used as primary qualifying criteria in the process of approving employment passes. A pre-requisite of having advertised vacancies on MYFutureJobs portal and not filled vacancies in 30 days is applied for work visas. Lack of *timeliness* of information from the *critical occupations list* is among one of the limitations for utilising the list in the qualifying criteria of work visas where – COL list takes about 8 months to develop. As such, the use of the *critical occupations list* for automatic exemption channel is contingent upon improvements to the process of identifying occupation shortages such that the information is more up to date and conducted on a bi-annual basis.

The present process is viewed by members of the business community as a redundancy and added administrative burden as the COL should represent job titles that are difficult to fill with domestic supply.

<u>Implementation</u>
Having fulfilled the implementation of recommendation 3.1, job titles that fall within the COL would be considered to be an up-to-date representation of the shortages in supply domestically. The proposed recommendation would be to provide for automatic exemptions for job titles that fall within the COL of jobs that are in short supply as illustrated in Figure 14.

Figure 14: Automatic exemption for job titles under the critical occupations list
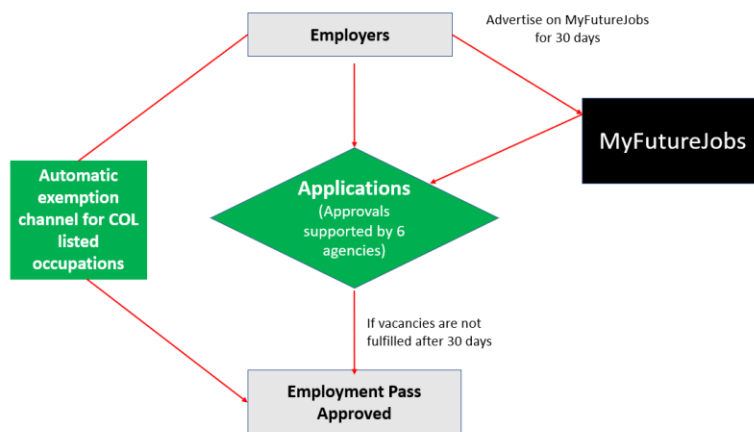
Note: Illustration sourced from Frost & Sullivan

Potential Stakeholders
Social Security Organisation (SOCSO), TalentCorp, Ministry of Human Resources.

Approving agencies (Ministry of Home Affairs, Malaysian Investment Development Authority, Multimedia Development Corporation, Public Service Department, Central Bank of Malaysia, Securities Commission Malaysia, Malaysia Global Innovation & Creativity Centre, and East Coast Economic Region Development Council).

Output
Automatic exemption for job titles that fall within the COL.

Outcome
Reduction in recruitment related cost of doing business and time taken to fill vacancies in critical occupations.

4.1 Regionally focus education projects

Overview
Critical occupations across the country vary due to differences in the composition of economic activities. As illustrated in the *regional analysis* section of this report, the highest proportion of vacancies in critical occupations originate from the central region comprised of Selangor, Kuala Lumpur, and Putrajaya. The central region accounts for the majority of services based critical occupations.

Vacancies in critical occupations of the southern region that is comprised of Johor, Melaka, and Negeri Sembilan are concentrated in the wholesale and retail sector and shortages are predominant in professionals' job category.

East Malaysia accounts for the largest proportion of vacancies in mining and quarrying and administrative and support economic activities when compared across regions. Shortages in safety officers, department of environment competent persons, instrument engineers, and chemical engineers are pressing concerns among manufacturing companies in the region.

East coast region comprising of Kelantan, Terengganu, and Pahang have critical occupation vacancies that are concentrated in the wholesale and retail sector and the majority of shortages are in services and sales workers categories. The region faces difficulties in filling vacancies in managerial position.

Northern region states that are comprised of Penang, Perak, Kedah, and Perlis reportedly have higher vacancies in the water supply, sewerage, waste management and remediation activities sector when compared across regions. Within the region, vacancies are predominantly in the wholesale and retail and manufacturing sector. The shift towards Gallium Nitride technology in semiconductor manufacturing is expected to require skills training.

The points above illustrate the vast differences in *critical occupations* across regions where a one size fits all initiative would be ineffective in addressing the diverse set of human capital challenges. With a total of 3,875 education and training institutions as illustrated in Table 23, coordinating training and development requirements to address critical occupations is administratively challenging. A more targeted approach is proposed to address the *critical occupations* needs of businesses across the country.

Initiatives that facilitate the industry-academia collaboration at a regional level based on COL will enable better alignment of skills.

Table 23: List of education and training institutions in Malaysia

Category of institutions	Type of institutions	Number
Public institution	Universities	69
	Polytechnic	36
	College/Institution	261
	Industrial Training Institute	23
	Advanced Technology Training Centre	8
Private institution	University	83
	University College	45
	College/Institution	396
Department of skills development	Accredited training centres	1,241
	Sub total	**3,875**

Note: Data adapted from https://www2.mqa.gov.my/mqr/english/eperutusan.cfm &
https://www.myspike.my/index.php?r=umum-pb%2Findex-umum

Implementation
The proposed recommendation may leverage on existing initiatives under TalentCorp for instance the *industry-academia collaboration* which focuses in facilitating joint efforts in curriculum development, training, internships, and competitions. The expanded role of the initiative will require a region-specific focus by bringing together industry associations, prominent business leaders, education and training providers, and government stakeholders in conversation to close the gap of *critical occupations.* The five regions shall have dedicated efforts based on the specific skills shortages of the location.

Potential stakeholders
TalentCorp, Ministry of Education, Ministry of Higher Education, Ministry of Human Resources, Human Resource Development Corporation, Ministry of Youth and Sports, and key business associations of the five regions (northern region, central region, southern region, east coast, and East Malaysia).

Output
Curriculum changes and increase in industry-academia engagements related to vacancies in the COL.

Outcome
Reduction in the number of *critical occupations* nominated.

4.2 Establish a regional critical occupations working group

Overview
Regional variation in *critical occupations* is underpinned by the differences in the economic focus and business environment of the various states in Malaysia. As such, initiatives that drive development of future talents and addressing near term skills shortages requires a structure that provides for a focus on continuous engagement, information capture and facilitation at a regional level. This enables more effective implementation and monitoring of performance of initiatives related to closing the gap in critical occupations.

Implementation
The proposed regional working group will implement regional rollout of services and initiatives targeted at closing the gap of the *critical occupations*. In particular the working group will focus on facilitating *continuous* engagement – quarterly basis - among prominent business associations, education and training providers, and other stakeholders. The focus of the engagements is to capture information on *critical occupations*, facilitate buy-in for initiatives that would address *critical occupations*, and enhance access to TalentCorp's services of returning Malaysians and expatriate services.

The working group will play a role in working with the industry to identify select number of local education and training providers that are best positioned and willing to collaborate with the industry in addressing gaps in curriculum and internship.

Potential stakeholders
TalentCorp, Regional focused Industry Association, and Education and training providers.

Output
Increase in industry and academia conversations and collaboration in curriculum and internship.

Outcome
Reduction in the number of critical occupations nominated.

5.1 Adoption of MSIC classification across education statistical data collection process

Overview
Mapping of supply side data sets to industry categorisation facilitates integration of demand and supply data. Findings from this study indicates that supply shortages does not stem from insufficient number of graduates in total but from a shortage of human resources entering certain industries for instance the *wholesale and retail sector*, *manufacturing*, and *agriculture*. The integration of Malaysian Standard Industrial Classification into supply side data sets would facilitate better demand and supply data analysis.

Implementation
Integration of MSIC data classification into education supply side data sets (e.g., intake, enrolment, and output) guided by the education course to industry mapping from the tracer study data. The mapping of supply data sets from tertiary education and technical and vocational training using MSIC classifications assist in improving the mapping of supply to demand by industry.

Potential stakeholders
Ministry of Higher Education, Department of Skills Development, Ministry of Human Resources, and TalentCorp.

Output
Mapping of supply side data set to prospective industries based-on historical tracer survey data.

Outcome
Data set that facilitates demand and supply trend analysis.

5.2 Integration of human capital information databases

Overview
The present body of knowledge and information on occupations resides within separate sets of static reports and documents. These includes various human capital scans studies, skills development framework, COL, demand and supply projections, and the Malaysian standard classification of occupations (MASCO). Learnings from international examples such as the O*Net system in the United States which provides for a one stop digital portal for all occupational related information enables stakeholders from the supply side, demand side, and job seekers to have a holistic picture of the occupation landscape.

Implementation
The proposed labour market information analytics platform (LMIAP) under the 12th Malaysia plan is similar to this recommendation where it aims to integrate all labour market related information. The LMIAP functionalities include the provision of analytics to assist in data driven policy making. Building on this platform, labour market information such as national occupational skills standard, industry skills framework, Malaysian standards classification of occupations, COL occupation demand projection proposed as part of this study, and strategic skills list proposed as part of this study shall be included. In addition, the integration of human capital information databases will facilitate the implementation of

recommendation 6.2 which provides for a seamless web-based interfaces that enables policy makers, businesses, job seekers, and education institutions to have ease of access and utilise labour market information. With reference to Figure 15.

Figure 15: Integrated information structure
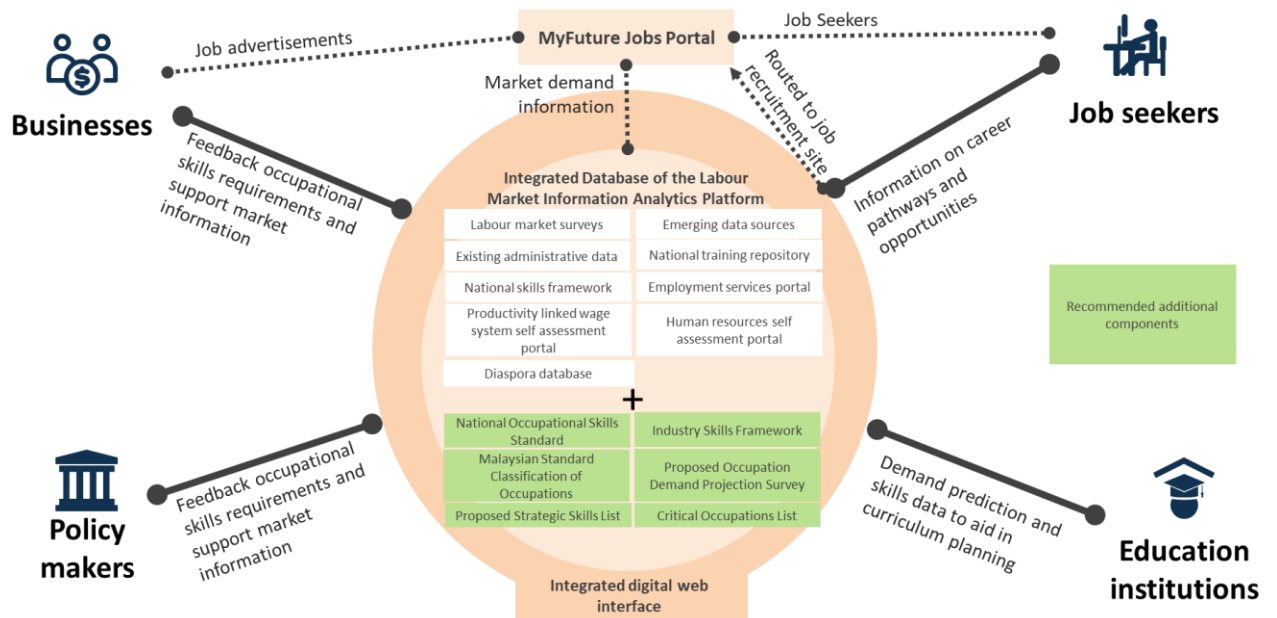
Potential stakeholders
TalentCorp, Department of Statistics, Ministry of Human Resources, Economic Planning Unit

Output
Integrated database of occupation information (skills frameworks, environmental scan, demand projections, COL, MASCO)

Outcome
Seamless access to occupation information and data analytics readiness

6.1 Awareness initiatives for sectors that are perceived to be unfavourable

Overview
Human capital shortages that persist in certain economic sectors for instance manufacturing and construction is driven by among many factors the poor perception among the local talent pool where the industry is perceived to be dirty, dangerous, and difficult. There are exceptions to the working environment for instance in certain industries such as the manufacture of medical instruments, plastics, and speciality chemicals. The work environments in these instances are clean and require semi skill to high skills.

Initiatives to create awareness of favourable work environments in these economic sectors are beneficial to encourage more graduates to consider industries such as manufacturing or construction as a career option.

Implementation
Collaborate with industry associations to create awareness of the availability of factories and working environments that are clean and industry 4.0 ready among undergraduate students. The awareness initiative would include highlighting the career opportunities of semi to skilled jobs in the manufacturing sector.

Potential stakeholders
Ministry of Human Resources, TalentCorp, Ministry of Higher Education, and Industry Associations

Output
Factory visits, career awareness roadshows

Outcome
Increase in graduates joining industries that are traditionally perceived to be dirty, dangerous, and difficult.

6.2 Integrated and interactive online occupational information portal

Overview
Open access to information and analytics on occupations enhances the decision-making process of education and training institutions, job seekers, and policy makers. Example of the O*Net portal adopted in the United States integrates information on occupational skills, abilities, demand projections, and job openings in a seamless and integrated online portal. The online platform allows for feedback inputs ensuring that the definition of skills is up to date as per the requirements of the industry. The following figures illustrate the information available on the O*Net portal.

Figure 16: Skillsets

Note: Illustration adapted from O-Net platform

Figure 17: Projected demand

Note: Illustration adapted from O*Net platform

Figure 18: Feedback form

Note: Illustration adapted from O*Net platform

Figure 19: Linkages to job recruitment portals

Note: Illustration adapted from O*Net platform

Implementation

The proposed recommendation involves the development a web-based platform that combines all aspects of occupation information including linkages to external job recruitment portal. The web-based platform shall provide for a seamless browsing experience across all aspects of occupational information as illustrated in Figure .

Figure 20: One stop occupation information portal
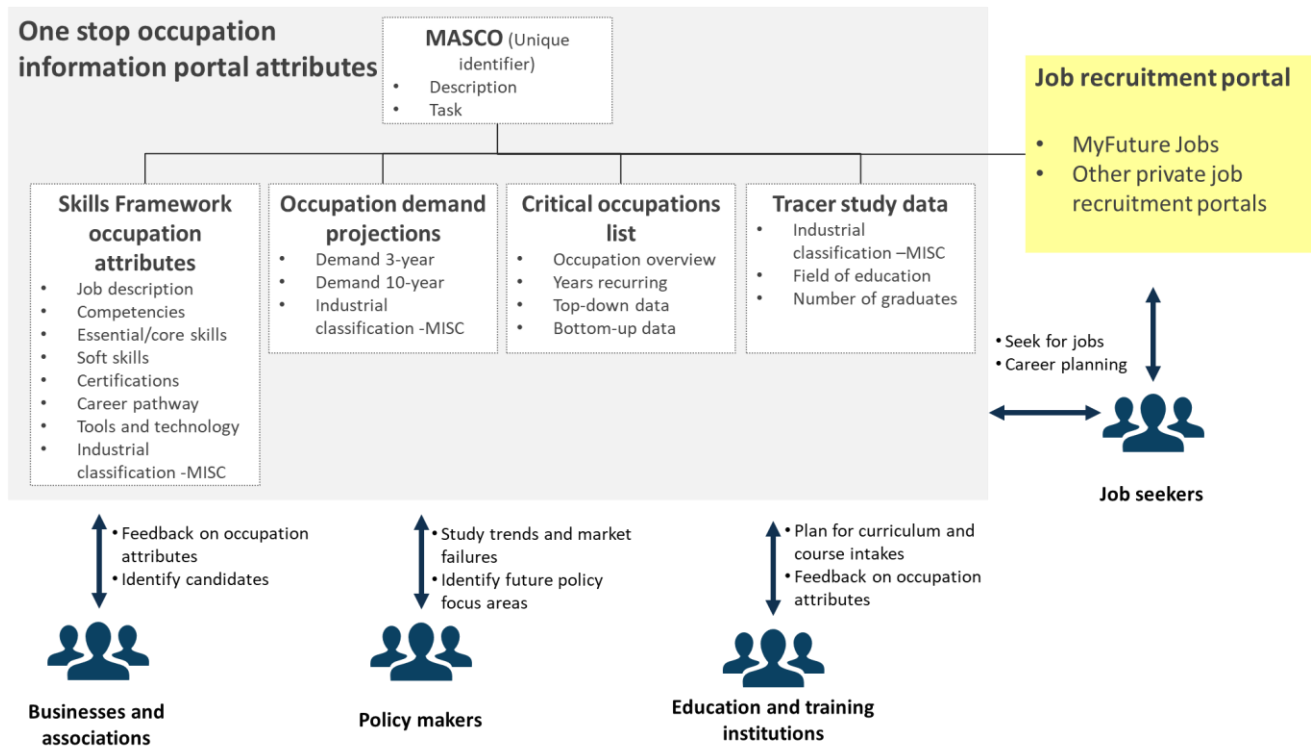
Potential stakeholders
Ministry of Human Resource, TalentCorp, Department of Skills Development, Human Resource Development Corporation, Social Security Organisation (SOCSO), Ministry of Higher Education, Department of Statistics, and Institute of Labour Market Information and Analysis.

Output
Integrated online job information portal

Outcome
Greater ease of access to occupation information and an overall reduction in the mismatch of supply and demand.

Additional observations that require further research in the future

Increasing recognition of Sijil Kemahiran Malaysia certificates holder within the demand market, for semi-skilled workforce categories

Statistics on vacancies captured through the CfE survey have revealed a disproportionately large share of demand for STPM and below qualified workforce in sectors such as agriculture, manufacturing, and accommodation services. Demand for STPM and below workforce represent 98%, 86%, and 78% of the vacancies in these sectors respectively. The general perspective in regards to the disproportionately large share of demand for unskilled workforce is that a large proportion of workforce catering to semi-skilled work requirements is fulfilled by personnel with education qualifications of STPM and below. The workforce in

these categories is perceived to have the skills competencies higher than their qualifications. Shortages in supply have led to members of the industry hiring those with lower qualification levels and providing training for the job. Further research is required in the future to establish quantitative evidence of the above view and examine effective policies of encouraging greater certification of existing workforce within the semi-skilled category.

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APPENDIX 1: TOP-DOWN SHORTAGE OCCUPATIONS

MASCO Code	MASCO Job Title	Total indicators available	Number of indicators exceeding threshold	Percentage of indicators passing threshold
1112	Senior Government Officials	10	6	60%
1113	Traditional Chiefs And Heads Of Village	9	5	56%
1121	Managing Directors And Chief Executives	11	9	82%
1212	Human Resource Managers	10	5	50%
1222	Advertising And Public Relations Managers	6	4	67%
1411	Hotel Managers	9	5	56%
1511	Information And Communications Technology Managers	9	6	67%
1616	Financial And Insurance Services Branch Managers	9	5	56%
2113	Chemists	6	3	50%
2132	Farming, Forestry And Fisheries Advisers	10	5	50%
2141	Industrial And Production Engineers	11	7	64%
2145	Chemical Engineers	6	4	67%
2149	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified	11	6	55%
2179	Transport Controllers Not Elsewhere Classified	8	5	63%
2182	Manufacturing Professionals	9	5	56%
2221	Nursing Professionals	11	7	64%
2263	Environmental And Occupational Health And Hygiene Professionals	11	6	55%
2351	Music Teachers	8	5	63%
2361	Language Teachers	8	4	50%
2399	Teaching Professionals Not Elsewhere Classified	10	6	60%
2411	Accountants	11	6	55%
2426	Research And Development Professsionals	8	4	50%
2431	Advertising And Marketing Professionals	9	7	78%
2511	Systems Analysts	10	5	50%
2514	Applications Programmers	10	5	50%
2831	Authors And Related Writers	6	4	67%
2832	Journalists	9	6	67%
2842	Musicians, Singers And Composers	8	4	50%
3231	Traditional And Complementary Medicine Associate Professionals	8	4	50%
3256	Medical Assistants	10	5	50%
3315	Valuers And Loss Assessors	8	4	50%
3522	Telecommunications Engineering Technicians	9	5	56%

MASCO Code	MASCO Job Title	Total indicators available	Number of indicators exceeding threshold	Percentage of indicators passing threshold
3623	Fitness And Recreation Instructors And Program Leaders	8	5	63%
4224	Receptionists	11	6	55%
4225	Enquiry Clerks	10	5	50%
4322	Production Clerks	11	6	55%
5112	Transport Conductors	4	3	75%
5113	Travel Guides	9	5	56%
5312	Teachers Aides	10	5	50%
6113	Gardeners, Horticultural And Nursery Growers	10	8	80%
6122	Poultry Producers	6	3	50%
7121	Roofers	8	4	50%
7317	Handicraft Workers Of Wood, Basketry And Related Materials	8	4	50%
7511	Meat And Fish Process Workers And Related Food Preparers	10	5	50%
7512	Bakers, Pastry, Pasta And Confectionery Makers	11	7	64%
7621	Tailors, Dressmakers, Furriers And Hatters	10	7	70%
8122	Metal Finishing, Plating And Coating Machine Operators	4	2	50%
8321	Motorcycle Drivers	10	6	60%
8351	Ships Deck Crews And Related Workers	8	4	50%

APPENDIX 2: 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
Section E: Water Supply; Sewerage, Waste Management and Remediation Activities	22. Water collection, treatment and supply	36
	23. Sewerage	37
	24. Waste collection, treatment and disposal activities; materials recovery	38
	25. Remediation activities and other waste management services	39

Sector	Priority Sub-sectors	MSIC
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	44. Land transport and transport via pipelines	49
	45. Water transport	50

Sector	Priority Sub-sectors	MSIC
Storage	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 **Section M: Professional, Scientific and Technical Activities**	58. Food and beverage service activities	56
	59. Legal and accounting activities	69
	60. Architectural and engineering activities; technical testing and analysis	71
	61. Scientific research and development	72
	62. Advertising and market research	73
	63. Veterinary activities	75

APPENDIX 3: CALL-FOR-EVIDENCE (CFE) SURVEY QUESTIONNAIRE 2020

TalentCorp ATTRACT · NURTURE · RETAIN   **ilmia** Institute of Labour Market Information & Analysis   **F R O S T & S U L L I V A N**

Call for Evidence (CfE) – Survey 2021

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 Malaysian Government to 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 to 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, Frost & Sullivan has been appointed to assist in data collection.

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

No.	Officer	Designation	Contact No.	Email
	Officers' Contact Details			
1.	Nursyazwani binti Zulhaimi	Research, Development and Policy Unit, Talent Corporation Malaysia Berhad	017-2007 559	nursyazwani.zulhaimi@talentcorp.com.my
2.	Nurul Izzati Kamrulbahri		019-6116 917	izzati.kamrulbahri@talentcorp.com.my
3	Munira Balkis binti Mohd Bakri	Senior Assistant Director, ILMIA, Department of Statistics Malaysia	016-2389 753	munirabalkis@dosm.gov.my
4.	Sarawana Venkatis	Consultant, Frost & Sullivan	013-6765 156	sarawana.venkatis@frost.com
5.	Gan Poh Hwa		016-2182 511	pohhwa.gan@frost.com

Call for Evidence (CfE) – Survey 2021

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

CfE – Survey 2021

1 **2** **3** **4**

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 is to develo a Critical Occupations List (COL) which will serve as a platform for the coordination of human capital development policies in the country. The need for this survey is clearly stated in the 11th Malaysia Plan. The survey aims to collect data on critical occupations and also to identify skills imbalances across key industrial sectors in 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 to set criteria for skills migration.

IN THIS SURVEY FORM

This survey form consist of three sections:

(1) Company Background
(2) Critical Occupations
(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, and 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 1A: Company Background

A1. Respondent Name

A2. Titles

Title	Code (SA)
YBhg Tan Sri	1
Dato' Seri	2
Dato'	3
Datuk	4
Datin	5
Dr.	6
Mr.	7
Mrs.	8
Ms.	9
Others:_____	99

A3. Company Name

A4. Company SSM Registration No.

A5. Company Address

A6. State

State	Code (SA)
Johor	1
Kedah	2
Kelantan	3
Melaka	4
Negeri Sembilan	5
Pahang	6
Pulau Pinang	7
Perak	8
Perlis	9
Selangor	10
Terengganu	11
Sabah	12

Sarawak	13
W.P. Kuala Lumpur	14
W.P. Labuan	15
W.P. Putrajaya	16

A7. Office Telephone

A8. Mobile Telephone

A9. Email Address

Section 1B: Main Activity of the Company

B1. Which industrial sector <u>best describes</u> your company's business activities?

B2. Which industrial sub-sector, <u>best describes</u> your company's business activities?

B1. Industrial Sector	B2. Industrial Sub-sector	Code (SA)	Go To
Agriculture, forestry and fishing	Crops and animal production, hunting and related service activities	A01	B4
	Forestry and logging	A02	
	Fishing and aquaculture	A03	
Mining and quarrying	Mining of coal and lignite	B05	
	Extraction of crude petroleum and natural gas	B06	
	Mining of metal ores	B07	
	Other mining and quarrying	B08	
	Mining support service activities	B09	
Manufacturing	Manufacture of food products	C10	B3
	Manufacture of beverages	C11	
	Manufacture of tobacco products	C12	
	Manufacture of textiles	C13	
	Manufacture of wearing apparel	C14	
	Manufacture of leather and related products	C15	
	Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	C16	
	Manufacture of paper and paper products	C17	
	Printing and reproduction of recorded media	C18	
	Manufacture of coke and refined petroleum products	C19	
	Manufacture of chemicals and chemical products	C20	
	Manufacture of basic pharmaceutical products and pharmaceutical preparations	C21	
	Manufacture of rubber and plastics products	C22	
	Manufacture of other non-metallic mineral products	C23	
	Manufacture of basic metals	C24	

	Manufacture of fabricated metal products, except machinery and equipment	C25	
	Manufacture of computer, electronic and optical products	C26	
	Manufacture of electrical equipment	C27	
	Manufacture of machinery and equipment n.e.c.	C28	
	Manufacture of motor vehicles, trailers and semitrailers	C29	
	Manufacture of other transport equipment	C30	
	Manufacture of furniture	C31	
	Other manufacturing	C32	
	Repair and installation of machinery and equipment	C33	
Electricity, gas, steam and air conditioning supply	Electricity, gas, steam and air conditioning supply	D35	
Water supply; sewerage, waste management and remediation activities	Water collection, treatment and supply	E36	
	Sewerage	E37	
	Waste collection, treatment and disposal activities; materials recovery	E38	
	Remediation activities and other waste management services	E39	
Construction	Construction of buildings	F41	
	Civil engineering	F42	
	Specialized construction activities	F43	
Wholesale and retail trade; repair of motor vehicles and motorcycles	Wholesale and retail trade and repair of motor vehicles and motorcycles	G45	
	Wholesale trade, except of motor vehicles and motorcycles	G46	
	Retail trade, except of motor vehicles and motorcycles	G47	
Transportation and storage	Land transport and transport via pipelines	H49	
	Water transport	H50	
	Air transport	H51	B4
	Warehousing and support activities for transportation	H52	
	Postal and courier activities	H53	
Accommodation and food service activities	Accommodation	I55	
	Food and beverage service activities	I56	
Information and communication	Publishing activities	J58	
	Motion picture, video and television programme production, sound recording and music publishing activities	J59	
	Programming and broadcasting activities	J60	
	Telecommunications	J61	
	Computer programming, consultancy and related activities	J62	
	Information service activities	J63	
Financial and insurance/takaful activities	Financial service activities, except insurance/takaful and pension funding	K64	
	Insurance/takaful, reinsurance/retakaful and pension funding, except compulsory social security	K65	
	Activities auxiliary to financial service and insurance/ takaful activities	K66	
Real estate activities	Real estate activities	L68	
Professional, scientific	Legal and accounting activities	M69	

and technical activities	Activities of head offices; management consultancy activities	M70	
	Architectural and engineering activities; technical testing and analysis	M71	
	Scientific research and development	M72	
	Advertising and market research	M73	
	Other professional, scientific and technical activities	M74	
	Veterinary activities	M75	
Administrative and support service activities	Rental and leasing activities	N77	
	Employment activities	N78	
	Travel agency, tour operator, reservation service and related activities	N79	
	Security and investigation activities	N80	
	Services to buildings and landscape activities	N81	
	Office administrative, office support and other business support activities	N82	
Education	Education	P85	
Human health and social work activities	Human health activities	Q86	
	Residential care activities	Q87	
	Social work activities without accommodation	Q88	
Arts, entertainment and recreation	Creative, arts and entertainment	R90	
	Libraries, archives, museums and other cultural activities	R91	
	Gambling and betting activities	R92	
	Sports activities and amusement and recreation activities	R93	
Other service activities	Activities of membership organizations	S94	
	Repair of computers and personal and household goods	S95	
	Other personal service activities	S96	

B3. What is the size of your company?
<Note to programmer: Only for Code C10 to C33 in Question B2. >

Manufacturing Sector	Code (SA)	Go To
Micro *Sales turnover: < RM300,000* *OR* *No. of Full Time Employees: < 5*	1	
Small *Sales turnover: RM300,000 < RM15 mil* *OR* *No. of Full Time Employees: From 5 to < 75*	2	
Medium *Sales turnover: RM15 mil ≤ RM50 mil* *OR* *No. of Full Time Employees: From 75 to ≤ 200*	3	**B5**
Large *Sales turnover: > RM50 mil* *OR* *No. of Full Time Employees: > 200*	4	

B4. What is the size of your company?
<Note to programmer: For ALL codes in Question B2, EXCEPT for Code C10 to C33. >

Services & Other Sectors	Code (SA)	Go To
Micro *Sales turnover: < RM300,000* *OR* *No. of Full Time Employees: < 5*	1	**B5**

Small *Sales turnover: RM300,000 < RM3 mil* *OR* *No. of Full Time Employees: From 5 to < 30*	**2**	
Medium *Sales turnover: RM3 mil ≤ RM20 mil* *OR* *No. of Full Time Employees: From 30 to ≤ 75*	**3**	
Large *Sales turnover: > RM20 mil* *OR* *No. of Full Time Employees: > 75*	**4**	

B5. Does your company have any critical occupation?

A critical occupation is defined by three specific criteria:
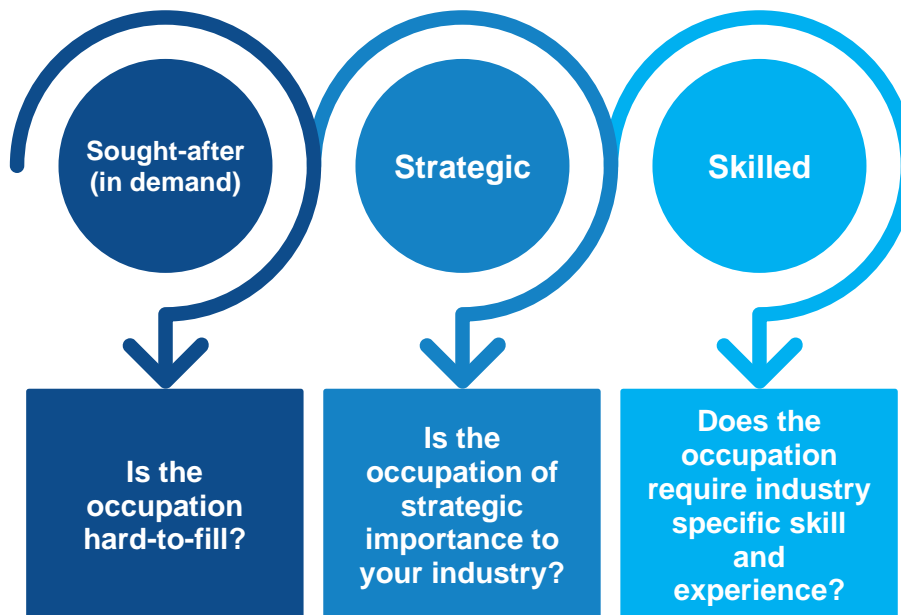
Does your company have any critical occupation?	Code (SA)	Go to:
Yes	1	Continue Section 2
No	2	Survey Ends. Thank You.

Section 2: Critical Occupations

Instruction:

A critical occupation is defined by three specific criteria:
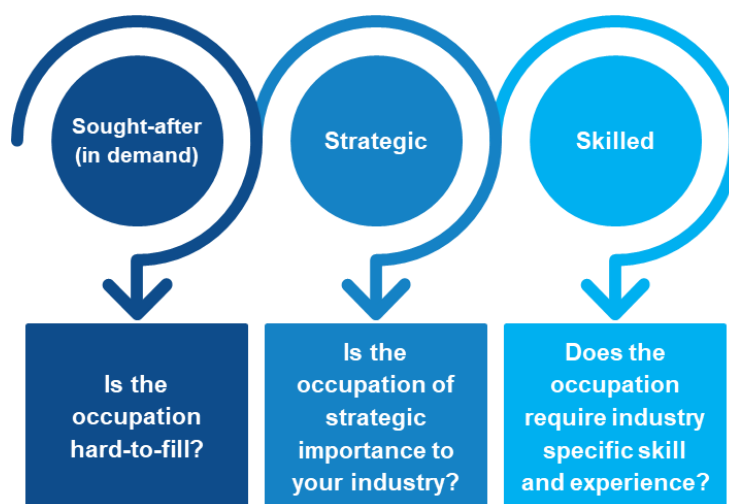
1. *In this section, please nominate the jobs that you deem are critical to your company, based on the three criteria: i.e. sought after, strategic and skilled (see above).*
2. *Please answer the questions to the best of your ability. All questions are mandatory unless otherwise stated.*
3. *Read the column titles / questions carefully and fill in the details of critical job positions in the table provided below.*

ID No.	Q1. Job Title	Q2. Job Department *(Note: Please indicate 1 department for 1 job title)*	Q3. Job Category *Options:* *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 Responsibilities / Job Description *(Please be as specific as possible)*
E.g.	*Process Engineer*	*E.g.: Sales / Support / Operations / Management / Admin / etc.*	*2*	*Designing chemical processes for palm oil refineries*
ID01				
ID02				
ID03				
ID04				
ID05				
ID06				
ID07				
ID08				
ID09				
ID10				

<Note to programmer: minimum must list 1 job title, max up to 10.>

Instruction:

*In the example below, **10 process engineers** (see Q5) **are needed ideally** but **I only have 5 process engineers currently employed** (see Q6).*
With that, I have 5 vacant positions for this role at the moment.
***I would be** (see Q7) **advertising 3 of the 5 vacant positions over the next 6 months** (see Q8).*

*Out of the **3 vacancies that I would be advertising**: (see Q9a and Q9b)*
- *   **1 vacancy** is for a position with **less than 2 years of experience** (with a maximum salary of **RM3,000** to be paid),*
- *   **1 vacancy** is for a position with **2 to 5 years of experience** (with a maximum salary of **RM5,000** to be paid),*
- *   **No vacancy** for position with **5 to 10 years of experience**,*
- *   And **1 vacancy** is for a position with **more than 10 years of experience** (with a maximum salary of **RM15,000** to be paid).*

ID No.	JOB TITLE *(Note: please pipe in Job Titles and ID No. listed in Q1)*	Q5. What is the total number of employees required **currently** for this position to ensure products / services are met?	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**? *Options: Code 1 = Yes Code 2 = No*	Q8. How many vacancies do you intend to advertise **over the next 6 months**?	Q9. a) How many employees are required for the advertised positions? b) What is the budgeted maximum salary to be paid for each of the advertised positions?							
						< 2 years of experience		2-5 years of experience		6-10 years of experience		>10 years of experience	
						No. of position to be advertised	Max. salary (RM)	No. of position to be advertised	Max. salary (RM)	No. of position to be advertised	Max. salary (RM)	No. of position to be advertised	Max. salary (RM)
E.g.	*Process Engineer*	*10*	*5*	*1*	*3*	*1*	*3,000*	*1*	*5,000*	*0*	*N/A*	*1*	*15,000*
ID01													
ID02													
ID03													
ID04													
ID05													
ID06													
ID07													
ID08													
ID09													
ID10													

<Note to programmer: For each Job Title: Q6 cannot exceed Q5; Sum of Q9a cannot exceed Q8. >
<Note to programmer: If the table is too long to be displayed, please break the table with Q8 and Q9 into next table. >

Instruction:

*In the example below, **12 process engineers** (see Q10) **are needed ideally, by next year (between January 2022 to December 2022).***

ID No.	JOB TITLE *(Note: please pipe in Job Titles and ID No. listed in Q1)*	Q10. What is the total number of employees required **between January to December 2022** for this position to ensure products / services are met?
E.g.	*Process Engineer*	*12*
ID01		
ID02		
ID03		
ID04		
ID05		
ID06		
ID07		
ID08		
ID09		
ID10		

*In the example below, all vacancies for the Process Engineer job position **took an average of 3 months to fill.***

ID No.	JOB TITLE *(Note: please pipe in Job Titles and ID No. listed in Q1)*	Q11. What is the average time taken to fill vacancies for this position (in months)?	Q12. What are the top-3 skills that are required for this position? *Options:* *1 = IT & Digital skills* *6 = Numeracy skills* *2 = Analytical skills* *7 = Literacy skills* *3 = Interpersonal & Communication skills* *8 = Teamwork* *4 = Language skills* *9 = Technical skills* *5 = Problem solving* *99 = Others (please specify): _____*		
			TOP 1 SKILL	**TOP 2 SKILL (OPTIONAL)**	**TOP 3 SKILL (OPTIONAL)**
E.g.	*Process Engineer*	*3*	*2*	*2*	*7*
ID01					
ID02					
ID03					
ID04					
ID05					
ID06					
ID07					
ID08					
ID09					
ID10					

<Note to programmer: For Q12, please insert text box for code 99. >

ID No.	JOB TITLE (Note: please pipe in Job Titles and ID No. listed in Q1)	Q13. Is this position hard-to-fill? (Please select code 1 or 2 for each critical job position) Options: Code 1 = Yes Code 2 = No	Q14. What are the top-3 reasons that this position is hard to fill? Options: 1 = Too few applicants or no applicant at all 2 = Applicants lack the required credentials or certification / qualification 3 = Applicants lack relevant job experience 4 = Applicants lack the required technical skills. Please specify the technical 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.). Please specify:_____ 6 = Applicants' expected compensation is beyond the market rate 7 = We cannot afford to pay the market rate for the applicants due to cost-cutting effort during the MCO 8 = We cannot afford to pay the market rate for the applicants due to poor business/sales 9 = Applicants do not have required digital skills to address the needs during MCO 99 = Others (please specify): _____		
			TOP 1 REASON	TOP 2 REASON (OPTIONAL)	TOP 3 REASON (OPTIONAL)
E.g.	Process Engineer	1	1	5	7
ID01					
ID02					
ID03					
ID04					
ID05					
ID06					
ID07					
ID08					
ID09					
ID10					

<Note to programmer: For Q13, please insert radio button for each option code. >
<Note to programmer: For Q14, please insert text box for code 99. >

ID No.	JOB TITLE (Note: please pipe in Job Titles and ID No. listed in Q1)	Q15. What were the top-3 strategies your company has used to fill the vacant positions?		
		Options: 1 = Raising wages 2 = Hiring less well qualified applicants 3 = Expanding local recruitment efforts (e.g. wider distribution of job openings, increased presence at career fairs, increased use of recruitment firms, etc.) 4 = Expanding international recruitment efforts 5 = Increasing employees' training 6 = Establishing or expanding partnerships with education or training providers focused on recruitment of graduates	7 = Increasing worker hours or overtime 8 = Convincing workers to delay retirement 9 = Converting part-time workers to full time status 10 = Hiring temporary or contract workers 11 = Outsourcing this job function 12 = Automating tasks performed in this occupation 13 = None 99 = Others (please specify): _____	
		TOP 1 STRATEGY	TOP 2 STRATEGY (OPTIONAL)	TOP 3 STRATEGY (OPTIONAL)
E.g.	Process Engineer	1	5	7
ID01				
ID02				
ID03				
ID04				
ID05				
ID06				
ID07				
ID08				
ID09				
ID10				

<Note to programmer: For Q15, please insert text box for code 99. >

ID No.	JOB TITLE (Note: please pipe in Job Titles and ID No. listed in Q1)	Q16. Do you think this position is more or less hard-to-fill now than one year ago? Options: 1 = More hard-to-fill 2 = Neither more nor less hard-to-fill 3 = Less hard-to-fill	Q17. What is the minimum level of qualification needed for this position? Options: 1 = No formal education required 2 = UPSR Level 3 = PMR/PT3 Level 4 = SKM Level 1 & 2 5 = SPM Level 6 = STPM Level / Matriculation / Foundation / Pre-University Program 7 = SKM Level 3 8 = Diploma / SKM Level 4 9 = Advanced Diploma / SKM Level 5 10 = Bachelor's Degree / Graduate Diploma / Graduate Certificate 11 = Master's Degree (by Research or Mixed Mode & Coursework) / Postgraduate Diploma / Postgraduate Certificate 12 = PhD / Doctoral Degree 99 = Others:_____	Q18. What is the field of studies / education required for this position? Options: <Note to programmer: Show drop down list for this question, drop down list available in next page. >
E.g.	Process Engineer	3	8	
ID01				
ID02				
ID03				
ID04				
ID05				
ID06				
ID07				
ID08				
ID09				
ID10				

<Note to programmer: For Q16, please insert radio button for each option code. >
<Note to programmer: For Q17, please insert text box for code 99. >

Q18 Field of Studies / Education Listing (based on National Education Code NEC 2010)

<Note to programmer: Show the below drop down list for Q18. >

Broad Field	Narrow Field	Detailed Field	Code (SA)
General Programmes	Basic/broad, general programmes	Basic I broad, general programmes	010
	Literacy and numeracy	Literacy and numeracy	080
	Personal skills	Personal skills	090
Education	Teacher training and education sciences	Teaching and training = 143+144+145+146	141
		Education science	142
		Training for preschool teachers	143
		Training for teachers at basic levels	144
		Training for teachers with subject specialisation	145
		Training for teachers of vocational subjects	146
Arts and Humanities	Arts	Fine arts	211
		Music and performing arts	212
		Audio-visual techniques and media production	213
		Design	214
		Craft skills	215
	Humanities	Religion	221
		Languages = 223+224	222
		National Language	223
		Other languages	224
		History and archaeology	225
		Philosophy and ethics	226
		History, philosophy and related subjects = 225+226	227
Social Sciences, Business, and Law	Social and behavioural sciences	Psychology	311
		Sociology and cultural studies	312
		Political science and civics	313
		Economics	314
	Journalism and information	Journalism and reporting	321
		Library, information, archive	322
	Business and administration	Wholesale and retail sales	341
		Marketing and advertising	342
		Finance, banking, insurance	343
		Accounting and taxation	344
		Management and administration	345
		Secretarial and office work	346
		Working life	347
	Law	Syariah Law	381
Science, Mathematics, and Computing	Life sciences	Biology and biochemistry	421
		Environmental science	422
	Physical science	Physics	441
		Chemistry	442
		Earth science	443
	Mathematics and statistics	Mathematics	461
		Statistics	462
	Computing	Computer science	481

		Computer use	482
Engineering, Manufacturing, and Construction	Engineering and engineering trades	Mechanics and metal work	521
		Electricity and energy	522
		Electronics and automation	523
		Chemical and process	524
		Motor vehicles, ships and aircraft	525
		Civil engineering	526
		Material engineering	527
	Manufacturing and processing	Food processing	541
		Textiles, clothes, footwear and leather	542
		Materials (wood, paper, plastic and glass)	543
		Mining and extraction	544
		Applied science	545
	Architecture and building	Architecture and town planning	581
		Building	582
Agriculture and Veterinary	Agriculture, forestry, and fishery	Crop and livestock production	621
		Horticulture	622
		Forestry	623
		Fisheries	624
	Veterinary	Veterinary	641
Health and Welfare	Health	Medicine	721
		Medical services = 725+726+727	722
		Nursing and caring	723
		Dental studies	724
		Medical diagnostic and treatment technology	725
		Therapy and rehabilitation	726
		Pharmacy	727
	Social services	Child care and youth services	761
		Social work and counselling	762
Services	Personal services	Hotel, restaurant and catering	811
		Travel, tourism and leisure	812
		Sports	813
		Domestic services	814
		Hair and beauty services	815
	Transport services	Transport services	840
	Environmental protection	Environmental protection technology	851
		Natural environments and wildlife	852
		Community sanitation services	853
	Security services	Protection of persons and property	861
		Occupational health and safety	862
		Military and defence	863

Section 3: Automation

Automation means using machines to replace work that is previously done by people / human labour.

ID No.	JOB TITLE *(Note: please pipe in Job Titles and ID No. listed in Q1)*	Q19. What percentage of the tasks in this occupation could potentially be automated? *Options:* *1 = 0%* *2 = Less than 25%* *3 = 25% - 50%* *4 = 51% - 75%* *5 = More than 75%*	Q20. Are you likely to automate the tasks of this occupation in the coming year? *Options:* *Code 1 = Yes* *Code 2 = No*	Q21. Please share any comments about this position that planners should know about. *(Optional)* *(open-ended)*
E.g.	Process Engineer	3		
ID01				
ID02				
ID03				
ID04				
ID05				
ID06				
ID07				
ID08				
ID09				
ID10				

<Note to programmer: For Q19 and Q20, please insert radio button for each option code. >
<Note to programmer: For Q21, please insert text box; open ended. >

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.

-THANK YOU-

APPENDIX 4: CONSULTATION DISCUSSION GUIDE

COL Consultation 2021 – Discussion Guide

Interviewees Details

Association / Company Name	Representative Name	Designation	Email	Telephone No.

Introduction

As part of the efforts under the 11th Malaysia Plan to address skills mismatches in the labour market, the Critical Skills Monitoring Committee (CSC) was established, jointly led by TalentCorp, MoHR, ILMIA and DOSM. The primary objective of CSC is to develop a Critical Occupations List (COL) to serve as a platform for the coordination of human capital development policies. The COL is an evidence-based list of occupations in Malaysia that reflects the most sought after and hard to fill occupations by industry in order to identify skills imbalances across the Malaysian economy.

Frost & Sullivan has been engaged by TalentCorp to develop the 6th edition of the COL 2020/2021. As part of the study, we are conducting consultation sessions with industry associations and key industry players to better understand industry views on the critical occupations and the recruitment challenges industries are facing.

This discussion session will take approximately 60 minutes to be completed.

Section 1: General Labour Market Trends

1.   How did your industry perform in 2020? How was the performance as compared to the previous 3 years? How did COVID-19 impact your industry?

2.   What are the current and emerging trends in your industry, locally and globally? For the global trends that are not prominent in Malaysia yet, do you think it would be adopted by the companies here within the next 1-2 years?

3. Is the existing talent pool within the industry ready to address these trends? If no, what are the skills gaps?

```
[                                                                    ]
[                                                                    ]
[                                                                    ]
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4. Does your industry face any employment challenges in the past one year? If yes, what are the key challenges faced? (e.g. low supply of talent with specific technical skills, candidates are more interested to work in other industries)

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[                                                                    ]
[                                                                    ]
[                                                                    ]
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5. What are the measures taken by the industry to overcome these employment challenges in the past one year?

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[                                                                    ]
[                                                                    ]
[                                                                    ]
```

6. What were the key employment trends in your industry in 2020? Are these (employment) trends causing a temporary change in demand or supply of talent in your Industry?
Probe in terms of:
- Hiring freeze
- Layoff of employees
- Focus on upskilling or retraining of existing employees
- Increase hiring of digital talent (e.g. for e-commerce, digital transformation, software /application development

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[                                                                    ]
[                                                                    ]
[                                                                    ]
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Section 2: Critical Occupations

7. Please nominate occupations that are 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".

8. Why are these jobs to be hard to fill? Are there specific reasons for the lack of talent in this industry? (e.g. Not enough applicants, applicants lack credentials or certificates, relevant job experience, expected compensation is beyond the market rate, etc.)

No.	Job Title	Reasons for hard to fill
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

9.   a) What are the specific qualifications, competencies or niche skills needed for those jobs (e.g. ACCA, CFA, IKM chemist licentiateship, IEM registered professional engineer)?

b) Are the skills/qualification hard to get or unavailable? If yes,
- How long does it take to acquire them?
- Where can potential candidates acquire the skills or certification?

No.	Job Title	Specific qualifications / competencies / niche skills required	Hard to get or unavailable?	How long to acquire the skills/qualification	Where to acquire the skills/ qualification
1			☐		
2			☐		
3			☐		
4			☐		
5			☐		
6			☐		
7			☐		
8			☐		
9			☐		
10			☐		

10.   What level of experience (number of years of experience) is most sought after for these hard to fill occupations?

11.   How has your industry been impacted by the critical shortage?

12.   What has the industry done to reduce the shortage? (e.g. provide training to employees, work closely with higher education/training institutions for talent supply, provide better salary or remuneration package)

No.	Job Title	Level of experience most sought after (no. of years)	Impact of critical shortage	Measures taken to reduce shortage
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

13.   [Note: Moderator to compare current critical occupations mentioned against last 5 years COL list. Asked this question if the occupation has occurred for 4-5 times previously.]
<Job title> has been in the COL list for 4 years or more.
a) In your opinion, what is the key bottleneck for talent shortage?
b) What else can be done to resolve the talent shortage issue?

No.	Job Title	Occurred in COL 4-5 times	Key Bottleneck	What else can be done
1		☐		
2		☐		
3		☐		

4		☐		
5		☐		
6		☐		
7		☐		
8		☐		
9		☐		
10		☐		

14.   What are the areas that the government can help to support?

Section 3: Automation

15.   Are there major automation/technology disruption trends in your industry?
Definition of Automation: Using machines to replace work done by people

16.   Would automation/technology disruption trends lead to a reduction in the number of workers required?
If yes,
- What percentage of reduction is most likely within next 3 years?
- Do you think new jobs would be created? What would be the new jobs? What are the skills required for these new jobs?

Section 4: Awareness and utilization of COL

17.   Are you aware of the COL before this session? Is the awareness within the industry high?

18.   Do you use the previous COL? If yes, how frequent do you use them and how do you use them?

Section 5: Applications of the Critical Occupations List

Demand side questions – for industry representatives

19.   What is your view of the previous COL? [Show a sample page of 2019/2020 COL]

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20.   In your opinion, in what manner can the 'Critical Occupations List' be used more effectively in the process of addressing the critical occupations needs of your industry?

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21.   Would your company/association be open to participate in an annual self-disclosure exercise to spell out the (1) Critical occupations requirements; (2) Fine tune the job description and skills requirements of the industry?

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Supply side questions – for education institutions

22.   Could you share with us the process of how your organisation uses COL in the planning and development process of your institution?

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23.   What is your view of the previous COL? [Show a sample page of 2019/2020 COL]
In your opinion, what are the areas that can be improved to better support the process of syllabus development and recruitment planning?

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24.   In your opinion, should there be harmonisation between agencies/ministries in COL development, e.g. standardisation across the various national occupational frameworks, standards and list, namely (1) Critical Occupations List, (2) Malaysian Standard Classification of Occupations, (3) HRDF – Industrial Skills Framework (https://www.hrdf.com.my/indsf/), and MoHR – National Occupation Skills Standards?

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END OF DISCUSSSION

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.

-THANK YOU-

APPENDIX 5: STAKEHOLDERS THAT TOOK PART IN CONSULTATION

No.	Associations / Companies
1.	Welding Institute of Malaysia (WIM)
2.	Malaysian Textile Manufacturers Association (MTMA)
3.	Malaysian Textile and Apparel Centre (MATAC)
4.	Federation of Malaysian Fashion, Textiles and Apparels (FMFTA)
5.	Malaysia Aerospace Industry Association (MAIA)
6.	Association of Banks in Malaysia (ABM)
7.	Chemical Industries Council of Malaysia (CICM)
8.	Machinery and Engineering Industries Federation (MEIF)
9.	Machinery and Equipment Manufacturers Association (MEMA)
10.	Malaysian Special Tooling and Machining Association (MSTMA)
11.	Malaysia Digital Economy Corporation Sdn Bhd (MDEC)
12.	Malaysian Petrochemicals Association (MPA)
13.	Malaysia Software Testing Board (MSTB)
14.	The National Tech Association of Malaysia (PIKOM)
15.	Association of Consulting Engineers Malaysia (ACEM)
16.	The Electrical and Electronics Association of Malaysia (TEEAM)
17.	Malaysian Employers Federation (MEF)
18.	Ikhtisas Kelautan Malaysia (IKMAL)
19.	Malaysian Organisation of Pharmaceutical Industries (MOPI)
20.	National Association of Private Educational Institutions (NAPEI)
21.	Malaysian Rubber Products Manufacturers' Association (MRPMA)
22.	Malaysian Association of Pharmaceutical Suppliers (MAPS)
23.	Malaysia Chamber of Mines (MCOM)
24.	Malaysian Association of Themepark and Family Attractions (MATFA)
25.	Public Relations and Communications Association of Malaysia (PRCA Malaysia)
26.	Malaysian Association of Hotels (MAH)
27.	Life Insurance Association of Malaysia (LIAM)
28.	Malaysian Agricultural Producers Association (MAPA)
29.	Malaysian Photovoltaic Industry Association (MPIA)
30.	Master Builders Association Malaysia (MBAM)
31.	Malaysian Association of Private Colleges and Universities (MAPCU)
32.	Real Estate and Housing Developers' Association (REHDA)
33.	Federation of Malaysian Freight Forwarders (FMFF)
34.	Malaysian Integrated Chip Designer Association (MICDA)
35.	Collaborative Research in Engineering, Science and Technology Centre (CREST)
36.	Sarawak Chamber of Commerce and Industry (SCCI)
37.	Malaysian Oil and Gas Services Council (MOGSC)

No.	Associations / Companies
38.	Early Childhood Care and Education Council (ECCE)
39.	Malaysia Automation Technology Association (MATA)
40.	Malaysia Rail Industry Corporation (MARIC)
41.	Association of Islamic Banking and Financial Institutions Malaysia (AIBIM)
42.	Federation of Malaysian Manufacturers (FMM) Sabah
43.	Coca Cola Malaysia

APPENDIX 6: SOURCES OF INFORMATION UTILIZED IN VALIDATION

No.	Associations / Reports
1.	Animation Society of Malaysia (ANIMAS)
2.	Association of Islamic Banking and Financial Institutions Malaysia (AIBIM)
3.	Association of Banks in Malaysia (ABM)
4.	Association of Private Hospitals of Malaysia (APHM)
5.	Malaysian Nurses Association (MNA)
6.	Construction Industry Development Board (CIDB)
7.	Malaysia Digital Economy Corporation Sdn Bhd (MDEC)
8.	Actuarial Society of Malaysia
9.	Malaysia Oil & Gas Services Council (MOGSC)
10.	PETRONAS / Akademi Laut Malaysia (ALAM; a wholly owned subsidiary of MISC)
11.	Federation of Malaysian Manufacturers (FMM)
12.	Environmental Scan for Maritime Sector (2018)

APPENDIX 7: REGIONAL ANALYSIS DETAILED TABLES

Table 24: Critical occupation nomination regional breakdown – comparisons within regions at 4 digit

Job Category	Northern Region	Central Region	East Coast	Southern Region	East Malaysia
24 Business And Administration Professionals	16%	19%	13%	15%	13%
52 Sales Workers	14%	9%	25%	11%	13%
31 Science And Engineering Associate Professionals	7%	8%	6%	6%	9%
21 Science And Engineering Professionals	6%	9%	3%	7%	7%
51 Personal Services Workers	7%	5%	7%	7%	11%
12 Administrative And Commercial Managers	4%	8%	5%	3%	3%
81 Stationary Plant And Machine Operators	6%	3%	2%	9%	4%
33 Business And Administration Associate Professionals	4%	4%	5%	5%	4%
25 Information And Communications Technology Profess	4%	6%	1%	1%	1%
96 Other Elementary Workers	3%	2%	4%	4%	5%
92 Agricultural, Forestry, Farming And Fishery Labourers	4%	0%	4%	5%	4%
22 Health Professionals	1%	4%	1%	5%	1%
83 Drivers And Mobile Plant Operators	3%	2%	3%	4%	3%
41 Office Clerks	2%	2%	3%	1%	5%
72 Metal, Machinery And Related Trades Workers	3%	2%	4%	3%	1%
43 Numerical And Material Recording Clerks	3%	2%	2%	0%	1%
94 Food Preparation Assistants	1%	2%	1%	1%	0%
42 Customer Services Clerks	1%	2%	1%	0%	1%
71 Building And Related Trades Workers (Excluding Electri	1%	0%	2%	1%	3%
13 Production And Manufacturing Managers	0%	1%	2%	2%	1%

Table 25: Critical occupation nomination regional breakdown – comparisons across regions at 4 digit

4 Digit Job Category	Northern Region
Restaurant Professionals	57%
Mail Carriers and Sorting Clerks	50%
Forestry Labourers	50%
Medical Assistants	50%
Sales Demonstrators	50%
Ships Deck Officers and Pilots	50%
Accounting and Auditing Associate Professionals	50%
Environmental Engineers	50%
Personnel and Careers Professionals	43%
Food and Related Products Machine Operators	41%
Livestock Farm Labourers	40%
Cooks	35%
Production Clerks	33%
Real Estate and Property Agents	33%
Bakers, Pastry, Pasta and Confectionery Makers	33%
Fishery and Aquaculture Labourers	33%
Civil Engineering Technicians	33%
Transport Clerks	33%
Financial and Investment Advisers	33%
Freight Workers and Storage Labourers	33%

4 Digit Job Category	Central Region
Systems Administrators	88%
Applications Programmers	75%
Mathematicians, Actuaries and Statisticians	75%
Policy and Planning Managers	75%
Cement, Stone and Other Mineral Products Machine Operators	67%
Draughtspersons and Surveying Technician	67%
Earth-Moving and Related Plant Operators	67%
Travel Consultants and Clerks	67%
Electrical Engineering Technicians	67%
Public Relations Professionals	67%
Cybersecurity Professionals	67%
Creative Content Designers Professionals	67%
Finance Managers	65%
Civil Engineering Labourers	63%
Electrical Engineers	60%
Insurance Representatives	60%
Kitchen Helpers	58%
Nursing Professionals	58%
Software Developers	57%
Specialist Medical Practitioners	57%

4 Digit Job Category	East Coast
Welders and Flame Cutters	67%
Hand Launderers and Ironers	50%
Information and Communications Technology Operation Technicians	50%
Plumbers and Pipe Fitters	50%
Electrical Mechanics and Fitters	50%
Garden and Horticultural Labourers	50%
Other Supervisor - Not Elsewhere Classified	50%
Retail and Wholesale Trade Managers	50%
Accounting and Auditing Associate Professionals	50%
Service Station and Pump Attendants	43%
Manufacturing Managers	40%
Carpenters and Joiners	33%
Cleaning and Housekeeping Supervisors In Offices, Hotels and Other Establishments	33%
Restaurant Managers	33%
Civil Engineering Technicians	33%
Creative Content Designers Professionals	33%
Driving Instructors	29%
Shop Supervisors	27%
Cashiers and Ticket Clerks	26%
Steam Engine and Boiler Operators	25%

Table 26: Critical occupation nomination regional breakdown – comparisons across regions at 4 digit – con't

4 Digit Job Category	Southern Region
Industrial and Production Technicians	67%
Garden and Horticultural Labourers	50%
Tailors, Dressmakers, Furriers and Hatters	50%
Advertising and Public Relations Managers	50%
Building and Related Electricians	50%
Engineering Professionals (Excluding Electrotechnology) - Not Elsewhere Classified	50%
Meat and Fish Process Workers and Related Food Preparers	50%
Forestry Labourers	50%
Medical Assistants	50%
Sales Demonstrators	50%
Ships Deck Officers and Pilots	50%
Mobile Farm and Forestry Plant Operators	50%
Pharmacists	44%
Packing, Bottling and Labelling Machine Operators	44%
Mining Engineers, Metallurgists and Related Professionals	43%
Buyers	43%
Livestock Farm Labourers	40%
Insurance Representatives	40%
Construction Managers	38%
Nursing Professionals	37%

4 Digit Job Category	East Malaysia
Carpenters and Joiners	67%
Bus and Tram Drivers	67%
Computer Network Professionals	67%
Production Clerks	67%
Real Estate and Property Agents	67%
Mobile Farm and Forestry Plant Operators	50%
Hand Launderers and Ironers	50%
Information and Communications Technology Operation Technicians	50%
Plumbers and Pipe Fitters	50%
Clerical Support Workers - Not Elsewhere Classified	50%
Mail Carriers and Sorting Clerks	50%
Driving Instructors	43%
Managing Directors and Chief Executives	42%
Transport Technicians - Not Elsewhere Classified	40%
General Office Clerks	39%
Air Conditioning and Refrigeration Mechanics	38%
Beauticians and Related Workers	38%
Receptionists	38%
Cleaning and Housekeeping Supervisors In Offices, Hotels and Other Establishments	33%
Environmental and Occupational Health and Hygiene Professionals	33%

Table 27: Critical occupation nomination regional breakdown – comparisons within regions – MSIC 2-digit

MSIC 2D	Industry	Northern Region	Central Region	East Coast	Southern Region	East Malaysia
47	Retail trade, except of motor vehicles and motorcycles	19%	15%	38%	14%	20%
56	Accommodation	9%	8%	8%	8%	10%
45	Wholesale and retail trade and repair of motor vehicles and motorcycles	10%	5%	14%	13%	4%
46	Wholesale trade, except of motor vehicles and motorcycles	8%	9%	5%	8%	7%
96	Other personal service activities	4%	5%	3%	5%	6%
10	Manufacture of food products	5%	1%	1%	6%	10%
49	Land transport and transport via pipelines	3%	3%	2%	5%	4%
55	Accommodation	5%	2%	3%	3%	4%
41	Construction of buildings	3%	5%	0%	0%	3%
86	Human health activities	2%	4%	1%	4%	1%
01	Crops and animal production, hunting and related service activities	4%	0%	3%	5%	4%
68	Real estate activities	3%	2%	0%	1%	4%
32	Other manufacturing	3%	2%	1%	4%	0%
42	Civil engineering	0%	2%	3%	3%	0%
35	Electricity, gas, steam and air conditioning supply	0%	2%	0%	3%	2%
62	Computer programming, consultancy and related activities	0%	3%	0%	0%	1%
43	Specialized construction activities	1%	2%	1%	2%	1%
85	Education	0%	2%	3%	1%	1%
14	Manufacture of wearing apparel	1%	1%	1%	4%	0%
11	Manufacture of beverages	1%	1%	1%	1%	2%