

CSC

*Critical Skills Monitoring
Committee*

**CRITICAL
OCCUPATIONS LIST
REPORT
2016/2017**

THE CRITICAL OCCUPATIONS LIST REPORT

2016/2017

CSC

Prepared by the Critical Skills Monitoring Committee (CSC)

This edition of the Critical Occupations List Report was prepared by Carmen Loo, Daryl Yong, Ooi Boon Han, Yoong Hau Wei, Teh Lee Xiang, Nor Wahidah Nor Azelan and Kumaresan A/L Manikam under the overall guidance of Shareen Shariza, Mahuran Saro Sariki, Lee Chee Sung, the World Bank Group and the UK Migration Advisory Committee. If you or your organisation have any queries, feedback or suggestions on the Critical Occupations List (general or related to the list's methodology or application), please contact our Research team (research@talentcorp.com.my / 603- 7839 7132 / 7180). We welcome constructive comments and strive to continuously improve the Critical Occupations List for better coordination and implementation of Malaysia's human capital development strategy.

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CHAPTER 1

INTRODUCTION

“

The most valuable of all capital is that invested in human beings.

”

Alfred Marshall

As the global work environment is evolving at a fast pace, it is crucial for the growing working age population in Malaysia to be equipped with the skills needed in an internationally competitive economy. The Critical Skills Monitoring Committee (CSC), jointly led by Talent Corporation (TalentCorp) and the Institute of Labour Market Information and Analysis (ILMIA), was established under the 11th Malaysia Plan to facilitate policy formulation in this direction and to mitigate skills mismatches within the labour market.

The principal task of the CSC is to develop the Critical Occupations List (COL), which sets forth the jobs most in demand in key sectors of the economy, and for which industries may be facing shortages or difficulties in hiring. The COL is designed to become the primary mechanism and input for the formulation of diverse human resources management and development policy measures, such as those related to reskilling & upskilling, scholarships, higher education, TVET, and immigration. The COL is generated through a multi-step process, involving both an analysis of national labour market statistics, and syndication and consultations with employers and industry associations. The COL's strength, thus lies in its evidence-based foundation and incorporation of industry views.

In 2015, the CSC released the 2015/2016 COL. It was warmly received by policy makers and employers alike, which led to its immediate use as a tool in the execution of several human capital policy initiatives. This includes graduate employability programmes and the Returning Expert Programme (REP), an initiative designed to bring home Malaysian professionals residing abroad.

This report presents an updated COL for the year 2016/2017. In the past year, the CSC has not only updated the occupations in the list, but also reviewed, improved and further strengthened its methodology. The context, methodology and application of the COL is also outlined and explained in this report.

Moving forward, the list will continually be refined and updated on an annual basis to ensure that it remains relevant and provides an accurate picture of labour imbalances in Malaysia. In addition, the CSC continuously strives to provide better insights into the critical occupations. The list will be expanded to cover additional economic sectors and semi-skilled occupations in the future.

CHAPTER 2

THE IMPORTANCE OF A CRITICAL OCCUPATIONS LIST FOR THE MALAYSIAN LABOUR MARKET

2.1 The Malaysian Labour Market in 2015

The Malaysian labour force¹ expanded to 14.5 million persons in 2015 from 14.2 million persons in 2014, amidst a volatile and uncertain global economic environment. There was a continued rise in the labour force participation rate to 67.9%, mainly led by increased female participation². While the male labour force participation rate remained stagnant at 80.6%, the female labour force participation rate rose 0.4 percentage points to 54.1%. This progress was evident across most age groups, reflecting improved participation from both younger and older women. Malaysia's labour force also continued to develop steadily in terms of educational attainment, with 27.6% of the labour force holding tertiary education, up from 26.7% in the previous year³.

Chart 1: Labour Force Participation Rate

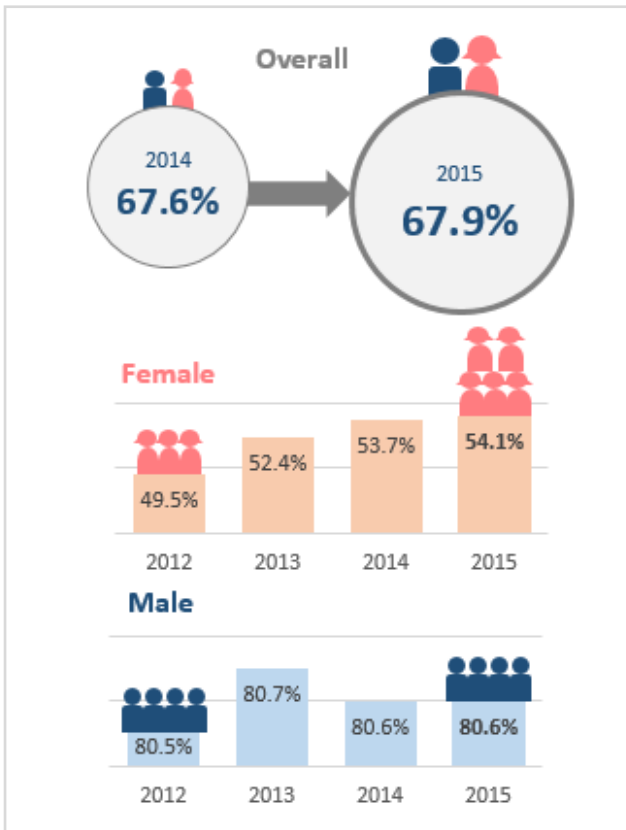
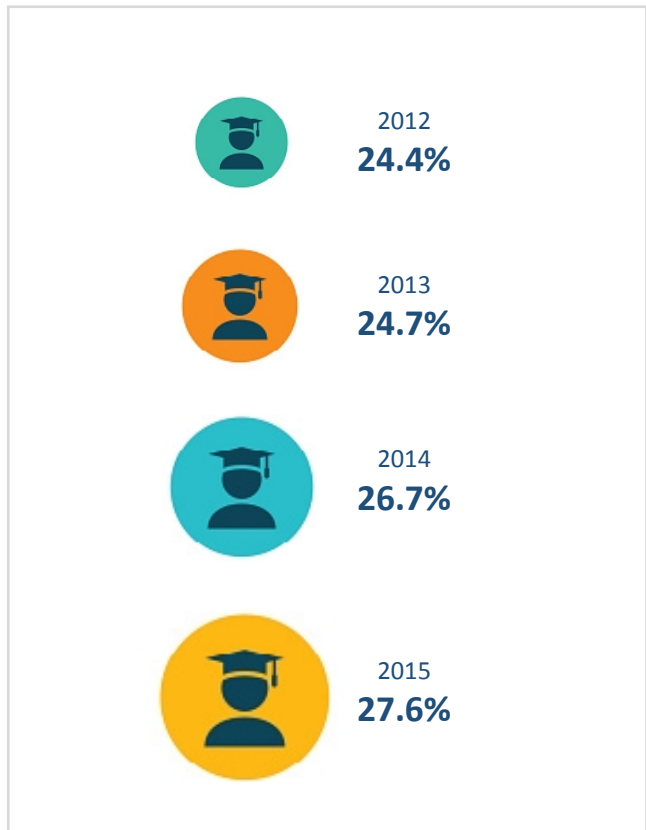


Chart 2: % Share of Labour Force with Tertiary Education



Source: Labour Force Surveys, Department of Statistics, Malaysia

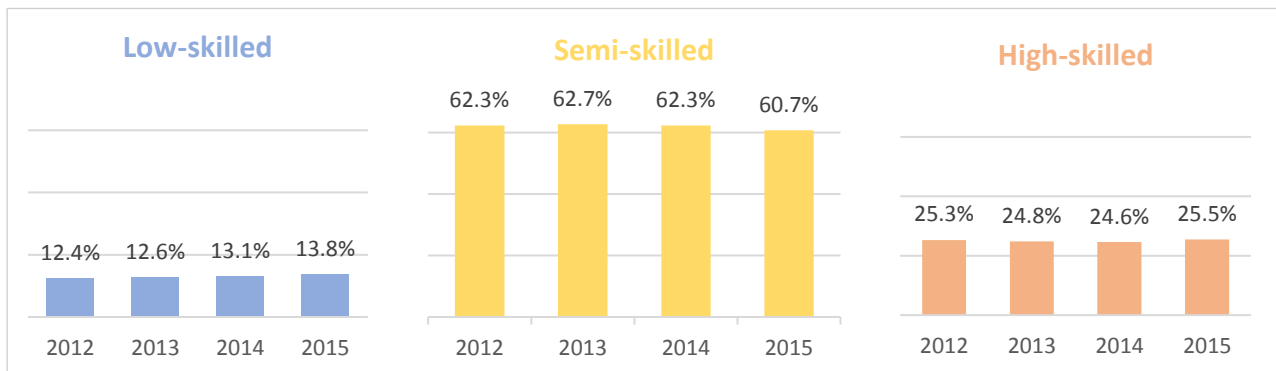
¹ As defined in the Labour Force Survey, the labour force is composed of workers 15 to 64 years who are either employed or unemployed.

² Initiatives to increase women participation in the workforce include the Resourcing Grant and the Retention Grant (under the Career Comeback Programme), and the flexWorkLife.my initiative, all of which are administered by TalentCorp.

³ For more info on the Malaysia labour market, historical trends and analysis, please access the Labour Force Survey annual reports through the Department of Statistics Malaysia website and ilmia.gov.my.

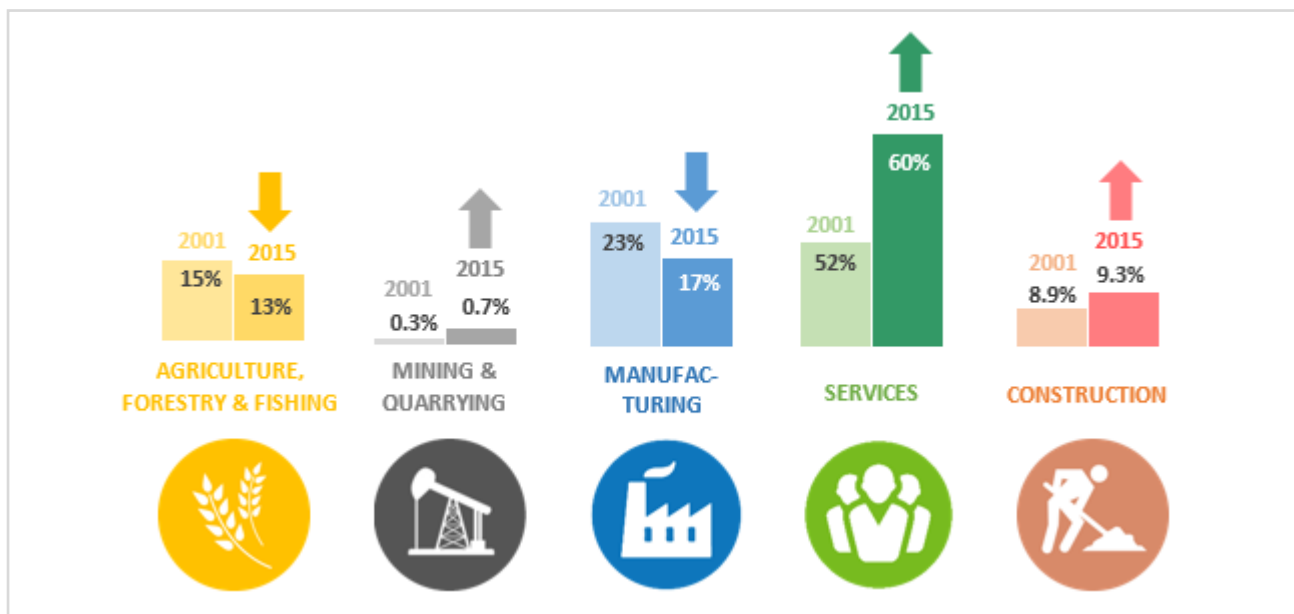
Parallel to the expansion in the labour force, employment also grew steadily to 14.1 million persons in 2015 from 13.9 million persons in 2014. The unemployment rate rose slightly from 2.9% to 3.1%, but remained low and manageable. The ratio of workers in high-skilled and low-skilled occupations increased, while that for semi-skilled occupations declined.³

Chart 3: Employment by Skill Categories (% Share)



Source: Labour Force Surveys, Department of Statistics, Malaysia

Chart 4: Employment by Economic Sector (% Share)



Source: Labour Force Surveys, Department of Statistics, Malaysia

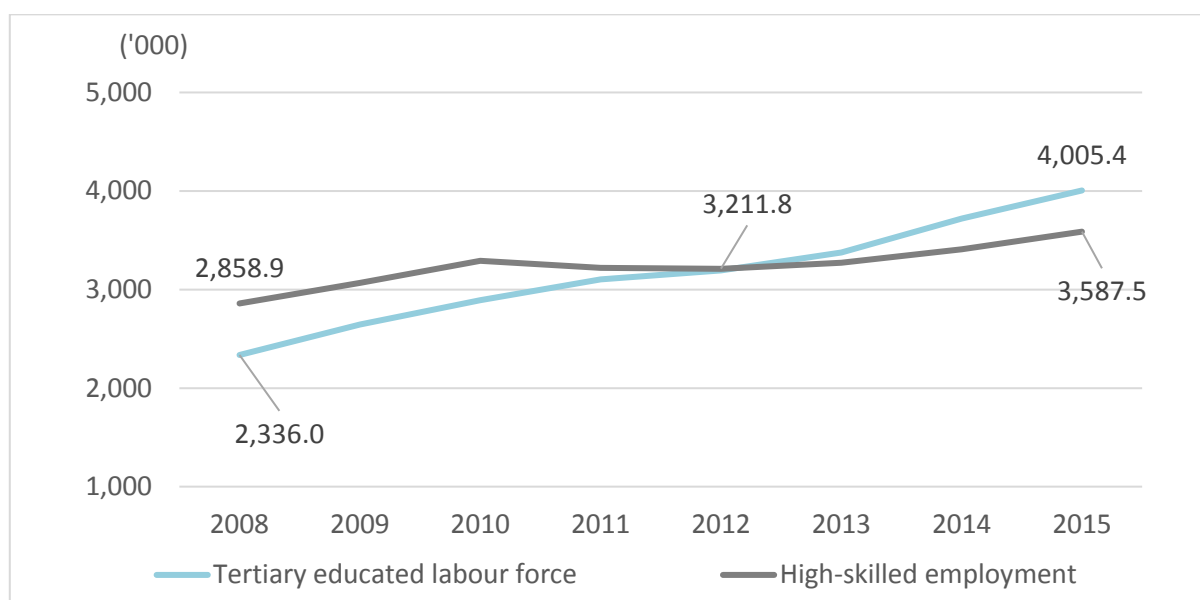
The services sector accounted for the largest share of employed workers (60.0%), mainly in the sub-sector of wholesale and retail trade. This was followed by the manufacturing (16.5%) and agriculture sectors (12.5%). Between 2001 and 2015, the proportion of employment in the agriculture and manufacturing industries

³ Occupations are categorised by skill level based on the Malaysian Standard Classification of Occupations 2013 (MASCO 2013), which has been developed in line with international standards. An occupation is identified as high-skilled if it falls within the Managers, Professionals, and Technicians and Associate Professionals groups of the MASCO 2013; as semi-skilled if it falls within the Clerical Support Workers, Service and Sales Workers, Skilled Agricultural, Forestry, Livestock and Fishery Workers, Craft and Related Trades Workers, and Plant and Machine Operators and Assemblers groups; and as low-skilled if it falls within the Elementary Occupations group.

declined from 38.8% to 29.0%, while the share of employment in the services industry grew from 52.4% to 60.0%. This shift is in line with government policies promoting migration into high value and knowledge-intensive service industries. By 2020, the services sector is expected to account for 56.5% to GDP, employing 9.3 million workers, mostly in high-skilled jobs.

2.2 Skill Imbalances in Malaysia and the Importance of the Critical Occupations List (COL)

Graph 1: Number of tertiary educated workers & high-skill jobs



In 2015, public and private sector collaboration continued to produce positive outcomes in the Malaysian labour market. This includes continued job creation, increased women participation, greater workforce diversity, and an increasingly educated talent pool. However, some pockets of labour imbalances still exist, which will challenge Malaysia’s transition into a high-income economy. In recent years, the difference between the volume of high-skill jobs and the supply of tertiary graduates has been widening. Before 2012, the number of persons employed as managers, professionals, associate professionals or technicians were higher than the number of tertiary educated labour force. However, from 2012 onwards, the number of tertiary educated people in the labour force surpassed the number of high skill jobs in the economy (See graph 1). Additionally, there is a misalignment between the supply and demand of Malaysian graduates in some sectors of the economy, as the graduate unemployment rate has remained high (23.9% in 2015)⁴.

⁴ According to the Tracer Study conducted by the Ministry of Education, in 2015, graduate unemployment stood at 23.9%

Table 1 below describes the potential sources of skill imbalances in Malaysia.

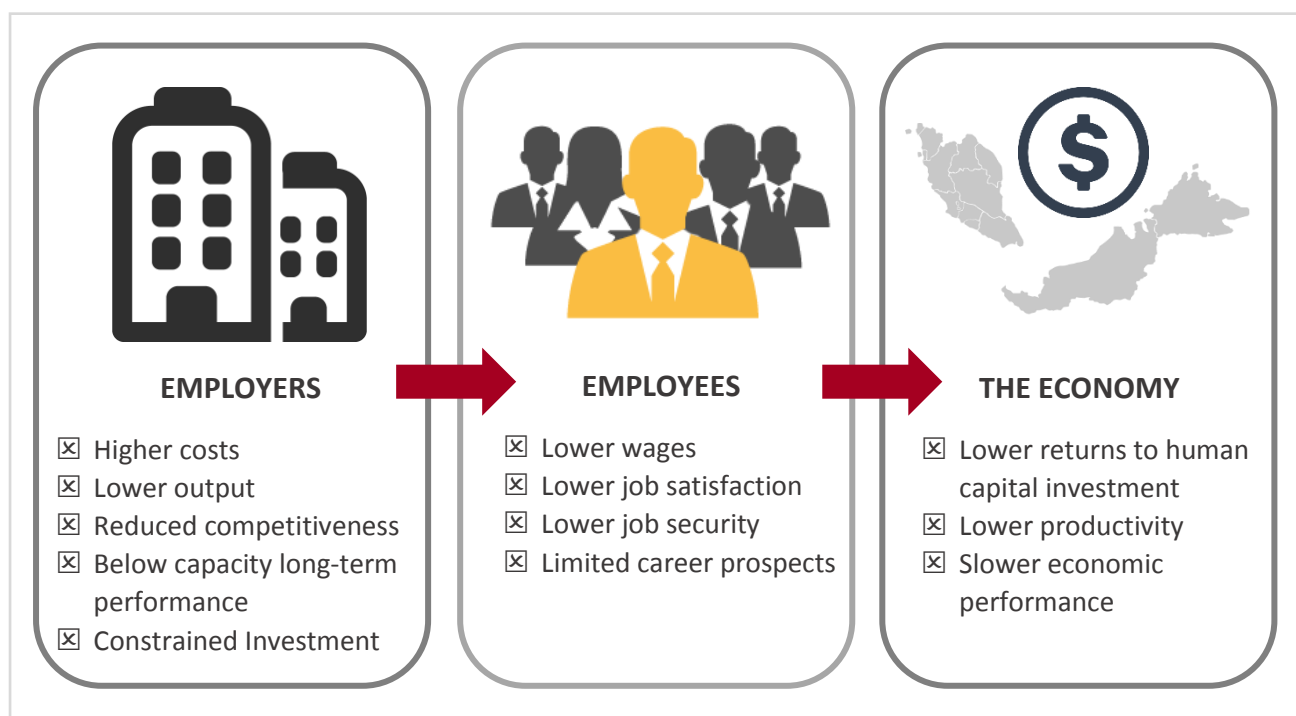
Table 1: Potential Sources of Skills Imbalances in Malaysia

Potential Sources of Skills Imbalances in Malaysia
1. Inadequate information on economic sector needs that leads to a lack of awareness by individuals, policy-makers and human capital development institutions
2. Low returns to training investment by firms due to reasons such as high staff turnover
3. Structural economic changes , such as a transition from a manufacturing-based economy to a more service-led economy, that lead to skills imbalances as the labour market adjusts
4. Geographical factors that hinder labour mobility, such as high transportation costs or rent
5. Lack of basic skills by workers, such as numeracy and literacy skills
6. Over-education of workers, leading to skills under-utilisation
7. Cultural or social barriers , such as gender dominance within certain occupations, or the negative perception of vocational training

Skills imbalances that persist over time could impose large costs on employers, employees and the economy (see Chart 5). Attempting to resolve the causes of skills imbalances is a complex process. It requires enormous coordinated effort by individuals, employers, unions and governments to ensure the skills formation system is responsive to industry needs and the work-life aspirations of job seekers.

Since 2014, the CSC has been tasked to conduct skills monitoring and to develop Malaysia's Critical Occupations List (COL), based on recommendations from the analysis of our workforce development framework by the World Bank and other international experts. Similar lists have been adopted in several countries successfully. For example, the United Kingdom and Australia use an occupation list to guide their immigration policies in attracting the right kind of talent, while Singapore uses a similar list to drive their upskilling programmes.

Chart 5: Potential Costs of Skills Imbalances on Employers, Employees and the Economy



The COL will increase the return on public investments in skills development and employment assistance programs by allocating resources according to labour market demands. A deeper understanding of the specific skills that are demanded by the labour market helps the government to prioritise publicly-financed initiatives related to the supply of labour and human capital, such as TalentCorp’s Returning Expert Programme (REP) and Residence Pass-Talent (RP-T), the Immigration Department’s Employment Pass, government scholarships, up-skilling and re-skilling programs and courses offered by institutes of higher education, including TVET.

Since 2014, the CSC has continuously worked with policy makers to ensure effective and smooth application of the COL. The COL will eventually be used to coordinate and prioritise all public interventions in talent development so that Malaysia can fully benefit from the investments it has made in its human capital. Chapters 3 and 4 detail the current and future application of the COL, as well as the CSC’s methodology in identifying critical occupations and producing the COL.

CHAPTER 3

APPLICATION OF THE LIST IN REDUCING SKILLS IMBALANCES

3.1 Towards a More Coordinated and Effective Human Capital Development Strategy

The COL is developed with the hope that it could become the primary instrument to facilitate effective coordination of human capital policies aimed at upskilling the workforce; guiding TVET and higher education teaching programs; retaining skilled Malaysians while also enticing returning Malaysians; and attracting foreign talent.

“*The inclusiveness of the COL, which ensures that it is evidence-based and representative of the industry’s views, has played a significant role in enhancing the REP assessment process, whereby talents who fall under the COL would be given the priority. The awareness on this, be it within the REP Committee or amongst applicants, has grown.*”

Yap Oi Wei, Global Malaysian Talent Facilitation, TalentCorp

What makes the COL different from previous initiatives to address skills imbalances in the country, is that it uses an evidence-based and participatory approach to identify occupations that are sought-after by key economic sectors. The COL is valuable for policy application because it is (i) Transparent, as it is constructed based on both data-driven and “Bottom-up” evidence; (ii) Participatory, involving key stakeholders, such as sector bodies, industry associations, top employers, as well as SMEs, to ensure that it reflects the needs of the whole economy; and (iii) Regular and Timely, as it is updated each year to ensure it reflects the current situation of the labour market. The following reflects both the current and potential use of the COL in selected human capital policy interventions.

- i. **Upskilling:** In a dynamic and ever-changing global work environment, the COL provides up-to-date information on the type of specialisations and competencies that the industry demands from workers. This information is useful for job seekers who have long left school or university, to keep updated on the type of skills they may need to upgrade. Upskilling initiatives could also be designed with reference to the COL, to ensure updated and relevant provision of training to workers.
- ii. **TVET:** Promoting Technical Vocational Education and Training (TVET) is a key pillar in the Eleventh Malaysia Plan. Accordingly, the CSC aims to expand the list to semi-skilled occupations in the future, and will therefore provide information on the types of TVET occupations that are sought-after and the type of qualifications required. This will facilitate the government and TVET-related agencies in improving curriculum design and programmes for TVET occupations.

Chart 6: Human Capital Policy Interventions where the COL can be utilised



- iii. **Graduate Employability:** Besides listing critical occupations demanded by the industry, the COL also provides insights into the type of job specialisations and/or qualifications required within each occupation. The COL can guide graduate employability programmes or bridging programmes to provide relevant training and knowledge for graduates to move from graduation to employment.
- iv. **Higher Education and Scholarship Management:** The COL incorporates industry evidence to provide guideline for shaping higher education curriculum and scholarship allocations. The COL indicates which occupations are sought-after firms, and also specific job titles within each occupation. The CSC is in discussions with the Public Service Department and the Ministry of Higher Education for this purpose. The COL can also be used by prospective students in guiding their decision-making for higher education. It can educate students on the diversity of industries and jobs that are open to them within each field of study.
- v. **Attracting foreign talent:** Malaysia aims to attract foreign talent in Malaysia to not only fill the short-term talent gaps we face, but to also ensure a transfer of technology and knowledge. As such, the COL can be a useful tool to target expatriates based on their specific expertise and to fit a specific skill demand that the country needs for its continued development. Currently, TalentCorp administers the Residence Pass-Talent (RP-T) initiative to facilitate the hiring of expatriates in Malaysia, and is working alongside the CSC to incorporate the COL into their selection process.

3.2 Progress Update and Plans Moving Forward

While the CSC has rolled out the application of the COL for several human capital initiatives, it has also begun to engage with the relevant agencies to discuss, strategise and lay out the use of the COL in their policy implementation. These agencies include the Public Services Department, Ministry of Education and the Human Resource Development Fund.

Currently, the COL is being used to guide the following public initiatives:

1. **University course review** – New courses proposed by public universities are cross-checked against the COL for relevance to industry needs.
2. **Graduate employability** – With reference to the COL, training programmes for graduates and profiling tests for jobseekers are tailored to focus on skills that are most needed by the industry.
3. **Returning Expert Programme (REP)** – In facilitating the return of Malaysian professionals from abroad, additional points are now awarded to REP applicants who are working in critical occupations, allowing for more effective targeting in overcoming the shortage of professionals in the country.⁵

The application of the COL for the following initiatives are currently in progress:

1. **Scholarship management** – The COL will be used by the Public Service Department (JPA) in determining essential field of studies to prioritise for their scholarship programmes.
2. **Residence Pass–Talent (RP-T)** – In facilitating the employment of expatriates in Malaysia, additional points will be awarded to expatriates working in critical occupations through the RP-T programme.

Going forward, the list will be continually refined and updated on an annual basis to ensure that it remains relevant and continues to provide an accurate picture of skills imbalances in Malaysia. In addition, the CSC aims to expand the list to provide better insights into the critical occupations, such as qualifications, specific skills, types of job competencies and experience expected as well as salary ranges being offered. The list will be developed to cover additional economic sectors, semi-skilled occupations and more specific geographical regions including job clusters that cut across industries. This will be done by analysing wider and more detailed sets of statistics and by expanding the scope of the CFE survey and consultations.

The expanded coverage of the COL will allow for increased policy reach to a variety of human capital interventions, such as the ones described in Section 3.1 above. The CSC will continue to engage data-providing agencies, firms, sector bodies, and regulators to ensure ongoing and fruitful collaboration in this important exercise.

⁵ The REP and RP-T programs are administered by TalentCorp. For more information on these initiatives, visit www.talentcorp.com.my.

CHAPTER 4

CONSTRUCTING THE CRITICAL OCCUPATIONS LIST

Using lessons from international experience with the UK Migration Advisory Committee and Australia Department of Education and Training, Malaysia's COL is developed through a combined approach of Top-down analysis (rigorous analysis of national-level labour statistics) and Bottom-up (engagement with industry and sector regulators) evidence.

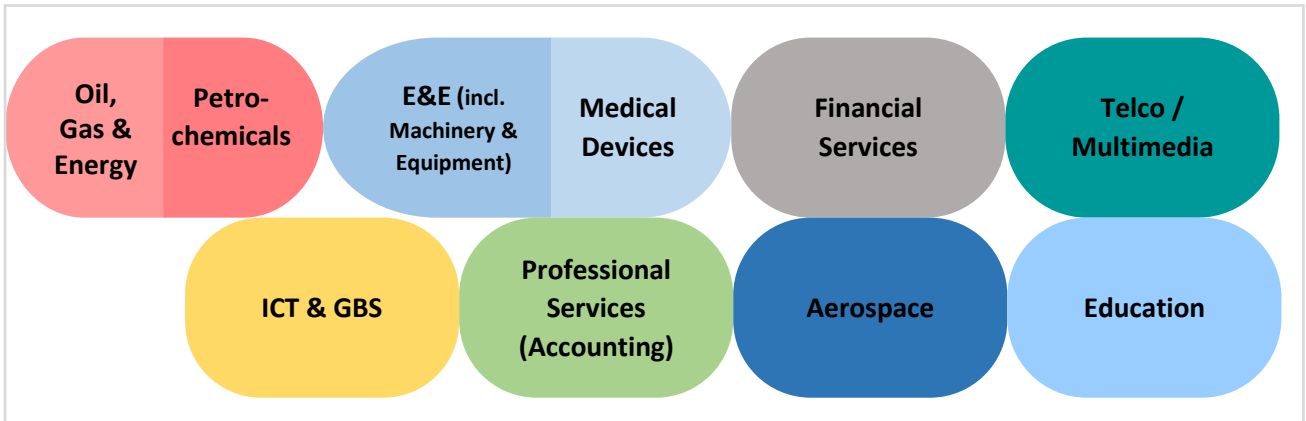
Top-down analysis is conducted using statistics from validated national-level sources, providing an aggregated economic view of the labour market and allowing for benchmarking with national trends and policy. **Bottom-up evidence** is obtained by asking core stakeholders to provide input and feedback on the COL. The Bottom-up approach is principally focused on obtaining evidence from the industry players themselves and validation of the COL by employers, industry associations and sector regulators. The two sources of evidence serves as complements to each other, and not as substitutes. They are both are needed and are interpreted together.

The main advantage of this combined approach is that it utilises and brings together the analysis of multiple indicators and data sets, as well as evidence from the ground. This enables policymakers to obtain a more precise and holistic view of skills development over time. The multi-dimensional analysis also provides useful information on the sources of skills imbalances and deeper insights into the specific challenges faced by both the demand and supply sides. This allows human capital development policy to be coordinated and implemented in a more efficient manner, which is beneficial in the context of the Malaysian economy.

The CSC team has been tasked to identify critical occupations within these 10 sectors: (i) Oil, Gas & Energy, (ii) Petrochemicals, (iii) Electrical and Electronics (E&E), (iv) Medical Devices, (v) Financial Services, (vi) Telecommunications and Multimedia, (vii) Information and Communications Technology (ICT) and Global Business Services (GBS), (viii) Professional Services (Accounting), (ix) Aerospace, and (x) Education. The sectors were selected based on their high concentration of knowledge workers as well as the significant roles they play in contributing to Malaysia's transformation into a knowledge-intensive, high-income economy. In future, the CSC will expand to cover additional sectors. In the COL, the Medical Devices sector is grouped with E&E, and the Petrochemicals sector with Oil and Gas. This is due to the presence of overlapping companies or information between the industries grouped together.

This section provides a brief snapshot of the COL methodology. More information on the conceptual approach, Top-down analysis and Bottom-up consultations is provided in Appendix IV.

Chart 7: Ten Strategic Sectors in the COL



4.1 Top-down Analysis of National Labour Market Statistics

The Top-down analysis mainly utilises labour market statistics obtained from the Labour Force Surveys conducted by the Department of Statistics, Malaysia. The analysis considers three criteria in determining if an occupation is critical:

- i. First, the CSC identifies occupations that are **skilled** based on the categorisation within the Malaysia Standard Classification of Occupations (MASCO) 2013;
- ii. Then, the CSC assesses if each skilled occupation is **sought after** based on selected labour market indicators (LMIs), such as employment and wage growth;
- iii. Finally, the CSC considers if the occupations identified as skilled and sought after is **strategic**, and should be developed in line with Malaysia’s investment and economic goals.

Chart 8: Three Criteria for Critical Occupations in the Top-down Analysis

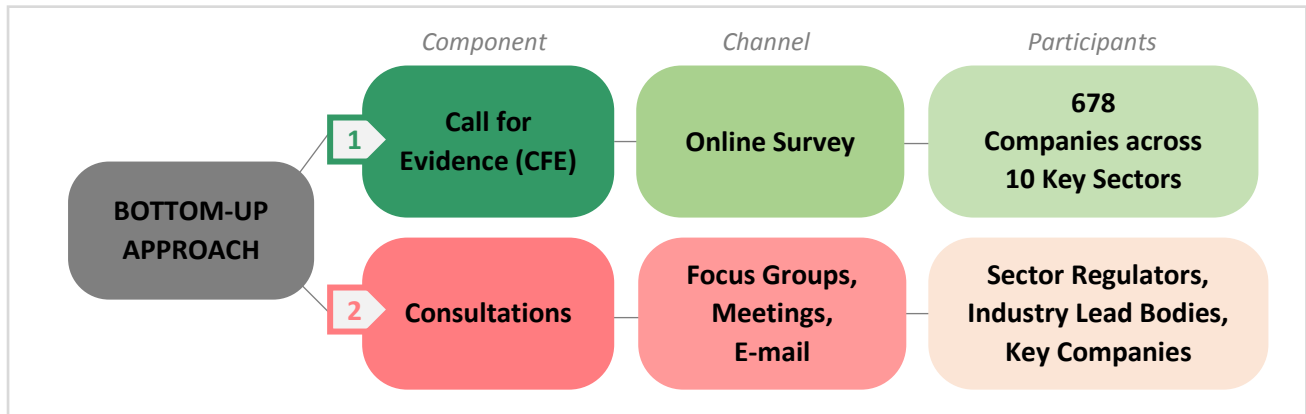


The Top-down analysis in 2016 produced 42 occupations to be nominated as critical, passing all three criteria of being skilled, sought-after and strategic. The Top-down results was then combined with the Bottom-up evidence to produce a preliminary COL list. This process is further discussed in the next section.

4.2 Bottom-up Evidence from Key Stakeholders

The CSC’s Bottom-up approach has two main components: (i) a Call for Evidence (CFE) survey to firms across the ten key sectors, and (ii) consultations with regulators, industry lead bodies and companies.

Chart 9: The Bottom-up Approach

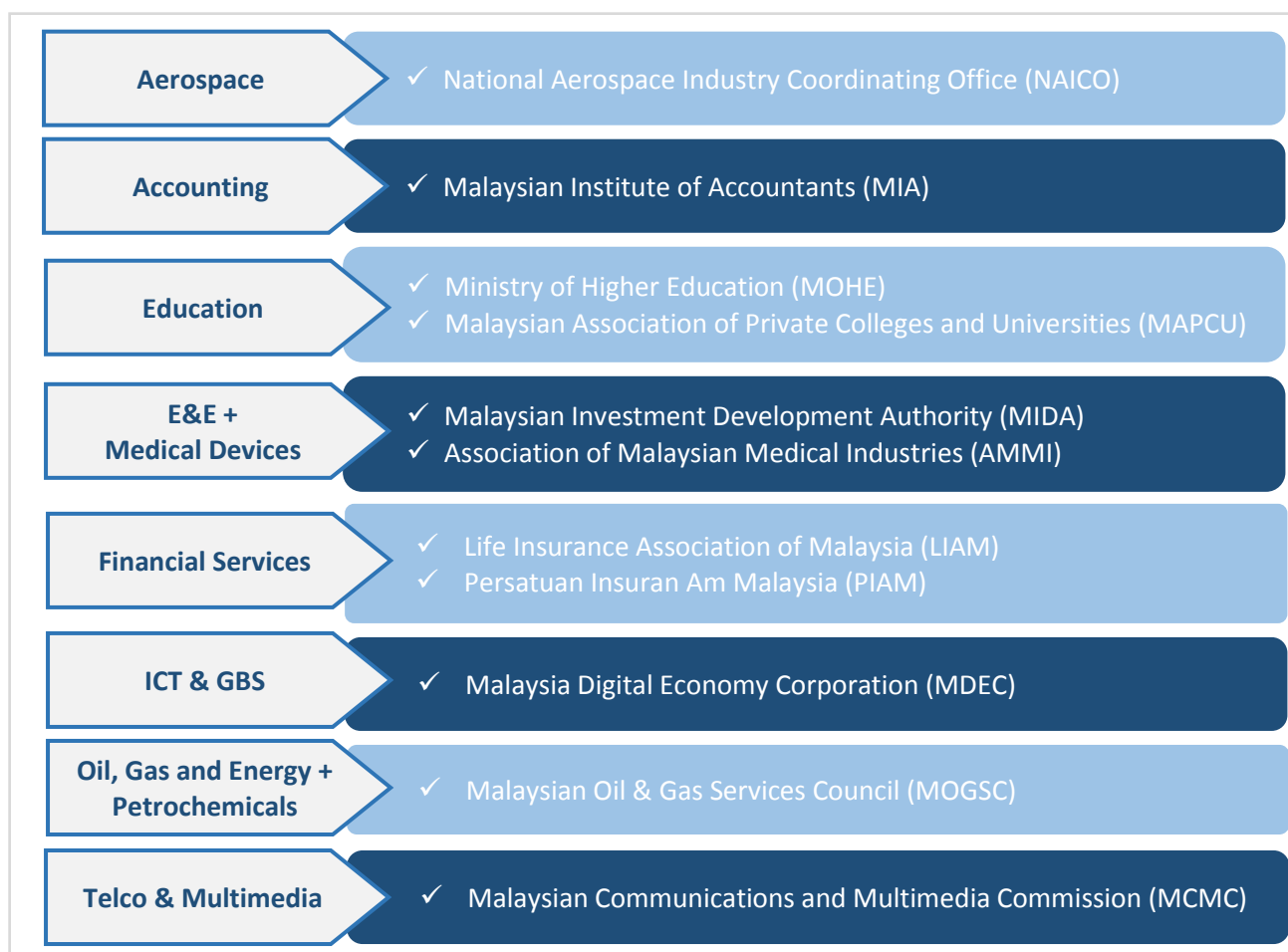


The **Call for Evidence (CFE)** survey was sent to 678 companies across the ten key sectors, to which 187 companies replied (28%). The survey mainly asked participating companies to nominate occupations for the COL and for details on the nominated occupations, such as their hiring experiences with respect to the nominated occupations, reasons for difficulty in hiring and measures they have undertaken to mitigate these challenges. It also provides an open channel for companies to provide the CSC with their feedback at their own convenience.

The selection of companies to participate in the CFE survey was based on consultations with selected regulators and industry lead bodies, to ensure ample and holistic representation across the different value chains within each sector. For example, the CSC ensured that participants from the Oil and Gas sector included both upstream firms and downstream service providers. Sufficient coverage across geographical regions was also accounted for. Across the country, the CSC ensured that firms in the northern (Penang, Kedah) and southern regions (Johor) were covered for the E&E industry, and firms in East Malaysia were surveyed for the Oil and Gas sector. The survey was also circulated to regulators and industry lead bodies, for their information and feedback if necessary. Appendix IV describes in further detail on how the CFE survey was carried out.

In the **consultations**, the CSC met with specific regulators and industry associations that were pre-determined to be representative of the ten key industries, and asked them to nominate jobs that they felt were critical in the industry, citing numbers and reasons where possible. This platform allowed for companies to inform the CSC about any difficulties they faced in hiring for specific positions. Participants were also asked about the latest trends in the industry to get a better understanding of the overall hiring needs. The consultations involved the following regulators and industry associations.

Chart 10: List of Regulators and Industry Associations Consulted by Sector



Source: CSC.

4.3 Dovetailing the Top-down and Bottom-up Findings

The information gathered from the consultations and findings from the CFE survey were combined with the results from Top-down analysis to produce the preliminary COL. We considered each occupation for inclusion in the preliminary COL based on (but not limited to) the following factors:

- ✓ Number of companies that nominated the occupation
- ✓ Employment size of the company relative to the whole industry
- ✓ Number of different sectors that nominated the occupation
- ✓ Presence of the nominated occupation in the previous COL
- ✓ Size of employment and the presence of foreign labour in the nominated occupation
- ✓ Number of vacancies posted for the nominated occupation
- ✓ What actions companies were taking to address shortages in the occupation
- ✓ Comparison with TalentCorp administrative data and checking against sector studies

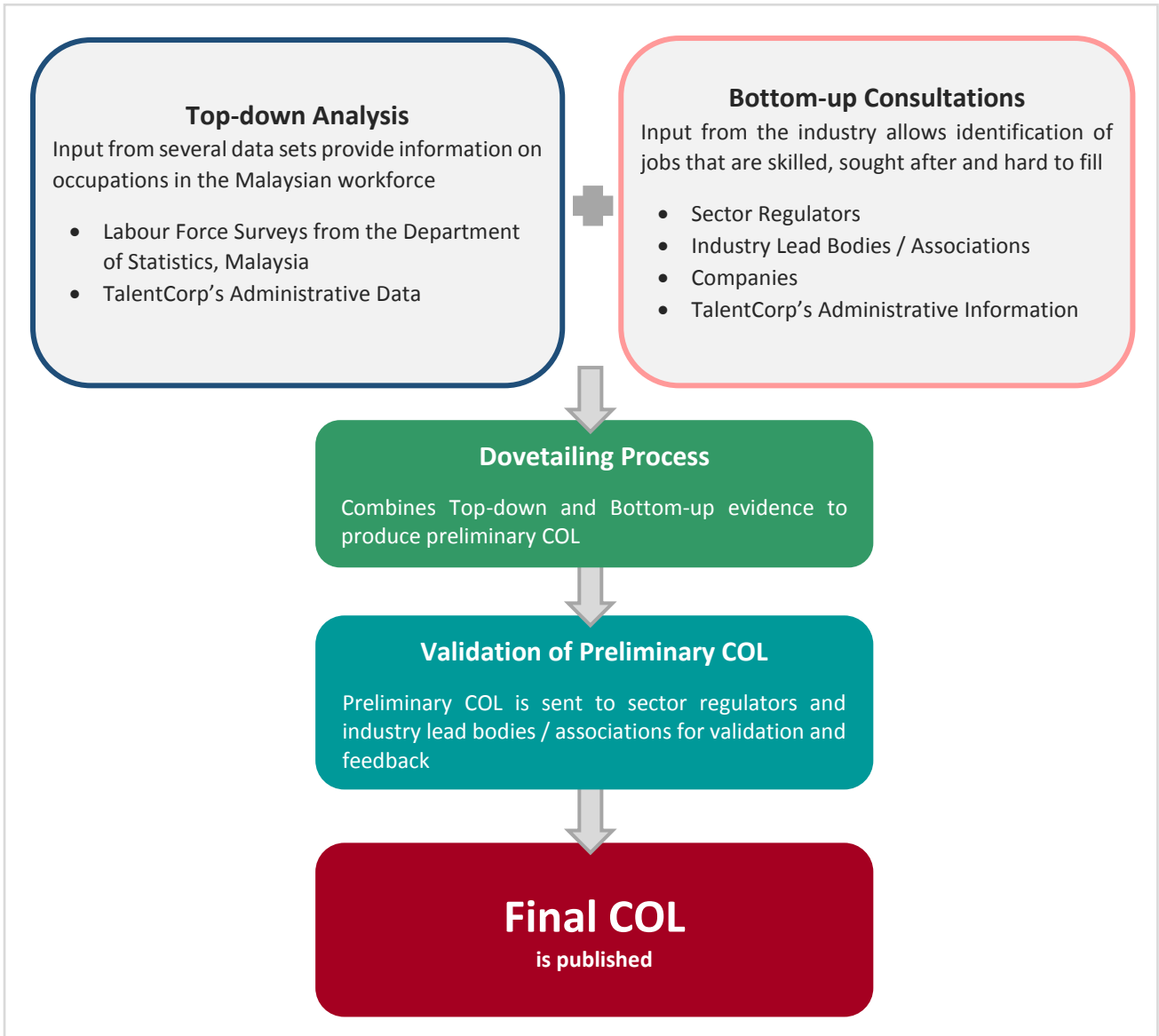
The CSC did a qualitative analysis on these factors, and made relative comparisons between occupations. This holistic approach assessed if the factors indicated a real shortage, and if this shortage has a real business impact on employers.

All jobs are classified by MASCO as 6-digit codes (job titles), and similar 6-digit codes are grouped under the same 4-digit code (occupation). For example, tax consultants (MASCO 6-digit code 2411-13) and liquidators (MASCO 6-digit code 2411-14) are job titles, which are considered to be a subset of accountants (MASCO 4-digit code 2411), an occupation.

If all the job titles in an occupation are very similar, the CSC will include the entire occupation in the COL as long as there are enough job title nominations from companies. However, if an occupation contains job titles that are quite different from one another, the CSC will only include the specific job titles nominated by companies.

Once the preliminary COL was constructed, it was sent to regulators and industry lead bodies for validation. The regulators and industry lead bodies were asked if the occupations in the preliminary COL are considered critical in their respective industries, and for their suggestions to remove or add any occupations to the COL. The regulators and industry lead bodies were generally in agreement with the CFE survey respondents in terms of the occupations that are critical, but also suggested more occupations to add into the list.

Chart 11: Overall Process Flow to Produce the COL



The final COL was constructed upon adjusting the preliminary COL in response to the feedback and validation from the regulators and industry lead bodies and it consists of 48 occupations that are skilled, sought-after and strategic across ten key sectors in Malaysia.

Aside from the 48 occupations listed, there were other occupations and job titles that either passed the Top-down thresholds or were nominated by companies, but were not included in the COL. The underlying reason behind the exclusion is due to insufficient or unconvincing evidence when the Top-down and Bottom-up evidence were analysed together for a particular occupation or job title.

The relevant stakeholders and all of the respondents to the CFE and validation surveys were then notified of the COL's publication on TalentCorp's website in December 2016. The CSC continues to welcome feedback on the COL from these respondents and from the general public.

CHAPTER 5

MALAYSIA'S CRITICAL OCCUPATIONS LIST (COL) 2016/2017

5.1 The Critical Occupations List (COL) 2016/2017

The **Critical Occupations List (COL)** shows occupations that are **skilled, sought-after** and **strategic** across ten key sectors in Malaysia. The annual review of the Critical Occupations List (COL) seeks to ensure that the list remains updated and relevant. As such, the list is bound to have changes in the composition due to additions, continuations, and removals of occupations from the list every year.

In COL 2015/2016, we identified 42 occupations that were critical. These occupations cover six sectors from Oil and Gas, Financial services, Information Communication and Technology (ICT)/Global Business Services, Telecommunication and Multimedia, Electrical and Electronics, and Accounting. In COL 2016/2017 we expanded our sector coverage to four additional sectors: Petrochemicals, Education, Medical Devices and Aerospace. Through this effort, we have identified 48 occupations as critical.

Out of the 48 critical occupations in COL 2016/2017, there are 17 occupations that did not appear in COL 2015/2016. In addition to the effect from the expansion of sector coverage, other reasons for the debut of these occupations are stated in the respective occupation reports. Moreover, 31 occupations continue to remain on the list for the second straight year. We have received updated and consistent evidence regarding the respective occupations warrants that these occupations should remain on the list.

There were 11 occupations that were on COL 2015/2016 but have been removed from COL 2016/2017.

No.	MASCO Code	Occupation
1.	1215	Administrative Managers
2.	2142	Civil Engineers
3.	2145	Chemical Engineers
4.	2423	Personnel and Career Professionals
5.	2431	Advertising and Marketing Professionals
6.	2611	Lawyers
7.	3257	Environmental and Occupational Health Inspectors and Associates
8.	3311	Securities and Finance Dealers and Brokers
9.	3312	Credit and Loans Officers
10.	3313	Accounting Associate Professionals
11.	3512	ICT User Support Technicians

Given the updated methodology and the further review of top-down and bottom-up evidence, the occupations in table 2 are now not considered critical due to a combination of reasons:

1. It did not passed the Top-down indicators
2. We did not receive any nomination from companies this year for some of these occupations.
3. We did not receive any other evidence from industry bodies / sector regulators indicating these occupations are critical.
4. After compiling all the evidence, we felt that the evidence is weak to support its inclusion.

The 48 critical 2016/2017 occupations are listed in table 3 below. For further details on each occupation, please refer to Appendix I and II.

Table 3: Critical Occupations List – Full List (48 Occupations)		
No.	Critical Occupation (MASCO Code)	Additional Information
1	Managing Directors and Chief Executives (1121)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Chief Executive Officer, Chief Operating Officer, Chief Legal Officer, Chief Technical Officer, Chief Medical Officer, Director, Senior Director, Executive Director, Deputy Executive Director, Managing Director, Chairperson, Director-General, General Manager, Operations Manager, Administrator, Chief Information Officer
2	Finance Managers (1211)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Finance Manager, Account Manager, Audit Manager, Audit and Risk Management Manager, Chief Financial Officer, Credit Manager, Insurance Manager, Tax Managers, Underwriting Manager, Financial Crime Compliance Manager, Director of Risk, Claim Manager, Finance Director
3	Human Resource Managers (1212)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> • Human Resource Manager, Training Manager, Industrial Relations Manager, Occupational Safety and Health Manager, Personnel Manager, Recruitment Manager, Learning & Organization Development Manager, Compensation & Benefits Manager, Talent and Organization Performance Manager
4	Policy and Planning Managers (1213)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> • Policy and Planning Manager, Policy and Research Manager, Strategic Planning Manager, Corporate Planning Manager, Project Planning Manager, Project Leader, Programme Manager, Senior Manager (Regulatory Affairs)

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
5	Business Services Managers (1214)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Production and Business Operation Manager, Business Services Development Manager, Production Controller, Compliance Manager, Country Manager
6	Sales and Marketing Managers (1221)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Sales Manager, Marketing Manager, Market Research Manager, Product Manager, Brand Manager, Sales and Marketing Manager
7	Advertising and Public Relations Managers (1222)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Communications Manager, Public Relations Manager, Customer Service Manager, Contact Centre Manager, Call Centre Manager, Contact Centre Team Leader Manager
8	Research and Development Managers (1223)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> • Research and Development Manager, Product Development Manager, Research Manager
9	Manufacturing Managers (1321)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Production and Operation Manager, Factory Manager, Mechanical Manager, Manufacturing Manager
10	Mining Managers (1322)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Production and Operation Manager (Oil and gas extraction), Oil and Gas Extraction Manager, Mining Manager, Senior Project Manager (Engineering, Procurement, Construction, Installation & Commissioning), Drilling, Well Stimulation, Wellbore & Completion Manager
11	Supply, Distribution and Related Managers (1324)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Transport Manager, Shipping Manager, Supply Manager, Warehouse Manager, Distribution Manager, Logistics Manager, Supplier Development Manager, Commercial Fleet Manager

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
12	Information and Communications Technology (ICT) Managers (1511)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Production and Operation Manager (Communications), Information Technology (IT) Manager, Application Development Manager, ICT Development Manager, Network Manager, Database Manager, Computer Security Manager, IT Project Manager, IT Infrastructure Manager, IT Delivery Manager, Creative Multimedia Manager, Technology Transformation Manager, Security Operations Centre (SOC) Manager
13	Geologists and Geophysicists (2114)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Geophysicist, Oil Geologist, Mining Geologist, Petroleum Geoscientist
14	Mathematicians, Actuaries and Statisticians (2121)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Data Scientist, Data Analyst, Data Mining Analyst, Predictive Analyst, Actuarial Science Mathematician, Appointed Actuary, Pricing Actuary, Product Actuary, Chief Actuary
15	Industrial and Production Engineers (2141)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Industrial Engineer, Systems Analyst (Except Computers), Planning Engineer, Cost Evaluation Engineer, Plant Engineer, Package Design Engineer, Analog Integrated Circuit (IC) Package Design Engineer, Material Specialist, Industrial Automation Engineer, Process Development Engineer, Fibre Reinforced Plastic (FRP) Production Engineer
16	Mechanical Engineers (2144)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Machinery and Tools Industrial Engineer, Instruments Mechanical Engineer, Jet Engine Engineer, Automotive Mechanical Engineer, Welding Technologist, Aerospace Mechanical Engineer, Aeronautics Mechanical Engineer, Aero-Material Component Engineer, Technology Technical Engineer, Equipment Engineer, Offshore Equipment Engineer, Instrumentation Engineer, Mechanical Engineer (Design), Mechanical Engineer (Rotating Equipment)
17	Mining Engineers, Metallurgists and Related Professionals (2146)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Natural Gas Mining Engineer, Metallurgist, Petroleum and Natural Gas Engineer, Drilling Engineer, Pipeline Engineer

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
18	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified (2149)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Project Engineer, Process Engineer, Quality Assurance Engineer, Quality Control Engineer, Research Engineer, Materials Engineer, Safety Engineer, Quality Engineer, Commissioning Engineer, Photonic Engineer, Head of Engineering, Method & Process Engineer, Supplier Quality Engineer (Aerospace), Non-Destructive Testing (NDT) Specialist, Sustainable Material & Renewable Specialist
19	Electrical Engineers (2151)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Electrical Testing Engineer, Power Generation Engineer, Embedded System/Firmware Engineer, Power Supply Design Engineer
20	Electronic Engineers (2152)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Electronics Engineer (Computer Hardware Design) Computer Engineer (Software), Systems Engineer, Information Technology Engineer, Semiconductor Electronics Engineer, Instrumentation Engineer, Pre-Silicon Validation Engineer, Printed Circuit Board (PCB) Design Engineer, Product Characterization Engineer, Computer-aided Design (CAD)/Computer-aided Manufacturing (CAM) Engineer, Product Development Engineer, Test Development Engineer, Wirebond Engineers, Leadframe Engineers, Field Application Engineer, Board Support Package (BSP) Embedded Engineer, Surface Mount Technology (SMT) Engineer
21	Telecommunications Engineers (2153)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Telecommunications Engineer (Signal Systems), Telecommunications Engineer (Microwave), Broadcast Engineer, Data Network Engineer, Value-added Service (VAS) Engineer, Network Architect, Network Designer, Network Planner, Network Optimisation Engineer, Transmission Network Engineer, IP Engineer, Network and Systems Engineer, Network Tester, Network Performance Engineer, Site and Construction Engineer (Telecommunications)
22	Building Architects (2161)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Architect, Interior Architect, Building Architect

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
23	Cartographers and Surveyors (2165)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Marine Surveyor, Land Surveyor, Railway Surveyor, Survey Engineer
24	Graphic and Multimedia Designers (2166)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Web Designer, Graphic Designer, Designer, Digital Artist, Animator, Screenwriter, 3D Artist, 3D Modeller
25	Ships Engineers (2171)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Aircraft Engineer, Aircraft Design Engineer, Aeronautical Engineer, Structural & Stress Engineers, Tooling Design Engineer
26	Aircraft Pilots and Related Professionals (2173)	<p>The following job title within this occupation is included:</p> <ul style="list-style-type: none"> • Pilot
27	Manufacturing Professionals (2182)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Manufacturing Executive, Quality Assurance Executive, Quality Control Executive, Maintenance Executive, Procurement Engineer, Manufacturing Quality Controller Executive, Product Quality Controller
28	University and Higher Education Professional Teachers (2311)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • University Lecturer, University Lecturer (Clinical – Medicine), University Lecturer (IT), University Lecturer (Engineering), University Lecturer (Actuarial Science)
29	Accountants (2411)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Certified Accountant, Tax Accountant, Tax Consultant, Liquidator, Management Accountant, Bank Accounting Analyst, Financial Controller, Auditor, Audit and Risk Assessment Executive, Project Accountant, Compliance Analyst, GST Specialist

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
30	Financial and Investment Advisers (2412)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Corporate Financial Adviser, Financial and Investment Adviser, E-Commerce Adviser, Bank Executive Officer, Financial Planner, Investment Consultant, Finance Executive
31	Financial Analysts (2413)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Finance Analyst, Fraud Specialist, Risk Operation Analyst, Pricing Analyst, Research Analyst, Investment Analyst, Rating Analyst, Financial Condition Management Analyst
32	Management and Organization Analysts (2421)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> Organization and Methods Analyst, Research and Information Analyst, Operation Research Analyst, Management Consultant, Business Consultant, Strategy Analyst,
33	Information and Communications Technology (ICT) Sales Professionals (2434)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Product Support Engineer, Product Development Engineer, IT Sales Engineer, Customer Support Representative, Engineering and Technical Operations
34	Systems Analysts (2511)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Electronic Data Processing Analyst, Management Information Systems (MIS) Analyst, Computer Systems Analyst, IT Systems Consultant, IT Business Analyst, IT Security Analyst, .Net Consultant, .Net Application Consultant, Java Consultant, IT System Analyst (JDE), Enterprise Systems Specialist, IT Specialist (SAP), Integrated Circuit (IC) Designer (IT), Technical Helpdesk Analyst
35	Software Developers (2512)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Software Developer, Software Designer, Software Engineer, Design Engineer, Application Developer (.Net), Java Developer, Hypertext Preprocessor (PHP) Developer, System Architect (IT), Software Analyst, OpenText Developer, BIOS Engineer

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
36	Applications Programmers (2514)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Systems Programmer, Analyst Programmer, Applications Programmer, .Net Programmer, C/C++ Programmer, Cobol Programmer, Java Programmer, Hypertext Preprocessor (PHP) Programmer, Android/iOS Programmer, Animation Programmer, Computer Games Programmer, User Interface (UI)/ Gameplay Coders, Game Engine Programmers, Computer Infrastructure Specialist
37	Software and Applications Developers Not Elsewhere Classified (2519)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> Quality Assurance Analyst (IT), Test Engineer (IT), Solution Architect (IT), Software Quality Assurance Engineer (IT), Application Consultant
38	Databases and Administrators (2521)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> Database Architect, Database Analyst, Database Administrator, Database Designer, Computer Auditor, Oracle Database Engineer, Structured Query Language (SQL) Database Engineer, Data Warehouse Specialist
39	Systems Administrators (2522)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Project Coordinator (IT), Computer Support Engineer, System Engineer (IT), SAP Application Administrator, Cloud Computing Solution Architect, Web and Mobility Developer
40	Computer Network Professionals (2523)	<p>ALL job titles within this occupation are included, for example:</p> <ul style="list-style-type: none"> Network Analyst, Network Services Consultant, Network Administrator, Network Infrastructure Administrator, Network Engineer, Network Systems Engineer, Cloud Specialist, Radio Network Planning Consultant, Network Performance Consultant, IT Network System Engineer
41	Database and Network Professionals Not Elsewhere Classified (2529)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Digital Forensic Specialist, Security Specialist (IT), IT Security Architect, Penetration Testers
42	Film, Stage and Related Directors and Producers (2844)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> Multimedia Producer, Motion Picture Producer, Television Producer, Scriptwriter

Table 3: Critical Occupations List – Full List (48 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
43	Electrical Engineering Technicians (3113)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Electrical Technician, Debug Technician
44	Electronics Engineering Technicians (3114)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Electronics Technician, Test Technician, Computer-aided Design (CAD)/Computer-aided Manufacturing (CAM) Technician
45	Mechanical Engineering Technicians (3115)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Aerospace (Mechanical) Engineering Technician, Aeronautical Engineering Technician, Mechanical Engineering Technician (Industrial Machinery and Tools), Aeronautical (Mechanical) and Equipment Engineering Assistant, Computer Numerical Control (CNC) Technician, Welding Technician, Hydraulic Workover Unit Supervisor
46	Aircraft Technicians (3151)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Aircraft Technician, Aircraft Service Technician, Aircraft Maintenance Technician (Airframes)
47	Valuers and Loss Assessors (3315)	<p>The following job title within this occupation is included:</p> <ul style="list-style-type: none"> • Claims Assessor
48	Insurance Underwriter* (3321)	<p>The following job titles within this occupation are included:</p> <ul style="list-style-type: none"> • Insurance Underwriter, Reinsurance Underwriter

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

*Based on MASCO Code 3321-03, under MASCO Code 3321 (Insurance Agents)

5.2 Critical Occupations in Ten Key Sectors

Ten key sectors were selected for consideration in the COL - (i) Aerospace, (ii) Electrical and Electronics (E&E), (iii) Medical Devices, (iv) Telecommunications and Multimedia, (v) Information and Communications Technology (ICT) and Global Business Services (GBS), (vi) Financial Services, (vii) Professional Services (Accounting), (viii) Oil, Gas & Energy, (ix) Petrochemicals and (x) Education. The Medical Devices sector is grouped with E&E, and the Petrochemicals sector with Oil and Gas. This is due to the presence of overlapping companies or information between the industries grouped together. The following list lists the critical occupations in the respective sectors. However, these occupations and job titles are put in an easy manner to read. They should be referenced together with their respective occupation report to have a good understanding of its inclusion.

Critical Occupations in the Aerospace Sector

Table 4: Critical Occupations List – Aerospace Sector			
No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1223	Research and Development Managers	Research and Development Manager, Product Development Manager
2	1321	Manufacturing Managers	Manufacturing Manager, Factory Manager
3	1324	Supply, Distribution and Related Managers	Supplier Development Engineer / Manager
4	2141	Industrial and Production Engineers	Automation Engineer, Planning Engineer, Cost Evaluation Engineer, Plant Engineer, Material Specialist, Industrial Automation Engineer, Process Development Engineer
5	2144	Mechanical Engineers	Machinery and Tools Industrial Engineer, Jet Engine Engineer, Welding Technologist, Aerospace Mechanical Engineer, Aeronautics Mechanical Engineer, Aero-Material Component Engineer

Table 4: Critical Occupations List – Aerospace Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
6	2149	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified	Materials Engineer, Quality Engineer, Supplier Quality Engineer (Aerospace), Non-destructive Testing (NDT) Specialist, Sustainable Material & Renewable Specialist
7	2152	Electronic Engineers	Computer Engineer (Software)
8	2171	Ships Engineers	Aircraft Engineer, Structural & Stress Engineers, Tooling Design Engineer
9	2173	Aircraft Pilots and Related Professionals	Pilot
10	2182	Manufacturing Professionals	Manufacturing Executive, Quality Assurance Executive, Quality Control Executive, Maintenance Executive, Manufacturing Quality Controller Executive, Product Quality Controller, Procurement Engineer
11	2413	Financial Analysts	Pricing Analyst
12	2514	Applications Programmers	Applications Programmer, C/C++ Programmer
13	3114	Electronics Engineering Technicians	Computer-aided Design (CAD)/Computer-aided Manufacturing (CAM) Technician
14	3115	Mechanical Engineering Technicians	Aerospace (Mechanical) Engineering Technician, Aeronautical Engineering Technician, Mechanical Engineering Technician, Aeronautical (Mechanical) and Equipment Engineering Assistant, Computer Numerical Control (CNC) Technician, Welding Technician
15	3151	Aircraft Technicians	Aircraft Service Technician, Aircraft Maintenance Technician (Airframes)

Critical Occupations in the Electrical & Electronics Sector (Including Machinery, Equipment and Medical Devices)

Table 5: Critical Occupations List – Electrical & Electronics Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1121	Managing Directors and Chief Executives	Director
2	1211	Finance Managers	Account Manager, Tax Managers
3	1223	Research and Development Managers	Research and Development Manager, Product Development Manager
4	1321	Manufacturing Managers	Manufacturing Manager, Manufacturing Production and Operation Manager, Factory Manager
5	2141	Industrial and Production Engineers	Industrial Engineer, Process Development Engineer, Analog Integrated Circuit (IC) Package Design Engineer
6	2144	Mechanical Engineers	Automotive Mechanical Engineer, Equipment Engineer, Mechanical Engineer (Instruments)
7	2149	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified	Process Engineer, Quality Assurance Engineer, Research Engineer, Photonic Engineer, Commissioning Engineer
8	2151	Electrical Engineers	Electrical Testing Engineer, Embedded System/Firmware Engineer
9	2152	Electronic Engineers	Electronics Engineer (Computer Hardware Design), Computer Engineer (Software), Information Technology Engineer, Electronics Engineer (Semiconductors), Printed Circuit Board (PCB) Design Engineer, Principal Engineers, Product Development Engineer & Test Dev Engineer, Leadframe Engineers, Wirebond Engineer, Surface Mount Technology (SMT) Engineer
10	2182	Manufacturing Professionals	Manufacturing Executive
11	2411	Accountants	Certified Accountant
12	2412	Financial and Investment Advisers	Finance Executive

Table 5: Critical Occupations List – Electrical & Electronics Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
13	2413	Financial Analysts	Financial Analyst
14	2434	Information and Communications Technology (ICT) Sales Professionals	Engineering and Technical Operations, Product Support Engineer
15	2511	Systems Analysts	.Net Consultant
16	2512	Software Developers	Software Designer, Application Developer (.Net)
17	2522	Systems Administrators	SAP Application Administrator
18	3113	Electrical Engineering Technicians	Debug Technician, Electrical Technician
19	3114	Electronics Engineering Technicians	Electronics technicians, Test Technician
20	3115	Mechanical Engineering Technicians	Mechanical Engineering Technician (Industrial Machinery and Tools)

Critical Occupations in the Telecommunications & Multimedia Sector

Table 6: Critical Occupations List – Telecommunications & Multimedia Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1121	Managing Directors and Chief Executives	Administrator, Chief Information Officer, Executive Vice President, Vice President, Managing Director, Chief Technology Officer, Director, Senior Director
2	1211	Finance Managers	Account Manager
3	1213	Policy and Planning Managers	Senior Manager (Regulatory Affairs), Project Planning Manager
4	1214	Business Services Managers	Business Development Manager
5	1221	Sales and Marketing Managers	Sales Manager
6	1511	Information and Communications Technology (ICT) Managers	Production and Operation Manager (Communications)
7	2153	Telecommunications Engineers	Value-added Service (VAS) Engineer, Network Architect, Network Designer, Network Planner, Network Optimisation Engineer, Transmission Network Engineer, IP Engineer, Network and Systems Engineer, Network Tester, Network Performance Engineer, Site and Construction Engineer (Telecommunications)
8	2166	Graphic and Multimedia Designers	Animator, 3D Artist
9	2421	Management and Organization Analysts	Strategy Analyst, Business Analyst
10	2434	Information and Communications Technology (ICT) Sales Professionals	Product Development Engineer
11	2511	Systems Analysts	.Net Consultant

Table 6: Critical Occupations List – Telecommunications & Multimedia Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
12	2512	Software Developers	Software Engineer
13	2519	Software and Applications Developers Not Elsewhere Classified	Solution Architect (IT), Software QA Engineer
14	2521	Database Designers and Administrators	Database Architect, Database Administrator, Database Designer, Computer Auditor
15	2522	Systems Administrators	System Engineer (IT), Cloud Computing Solution Architect, Web and Mobility Developer
16	2529	Database and Network Professionals Not Elsewhere Classified	Digital Forensic Specialist, Security Specialist (IT), IT Security Architect, Penetration Testers
17	2844	Film, Stage and Related Directors and Producers	Television Producer

Critical Occupations in the Information and Communications Technology (ICT) & Global Business Services (GBS) Sector

Table 7: Critical Occupations List – ICT & GBS Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1121	Managing Directors and Chief Executives	Chief Executive Officer, Operations Manager
2	1211	Finance Managers	Audit and Risk Management Manager, Tax Managers
3	1214	Business Services Managers	Business Development Manager
4	1222	Advertising and Public Relations Managers	Communications Manager, Public Relations Manager, Customer Service Manager, Contact Centre Manager, Call Centre Manager, Contact Centre Team Leader Manager
5	1511	Information and Communications Technology (ICT) Managers	Information Technology Manager, Computer Security Manager, Information Technology Project Manager, Creative Multimedia Manager, Security Operations Centre (SOC) Manager
6	2121	Mathematicians, Actuaries and Statisticians	Data Scientist, Data Analyst, Data Mining Analyst
7	2144	Mechanical Engineers	Technology Technical Engineer
8	2151	Electrical Engineers	Embedded System/ Firmware Engineer
9	2152	Electronic Engineers	Systems Engineer
10	2166	Graphic and Multimedia Designers	Web Designer, Graphic Designer, Designer, Digital Artist, Animator, Screenwriter, 3D Artist, 3D Modeller
11	2411	Accountants	Tax Accountant, Management Accountant, Account Executive, Bank Accounting Analyst, Auditor, Compliance Analyst

Table 7: Critical Occupations List – ICT & GBS Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
12	2412	Financial and Investment Advisers	E-Commerce Adviser
13	2413	Financial Analysts	Financial Analyst
14	2434	Information and Communications Technology (ICT) Sales Professionals	Information Technology Sales Engineer, Customer Support Representative, Product Development Engineer
15	2511	Systems Analysts	Electronic Data Processing Analyst, IT Business Analyst, .Net Consultant, Java Consultant, IT Specialist (SAP), Security Analyst (IT), Integrated Circuit (IC) Designer (IT), Technical Helpdesk Analyst
16	2512	Software Developers	Software Developer, Software Designer, Software Engineer, Java Developer, OpenText Developer
17	2514	Applications Programmers	Systems Programmer, Analyst Programmer, Applications Programmer, .Net Programmer, C/C++ Programmer, Cobol Programmer, Java Programmer, Hypertext Preprocessor (PHP) Programmer, Android/iOS Programmer, Animation Programmer, Computer Games Programmer, User Interface (UI)/ Gameplay Coders, Game Engine Programmers, Computer Infrastructure Specialist
18	2519	Software and Applications Developers Not Elsewhere Classified	Test Engineer (IT), Solution Architect (IT), Software Quality Assurance Engineer (IT)
19	2521	Databases and Administrators	Database Architect, Database Designer, Oracle Database Specialist Structured Query Language (SQL) Database Administrator
20	2522	Systems Administrators	Systems Administrator, Project Coordinator (IT), Computer Support Engineer
21	2523	Computer Network Professionals	Network Administrator, Network Engineer
22	2529	Database and Network Professionals Not Elsewhere Classified	Digital Forensic Specialist, Security Specialist (IT), IT Security Architect, Penetration Testers
23	2844	Film, Stage and Related Directors and Producers	Motion Picture Producer, Television Producer

Critical Occupations in the Financial Services Sector (Including Takaful and Insurance activities)

Table 8: Critical Occupations List – Financial Services Sector			
No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1121	Managing Directors and Chief Executives	Chief Executive Officer, Chief Operating Officer, Chief Medical Officer
2	1211	Finance Managers	Finance Manager, Audit and Risk Management Manager, Credit Manager, Insurance Manager, Tax Managers, Underwriting Manager, Financial Crime Compliance Manager, Claims Manager
3	1212	Human Resource Managers	Human Resource Manager
4	1214	Business Services Managers	Compliance Manager
5	1221	Sales and Marketing Managers	Marketing Manager, Market Research Manager, Product Manager
6	1223	Research and Development Managers	Product Development Manager
7	1511	Information and Communications Technology Managers	Chief IT Officer, IT Project Manager, IT Delivery Manager, Change Management (IT)
8	2121	Mathematicians, Actuaries and Statisticians	Actuarial Science Mathematician, Data Analyst, Appointed Actuary, Pricing Actuary, Product Actuary
9	2411	Accountants	Accountant, Audit and Risk Assessment Executive
10	2412	Financial and Investment Advisers	Corporate Financial Adviser, Financial and Investment Adviser
11	2413	Financial Analysts	Pricing Analyst, Research Analyst, Investment Analyst, Fraud Specialist, Rating Analyst, Financial Condition Management Analyst

Table 8: Critical Occupations List – Financial Services Sector

No.	MASCO	Critical Occupation	Job Titles
			<i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
12	2421	Management and Organization Analysts	Business Consultant
13	2434	Information and Communications Technology (ICT) Sales Professionals	ICT Sales Application Engineer, Product Development Engineer
14	2511	Systems Analysts	Computer Systems Analyst, IT Business Analyst, IT System Analyst (JDE), Enterprise Systems Specialist (IT)
15	2512	Software Developers	Software Developer, Pega Specialist
16	2514	Applications Programmers	Applications Programmer
17	2519	Software and Applications Developers and Analysts Not Elsewhere Classified	Application Consultant
18	2521	Database Designers and Administrators	Computer Auditor
19	3315	Valuers and Loss Assessors	Claims Assessor
20	3321	Insurance Underwriter*	Claim Underwriter, Reinsurance Underwriter

*Based on MASCO Code 3321-03, under MASCO Code 3321 (Insurance Agents)

Critical Occupations in the Accounting Sector

Table 9: Critical Occupations List – Accounting Sector			
No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	2411	Accountants	Certified Accountant, Tax Accountant, Tax Consultant, Liquidator, Account Executive, Financial Controller, Auditor, GST Specialist
2	2413	Financial Analysts	Fraud Specialists

Critical Occupations in the Oil, Gas & Energy Sector (Including Petrochemicals)

Table 10: Critical Occupations List – Oil, Gas and Energy Sector			
No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1211	Finance Managers	Finance Manager, Audit Manager, Tax Managers
2	1212	Human Resource Managers	Human Resource Manager
3	1213	Policy and Planning Managers	Project Leader
4	1214	Business Services Managers	Country Manager
5	1322	Mining Managers	Production and Operation Manager (Oil and gas extraction), Oil and Gas Extraction Manager, Mining Manager, Senior Project Manager (Engineering, Procurement, Construction, Installation & Commissioning), Drilling, Well Stimulation, Wellbore & Completion Manager
6	2114	Geologists and Geophysicists	Geophysicist, Oil Geologist, Mining Geologist, Petroleum Geoscientist
7	2141	Industrial and Production Engineers	Process Development Engineer, Fibre Reinforced Plastic (FRP) Production Engineer
8	2144	Mechanical Engineers	Equipment Engineer, Offshore Installation Managers Mechanical Engineer (Design), Mechanical Engineer (Rotating Equipment), Offshore Equipment Engineer
9	2146	Mining Engineers, Metallurgists and Related Professionals	Drilling Engineer
10	2149	Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified	Process Engineer, Head of Engineering, Method & Process Engineer

Table 10: Critical Occupations List – Oil, Gas and Energy Sector

No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
11	2411	Accountants	Accountant
12	2511	Systems Analysts	IT Analyst
13	3115	Mechanical Engineering Technicians	Mechanical Engineering Technician, Hydraulic Workover Unit Superintendent / Supervisor

Critical Occupations in the Education Sector

Table 11: Critical Occupations List – Education Sector			
No.	MASCO	Critical Occupation	Job Titles <i>(Based on bottom-up feedback, input from sector regulators and administrative data)</i>
1	1213	Policy and Planning Managers	Senior Manager (Regulatory Affairs)
2	1221	Sales and Marketing Managers	Sales and Marketing Manager
3	2311	University and Higher Education Professional Teachers	University Lecturer, University Lecturer (Clinical – Medicine), University Lecturer (IT), University Lecturer (Engineering), University Lecturer (Actuarial Science)
4	2511	Systems Analysts	.Net Application Consultant

5.3 Detailed evidence on the Critical Occupations

Detailed evidence justifying the inclusion of each occupation into the COL is shown in following pages. Evidence includes data from the Department of Statistics Malaysia (DOSM) and input from stakeholders (regulators, companies, and trade associations).

Occupation: Managing Directors and Chief Executives

MASCO 2013 (4-Digit Code): 1121

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

Chief Executive Officer, Chief Operating Officer, Chief Legal Officer, Chief Technical Officer, Chief Medical Officer, Director, Senior Director, Executive Director, Deputy Executive Director, Managing Director, Chairperson, Director-General, General Manager, Operations Manager, Administrator, Chief Information Officer

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	87.58	4. Median wage growth - 1 year	-25.56
2. Employment growth - 3 years	-1.19	5. Median wage growth - 3 years	28.85
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	2.01

Bottom-up evidence:

General qualifications needed:

Bachelors or Masters

Note: Some companies require specialised professional qualifications

This is a debut occupation in COL 2016/2017 for the following reasons:

- i. We received evidence from 7 companies reporting a total of 6 vacancies and 57 employed persons (10% vacancy) from the following sectors: Financial Services (including Takaful/Insurance services), Oil, Gas & Energy (including Petrochemicals), Healthcare (including Medical Devices and Pharmaceutical), Telecommunications & Multimedia, and Fast-moving Consumer Goods.
- ii. Most companies took more than six months to fill up the vacancies for this occupation. All companies reported the position is just as hard or harder to fill compared to a year ago. However, the companies have different opinions about the future, with three firms anticipating that the positions would be easier to fill.
- iii. We were told by the companies that the key reason this occupation is hard to fill is due to the lack of applicants with sufficient experience and non-technical skills.
- iv. Consultation with LIAM indicated that a member company is having difficulty finding experienced chief medical officers who can oversee the underwriting reports.
- v. Using TalentCorp administrative data, we also identified that a significant portion of managing directors and chief executives are in demand.
- vi. On the strategies to address these shortages, companies have reported increasing international recruitment efforts, followed by raising wages and expanding local recruitment efforts.

Occupation: Finance Managers**MASCO 2013 (4-Digit Code):** 1211**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Finance Manager, Account Manager, Audit Manager, Audit and Risk Management Manager, Chief Financial Officer, Credit Manager, Insurance Manager, Tax Managers, Underwriting Manager, Financial Crime Compliance Manager, Director of Risk, Claim Manager, Finance Director

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	11.91	4. Median wage growth - 1 year	-11.67
2. Employment growth - 3 years	4.41	5. Median wage growth - 3 years	32.50
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	-0.27

Bottom-up evidence:**General qualifications needed:**

Bachelors or at least Diploma

Note: Some companies require specialised professional certification.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. Despite the weak Top-down evidence, we placed a heavier emphasis on Bottom-up evidence given the frequency that this occupation was nominated by companies across industries.
- ii. We received evidence from 19 companies reporting a total of 75 vacancies and 576 employed persons (13% vacancy) from the following sectors: Business Services, Healthcare (including Medical Devices and Pharmaceutical), Telecommunications & Multimedia, Oil, Gas & Energy (including Petrochemicals), Information & Communications Technology, Financial Services (including Takaful/Insurance services), and Manufacturing.
- iii. Majority of the companies took more than two months to fill up the vacancies for this occupation. Half of the companies reported that the occupation is harder to fill compared to one year ago, and believed that the occupation will be harder to fill in the near future.
- iv. We were told by the companies that the key reasons this occupation is hard to fill is due to the lack of applicants with the relevant experience, technical skills and other non-technical skills. The companies also reported that the salary expectations by applicants are beyond what they can offer. Additionally, the companies also indicated that there is strong competition from other industries.
- v. Companies have reported raising wages, hiring less well qualified applicants and expanding local and international recruitment efforts to address the shortages of finance managers.

Bottom-up evidence (continuation):

- vi. Due to difficulties in hiring for this position, the companies have reported increasing the workload for current employees. The companies also indicated that they faced difficulty in meeting product or service objectives.
- vii. Given the strategic role this occupation plays in an organisation, we decided that based on the Bottom-up evidence that this occupation should remain in the COL.

Occupation: Human Resource Managers**MASCO 2013 (4-Digit Code):** 1212**All job titles within this occupation are included in the Critical Occupations List (COL):**

Human Resource Manager, Training Manager, Industrial Relations Manager, Occupational Safety and Health Manager, Personnel Manager, Recruitment Manager, Learning & Organization Development Manager, Compensation & Benefits Manager, Talent and Organization Performance Manager

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data

Top-down data:

This occupation passes 2 out of 3 indicators from Top-down evidence

1. Employment growth - 1 year	54.19	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	92.33	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors

This debut occupation is in the COL 2016/2017 for the following reasons:

- i. We received evidence from 3 companies for the nomination of this occupation from the following sectors: Healthcare (including Medical Devices and Pharmaceutical) and Oil, Gas & Energy (including Petrochemicals).
- ii. With regards to why human resource manager positions are hard to fill, companies cited that the applicants lack the relevant job experience and other required skills.
- iii. To mitigate this shortage, companies reported expanding local recruitment efforts and outsourcing.
- iv. Specific consultation with a large Oil & Gas company highlighted that there is a demand for human resource managers specialising in change management (additionally the job requires an understanding of the Oil & Gas business).
- v. Our consultation with LIAM indicated that human resource managers are in demand in the insurance industry. Expertise in change management is again mentioned as a critical function which is needed to drive transformation and innovation in companies.
- vi. TalentCorp administrative data indicated that there is a demand for human resource managers by companies.
- vii. The companies have reported increasing the workload for their current employees due to the position being hard to fill. They have also indicated that they faced the issue of decreasing ability to develop new products.

Occupation: Policy and Planning Manager**MASCO 2013 (4-Digit Code):** 1213**All job titles within this occupation are included in the Critical Occupations List (COL):**

Policy and Planning Manager, Policy and Research Manager, Strategic Planning Manager, Corporate Planning Manager, Project Planning Manager, Project Leader, Programme Manager, Senior Manager (Regulatory Affairs)

Evidence received from:

Bottom-up data (CFE survey); Malaysia Communications and Multimedia Commission (MCMC); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors or Masters

Note: One company indicated that they require applicants to have specialised professional certification

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 6 companies reporting 19 vacancies and 121 employed (15.7% vacancy) from the following sectors: Financial Services (including Takaful/Insurance services), Business Services, Oil, Gas & Energy (including Petrochemicals), Telecommunications & Multimedia, and Professional Services.
- ii. Most companies reported taking between one to two months to fill positions in this occupation. Half of the companies reported that the position is much harder to fill compared to one year ago and believed that this trend will continue in the near future.
- iii. With regards to why policy and planning manager positions are hard to fill, companies cited that applicants lacked the relevant job experience and technical skills. Applicants also expected salaries beyond what companies can offer.
- iv. We were told by the companies that this occupation is hard to fill nationwide, and some companies reported facing overseas competition.
- v. To address this shortage, companies have reported raising wages for current employees, and expanding local and international recruitment efforts.
- vi. Because of this shortage, companies have indicated that they have experienced a decreased in financial performance and operational efficiency.

Occupation: Business Services Managers**MASCO 2013 (4-Digit Code): 1214****Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Production and Business Operation Manager, Business Services Development Manager, Production Controller, Compliance Manager, Country Manager

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Malaysian Investment Development Authority (MIDA); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation passes 3 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	4.85	4. Median wage growth - 1 year	16.00
2. Employment growth - 3 years	40.81	5. Median wage growth - 3 years	45.00
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	-0.46

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: One of the company indicated that they are open to SPM/Diploma holder provided they have the requisite work background/ experience

This occupation appeared on COL 2015/2016 . The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 4 companies reporting a total of 8 vacancies and 45 employed persons (18% vacancy) from the following sectors: Oil, Gas & Energy, Telecommunications & Multimedia, and Financial Services (including Takaful/Insurance services).
- ii. Responses vary on the duration of vacancies, ranging from one month to more than six months. Most companies reported that the occupation is harder to fill now than a year ago, and all the companies expect the occupation to be harder to fill in the near future.
- iii. We were told by the companies that the primary reasons that this occupation is hard to fill are due to the job applicants lacking the required technical skills or having the required job experience. Additionally, majority of the companies also reported facing overseas competition for these workers.
- iv. On the strategies to address these shortages, the companies reported raising wages and hiring less well qualified applicants. This is also reflected in the Top-down median wage growth indicators.
- v. A large financial service company specifically highlighted the shortage of compliance manager (including financial crime compliance) due to an increasing demand to meet local and international regulatory requirements.

Bottom-up evidence (continuation):

- vi. Further consultation with MDEC indicated that IT business development managers are highly sought after.

Occupation: Sales and Marketing Managers			
MASCO 2013 (4-Digit Code): 1221			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Sales Manager, Marketing Manager, Market Research Manager, Product Manager, Brand Manager, Sales and Marketing Manager	
Partner evidence received from: Top-down data; Bottom-up data (CFE survey); Persatuan Insuran Am Malaysia (PIAM); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data			
Top-down data: This occupation passes 1 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	2.04	4. Median wage growth - 1 year	5.00
2. Employment growth - 3 years	-19.52	5. Median wage growth - 3 years	20.00
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	3.44
Bottom-up evidence:			
General qualifications needed: Bachelors or at least Advanced Diploma Note: One of the company indicated that they are open to SPM/Diploma holder provided they have the requisite work background/ experience			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 6 companies reporting a total of 100 vacancies and 796 employed persons (13% vacancy) from the following sectors: Education, Telecommunications & Multimedia, Financial Services (including Takaful/Insurance services), Fast-moving Consumer Goods and Other Manufacturing. ii. Companies reported having too few job applicants, applicants lacking experience, applicants lacking non-technical skills and strong competition from other sectors as the primary reasons that this occupation is hard to fill. iii. As a result of shortage, companies have reported increasing workload for current employees, losing revenue and business to competitors, and having difficulty in meeting customer service objectives. iv. To address the shortage, most companies reported raising wages, hiring less qualified applicants, and expanding local recruitment efforts. v. Our consultation session with PIAM indicated that vacancies for this occupation tends to be high due to the high turnover rate. 			

Occupation: Advertising and Public Relations Managers			
MASCO 2013 (4-Digit Code): 1222			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Communications Manager, Public Relations Manager, Customer Service Manager, Contact Centre Manager, Call Centre Manager, Contact Centre Team Leader Manager	
Evidence received from: Top-down data; Malaysia Digital Economy Corporation (MDEC); TalentCorp administrative data			
Top-down data: This occupation passes 2 out of 3 indicators from Top-down evidence			
1. Employment growth - 1 year	22.96	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	40.58	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	NA
Bottom-up evidence:			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. Our consultation with MDEC highlighted that contact centre team leader manager is a critical job in the shared services industry. A study conducted by MDEC reflected that there is a significant headcount and a substantial number of vacancies, indicating that this job title is sought after. ii. TalentCorp administrative data shows that job titles like communications manager, customer service manager, and call centre manager are highly sought after. 			
Note: We did not receive survey information from any employers with regards to this occupation.			

Occupation: Research and Development Managers			
MASCO 2013 (4-Digit Code): 1223			
All job titles within this occupation are included in the Critical Occupations List (COL):		Research and Development Manager, Product Development Manager, Research Manager	
Evidence received from: Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Bachelors or PhD Note: One company indicated that they require applicants to have specialised professional certification.			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons: <ul style="list-style-type: none"> i. We received evidence from 3 companies reporting a total of 4 vacancies and 30 employed persons (13% vacancy) from the following sectors: Healthcare (including Medical Devices and Pharmaceutical) and Electrical & Electronics. ii. All three companies expect the position to be harder to fill moving forward. iii. We were told by the companies that the vacancies are hard to fill because job applicants lack the experience, technical skills and non-technical skills. Additionally, job applicants also expect wages beyond what companies could offer. iv. To address this shortage, companies have increased domestic recruitment efforts, including engaging head-hunting firms. Other actions include raising wages, hiring less well qualified applicants, and increasing recruitment efforts abroad. v. As a result of this shortage, companies report a decreased ability to develop new products and to introduce technological process upgrades. One company also reported facing revenue loss. 			

Occupation: Manufacturing Managers			
MASCO 2013 (4-Digit Code): 1321			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Production and Operation Manager, Factory Manager, Mechanical Manager, Manufacturing Manager	
Evidence received from: Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); TalentCorp administrative data			
Top-down data: This occupation passes 0 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	-23.86	4. Median wage growth - 1 year	-11.67
2. Employment growth - 3 years	-19.07	5. Median wage growth - 3 years	6.00
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	-0.29
Bottom-up evidence:			
General qualifications needed: Bachelors Note: Individual company indicated that they require applicants to have specialised professional certification or qualification in engineering			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 4 companies reporting a total of 3 vacancies and 36 employed persons (28% vacancy) from the following sectors: Electrical & Electronics and Other Manufacturing. ii. Companies reported positions being vacant for at least two to six months. Also, they felt that vacancies are harder to fill than a year ago, and that the trend will persist in the near future. iii. With regards to why this occupation is hard to fill, companies told us that applicants lack relevant job experience, technical and soft skills. Three of the companies also reported facing overseas competition. iv. To address these shortages, companies have reported raising wages, and expanding local and international recruitment efforts. v. The Machinery & Equipment (M&E) and Engineering Support Industry (ESI) environmental scan conducted by the Institute of Labour Market Information and Analysis (ILMIA) indicated that this occupation is sought after. From the environmental scan, 33% of surveyed M&E companies and 42% of ESI companies find that manufacturing managers is critical. 			

Occupation: Mining Managers			
MASCO 2013 (4-Digit Code): 1322			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Production and Operation Manager (Oil and gas extraction), Oil and Gas Extraction Manager, Mining Manager, Senior Project Manager (Engineering, Procurement, Construction, Installation & Commissioning), Drilling, Well Stimulation, Wellbore & Completion Manager	
Evidence received from: Bottom-up data (CFE survey); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Bachelors or Masters Note: One company indicated that they require applicants to have specialised professional certification.			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 3 companies reporting a total of 10 vacancies and 96 employed persons (10% vacancy) from the Oil, Gas & Energy (including Petrochemicals) sectors. ii. Most companies reported that vacancies for this occupation have been open for more than six months. The companies reported that this occupation is harder to fill, compared to a year ago. iii. With regards to why mining manager positions are hard to fill, companies reported to us that applicants lack the relevant job experience and technical skills. Additionally, applicants also expect salaries beyond what companies could offer. iv. All companies also reported facing competition from overseas employers. v. Our further consultation with a large Oil & Gas company indicates that specialised and experienced mining managers are sought after. vi. To address these shortages, companies have reported expanding local and international recruitment efforts and raising wages. vii. The shortage has resulted in increased workload for current employees, increased operational costs, and decreased companies' ability to set strategic objectives. 			

Occupation: Supply, Distribution and Related Managers

MASCO 2013 (4-Digit Code): 1324

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

Transport Manager, Shipping Manager, Supply Manager, Warehouse Manager, Distribution Manager, Logistics Manager, Supplier Development Manager, Commercial Fleet Manager

Evidence received from:

Top-down data; Bottom-up data (CFE survey); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-17.68	4. Median wage growth - 1 year	-13.33
2. Employment growth - 3 years	-1.88	5. Median wage growth - 3 years	44.44
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	-0.83

Bottom-up evidence:

General qualifications needed:

Bachelors

Note: One company from aerospace industry indicated that they require applicants to have AS9100 certification.

This debut occupation is in the COL 2016/2017 for the following reasons:

- i. We received evidence from 3 companies reporting a total of 3 vacancies and 8 employed persons (38% vacancy) from the following sectors: Aerospace, Fast-moving Consumer Goods, and Oil, Gas & Energy (including Petrochemicals).
- ii. The companies have reported that the vacancies in this position takes between one and six months to fill. They also reported that the occupation is much harder to fill compared to one year ago.
- iii. All companies agreed that the lack of the required credentials and experience are the main reasons why this occupation is hard to fill.
- iv. To address these shortages, companies told us that they have been hiring less well qualified applicants, expanding local and international recruitment efforts, increasing training, and raising wages.
- v. Due to these shortages, companies reported increasing workload for current employees and increasing operational costs. They also reported that they faced difficulty in meeting customers' service objectives, and a decreased ability to develop products and technological/process upgrades.
- vi. TalentCorp administrative data shows that this occupation is sought after.

Occupation: ICT Managers**MASCO 2013 (4-Digit Code): 1511****Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Production and Operation Manager (Communications), Information Technology (IT) Manager, Application Development Manager, ICT Development Manager, Network Manager, Database Manager, Computer Security Manager, IT Project Manager, IT Infrastructure Manager, IT Delivery Manager, Creative Multimedia Manager, Technology Transformation Manager, Security Operations Centre (SOC) Manager

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	6.93	4. Median wage growth - 1 year	-7.14
2. Employment growth - 3 years	54.30	5. Median wage growth - 3 years	8.33
3. Median hours worked growth - 1 year	-6.25	6. Wage premium - 1 year	1.66

Bottom-up evidence:**General qualifications needed:**

Bachelors or Masters

Note: One company indicated that they require applicants to have specialised professional certification

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 6 companies reporting a total of 26 vacancies and 73 employed persons (36% vacancy) from the following sectors: Financial Services (including Takaful/Insurance services), Business Services, and Telecommunications & Multimedia.
- ii. Most of the companies took around two to six months to fill up the vacancies for this occupation.
- iii. Consultation with MDEC showed that jobs in this occupation related to governance/compliance and incident-handling are critical.
- iv. With regards to why ICT manager positions are hard to fill, companies reported to us that job applicants lack the experience, required technical skills and required certification. Applicants also requested for salaries beyond what companies could offer.
- v. To address this shortage, companies have reported expanding local and international recruitment efforts, and raising wages.

Bottom-up evidence (continuation):

- vi. Due to this shortage, companies resulted in increased workload for current employees, difficulty in meeting customer service objectives, and a decreased ability to introduce technological upgrades.

Occupation: Geologists and Geophysicists			
MASCO 2013 (4-Digit Code): 2114			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Geophysicist, Oil Geologist, Mining Geologist, Petroleum Geoscientist	
Evidence received from: Bottom-up data (CFE survey); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Bachelors or Masters			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons: <ul style="list-style-type: none"> i. We received evidence from 1 large Oil & Gas company reporting a total of 10 vacancies and 96 employed persons (10% vacancy). ii. Strong TalentCorp administrative data indicated that this occupation is still sought after by Oil & Gas companies. iii. Our consultation with a large Oil & Gas company showed that geologist and geophysicist positions are hard to fill because local professionals with enough experience are hard to find (10 years of experience is preferred). Moreover, there is a lack of applicants with adequate leadership, communication skills, and technical knowledge. iv. To address these shortages, the company reported hiring foreign talent for their expertise. v. Our validation with MIDA further reaffirm that this occupation is sought after. 			

Occupation: Mathematicians, Actuaries and Statisticians**MASCO 2013 (4-Digit Code):** 2121**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Data Scientist, Data Analyst, Data Mining Analyst, Predictive Analyst, Actuarial Science Mathematician, Appointed Actuary, Pricing Actuary, Product Actuary, Chief Actuary

Evidence received from:

Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC) and Persatuan Insuran Am Malaysia (PIAM); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: All companies that nominated actuary related occupations indicated that they require applicants to have specialised professional certification.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 3 companies reporting a total of 7 vacancies and 75 employed persons (9% vacancy) from the following sectors: Business Services and Financial Services (Including Insurance/Takaful Activities).
- ii. All companies reported this position took more than two months to fill up.
- iii. We were told by the companies that they faced difficulty in hiring due to the high qualifications needed in this field – Challenging professional qualifying examinations are required in addition to Bachelor’s degree. Additionally, applicants often lack the necessary credentials needed for this occupation, and there is strong overseas competition for actuaries.
- iv. Consultation with PIAM confirmed that actuaries are critical to the economy. PIAM reported that there are perhaps less than 20 qualified actuaries in Malaysia. By 2017, Bank Negara Malaysia (BNM) will also require all companies to have at least one Appointed Actuary.
- v. Due to this shortage, companies reported increasing workload for current employees. They have also indicated that they faced difficulty in setting product or service quality objectives, and decreased ability to develop new products or services.

Bottom-up evidence (continuation):

- vi. TalentCorp administrative data indicated that jobs such as data miner, data analyst, and data scientist are highly sought after.

Occupation: Industrial and Production Engineers**MASCO 2013 (4-Digit Code):** 2141**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Industrial Engineer, Systems Analyst (Except Computers), Planning Engineer, Cost Evaluation Engineer, Plant Engineer, Package Design Engineer, Analog Integrated Circuit (IC) Package Design Engineer, Material Specialist, Industrial Automation Engineer, Process Development Engineer, Fibre Reinforced Plastic (FRP) Production Engineer

Evidence received from:

Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data

Top-down data:

This occupation passes 3 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-33.95	4. Median wage growth - 1 year	37.50
2. Employment growth - 3 years	-18.56	5. Median wage growth - 3 years	83.33
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	5.84

Bottom-up evidence:**General qualifications needed:**

At least a Diploma, Bachelors or Masters.

Note: Two company indicated that they require applicants to have specialised professional qualifications while another requires applicant had long term on the job training at overseas plant.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 8 companies reporting a total of 44 vacancies and 192 employed persons (23% vacancy) from the following sectors: Healthcare (including Medical Devices and Pharmaceutical), Oil, Gas & Energy (including Petrochemicals), Electrical & Electronics, and Fast-moving Consumer Goods.
- ii. Companies reported this occupation taking two to six months to fill up. They found the occupation just as hard to fill, or harder to fill, compared to one year ago, and expect the occupation to be harder to fill in the near future.
- iii. With regards to why this occupation is hard to fill, companies reported that there were few job applicants generally, and they lack the relevant job experience and technical skills, Applicants also requested for salaries beyond what companies could offer.
- iv. On the strategies to address these shortages, companies have reported raising wages and expanding local and international recruitment efforts. This is also reflected in the Top-down median wage growth and wage premium indicators.

Bottom-up evidence (continuation):

- v. Additional evidence from the Environmental Scan for the M&E and ESI sector indicates that industrial and production engineers are highly sought after in the industry.

Occupation: Mechanical Engineers			
MASCO 2013 (4-Digit Code): 2144			
<p>Only the following job titles within this occupation are included in the Critical Occupations List (COL):</p>		<p>Machinery and Tools Industrial Engineer, Instruments Mechanical Engineer, Jet Engine Engineer, Automotive Mechanical Engineer, Welding Technologist, Aerospace Mechanical Engineer, Aeronautics Mechanical Engineer, Aero-Material Component Engineer, Technology Technical Engineer, Equipment Engineer, Offshore Equipment Engineer, Instrumentation Engineer, Mechanical Engineer (Design), Mechanical Engineer (Rotating Equipment)</p>	
<p>Evidence received from: Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data</p>			
<p>Top-down data: This occupation passes 3 out of 6 indicators from Top-down evidence</p>			
1. Employment growth - 1 year	-20.18	4. Median wage growth - 1 year	25.00
2. Employment growth - 3 years	-18.81	5. Median wage growth - 3 years	42.86
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	3.54
<p>Bottom-up evidence:</p>			
<p>General qualifications needed: Bachelors or Diploma Note: Several companies indicated that they require applicants to have specialised professional certification or training, such as: 7 QC Tools, Failure Mode Effect analysis (FMEA), Statistical Process Control (SPC), Measurement System Analysis, 8D, BOSIET, Flexilay & Equipment Maintenance, Advanced Hydraulic Training, IWCF Level 4 or Offshore Installation Manager Certification</p>			
<p>This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:</p> <ul style="list-style-type: none"> i. We received evidence from 10 companies reporting a total of 30 vacancies and 359 employed persons (8% vacancy) from the following sectors: Healthcare (including Medical Devices and Pharmaceutical), Oil, Gas & Energy (including Petrochemicals), Electrical & Electronics, and Other Manufacturing. ii. Most companies reported this occupation taking one to two months to fill up. All companies reported that the occupation is just as hard to fill, or harder to fill, compared to one year ago. Three companies expect this occupation to be easier to fill in the future. 			

Bottom-up evidence (continuation):

- iii. With regards to why this occupation is hard to fill, companies reported to us that job applicants lack the relevant job experience and technical skills. Additionally, job applicants expect salaries beyond what companies could offer and some companies also reported facing overseas competition for these employees.
- iv. To address this shortage, companies reported expanding local recruitment, raising wages, and outsourcing this job function.
- v. Due to this shortage, companies reported increasing workload for current employees, increasing operational costs, and revenue loss.

Occupation: Mining Engineers, Metallurgists and Related Professionals**MASCO 2013 (4-Digit Code):** 2146**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Natural Gas Mining Engineer, Metallurgist, Petroleum and Natural Gas Engineer, Drilling Engineer, Pipeline Engineer

Evidence received from:

Bottom-up data (CFE survey); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Masters

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. For 2016, we lacked the sample size requirement for the Top-down evidence of this occupation. Given that this occupation was on the previous COL, we decided to place a heavier emphasis on our consultation with companies and regulatory body.
- ii. We received evidence from 1 Oil & Gas company reporting a total 4 vacancies and 54 employed persons (7% vacancy) from the Oil, Gas & Energy (including Petrochemicals) sector.
- iii. The company reported this occupation taking two to six months to fill up, but the position is easier to fill compared to one year ago. They expect the position to be easier to fill in the future.
- iv. Consultation with another large Oil & Gas company showed that experienced drilling engineers, pipeline engineers and subsea engineers are sought after by the company. The company reported a preference for candidates with more than 10 years' experience for this position.
- v. With regards to why this occupation is hard to fill, we were told by the company that job applicants lack the relevant job experience and technical skills.
- vi. To address this shortage, the company reported hiring less well-qualified applicants and expanding local recruitment efforts.
- vii. Due to this shortage, the company reported increasing workload for their current employees, and decreasing ability to set strategic objectives for the future.

Occupation: Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified

MASCO 2013 (4-Digit Code): 2149

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

Project Engineer, Process Engineer, Quality Assurance Engineer, Quality Control Engineer, Research Engineer, Materials Engineer, Safety Engineer, Quality Engineer, Commissioning Engineer, Photonic Engineer, Head of Engineering, Method & Process Engineer, Supplier Quality Engineer (Aerospace), Non-Destructive Testing (NDT) Specialist, Sustainable Material & Renewable Specialist

Evidence received from:

Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data

Top-down data:

This occupation passes 0 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	4.34	4. Median wage growth - 1 year	-17.78
2. Employment growth - 3 years	16.02	5. Median wage growth - 3 years	-7.50
3. Median hours worked growth - 1 year	-6.25	6. Wage premium - 1 year	0.95

Bottom-up evidence:

General qualifications needed:

Bachelors

Note: Several companies indicated that they require applicants to have specialised professional certification.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 21 companies reporting a total 187 vacancies and 1949 employed persons (10% vacancy) from the following sectors: Aerospace, Electrical & Electronics, Healthcare (including Medical Devices and Pharmaceutical), Oil, Gas & Energy (including Petrochemicals), Other Manufacturing, and Financial Services (including Takaful/Insurance services).
- ii. We placed a heavier emphasis on the Bottom-up evidence for this occupation. We decided that the large variety of possible job titles under this occupation group means that the Top-down evidence is not sufficiently relevant.
- iii. Majority of the companies reported taking more than two months to fill up this occupation. Companies reported that the occupation is just as hard to fill compared to one year ago, but expect the occupation to be harder to fill in the future.
- iv. With regards to why this occupation is hard to fill, we were told by the companies that job applicants lack the required job experience and technical skills.

Bottom-up evidence (continuation):

- v. To address this shortage, companies reported expanding local and international recruitment efforts, raising wages, and hiring less qualified applicants.
- vi. Due to this shortage, companies reported increasing workload for current employees. They also reported that they faced difficulty in meeting customer service objectives, and decreased ability to develop new products.
- vii. Consultation with NAICO showed that aerospace engineers were in high demand but low supply – academic institutions put less emphasis on this field of study. Many Malaysian aerospace engineers also choose to work abroad due to higher pay, further reducing the supply of engineers.

Occupation: Electrical Engineers			
MASCO 2013 (4-Digit Code): 2151			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Electrical Testing Engineer, Power Generation Engineer, Embedded System/Firmware Engineer, Power Supply Design Engineer	
Evidence received from: Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); TalentCorp administrative data			
Top-down data: This occupation passes 3 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	12.52	4. Median wage growth - 1 year	18.42
2. Employment growth - 3 years	4.65	5. Median wage growth - 3 years	-10.00
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	2.78
Bottom-up evidence:			
General qualifications needed: Bachelors Note: One company indicated that they require applicants to have the Competent Certification from the Energy Commission			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 4 companies reporting a total 119 vacancies and 553 employed persons (22% vacancy) from the following sectors – Construction, Electrical & Electronics and Oil, Gas & Energy (including Petrochemicals). ii. Most companies took more than two months to fill up this occupation, and expect the positions to be harder to fill in the future. iii. With regards to why this occupation is hard to fill, companies reported that there were too few job applicants and applicants generally lack sufficient technical skills and relevant work experience. Additionally, applicants also expect salary beyond what companies could offer. iv. To address this shortage, companies reported increasing wages and work hours for existing staff. Most companies also reported hiring less well-qualified applicants, as well as expanding their recruitment efforts. The increase in wage is also reflected in the Top-down indicators for wage growth and wage premium. v. Due to this shortage, companies reported increasing workload for existing staff and increasing operational costs. They also reported facing difficulty in meeting customer needs, and a decreased ability to develop new products. 			

Occupation: Electronic Engineers

MASCO 2013 (4-Digit Code): 2152

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

Electronics Engineer (Computer Hardware Design) Computer Engineer (Software), Systems Engineer, Information Technology Engineer, Semiconductor Electronics Engineer, Instrumentation Engineer, Pre-Silicon Validation Engineer, Printed Circuit Board (PCB) Design Engineer, Product Characterization Engineer, Computer-aided Design (CAD)/Computer-aided Manufacturing (CAM) Engineer, Product Development Engineer, Test Development Engineer, Wirebond Engineers, Leadframe Engineers, Field Application Engineer, Board Support Package (BSP) Embedded Engineer, Surface Mount Technology (SMT) Engineer

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); TalentCorp administrative data

Top-down data:

This occupation passes 4 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	10.48	4. Median wage growth - 1 year	11.11
2. Employment growth - 3 years	36.56	5. Median wage growth - 3 years	42.86
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	3.68

Bottom-up evidence:

General qualifications needed:

Bachelors

Note: Different companies require different specific qualifications or training, such as: training on the television broadcasting software and automation system, or experience in particular field e.g. MEMs, Photonics, etc. One company indicated that they require applicants to have skills and knowledge in Cardance Allegro Mentor Graphics Expedition.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 14 companies reporting a total 161 vacancies and 1020 employed persons (16% vacancy) from the following sectors: Electrical & Electronics, Healthcare (including Medical Devices and Pharmaceutical), Information & Communications Technology, and Other Manufacturing.
- ii. Most companies took two to six months to fill this occupation. Companies reported that the occupation is harder to fill compared to one year ago, and expect the situation to continue in the future.

Bottom-up evidence (continuation):

- iii. With regards to why this occupation is hard to fill, we were told by the companies that job applicants lack the relevant job experience and technical skills. Half of the companies also report strong competition from other industries and foreign employers.
- iv. To address this shortage, companies reported hiring less qualified applicants, and expanding local and international recruitment efforts.
- v. Due to this shortage, companies reported increasing workload for current employees and increasing operational costs. They also reported a decreased ability to develop new products and strategic objectives.
- vi. Our internal sector relationship managers, through their engagement sessions with E&E companies, also continue to obtain feedback that this occupation is highly sought after.
- vii. Given the strategic role this occupation plays in our economy, we decided to keep this occupation in the COL.

Occupation: Telecommunications Engineers**MASCO 2013 (4-Digit Code):** 2153**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Telecommunications Engineer (Signal Systems), Telecommunications Engineer (Microwave), Broadcast Engineer, Data Network Engineer, Value-Added Service (VAS) Engineer, Network Architect, Network Designer, Network Planner, Network Optimisation Engineer, Transmission Network Engineer, IP Engineer, Network and Systems Engineer, Network Tester, Network Performance Engineer, Site and Construction Engineer (Telecommunications)

Evidence received from:

Bottom-up data (CFE survey); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. For 2016, we lacked the sample size requirement for the Top-down evidence of this occupation. Given that this occupation was on the previous COL, we decided to place a heavier emphasis on our consultation with regulatory body and Bottom-up evidence.
- ii. We received evidence from 1 company from the Telecommunications & Multimedia sector.
- iii. The company reported taking two to six months to fill up this occupation. However, the company reported that the position will be slightly easier to fill in the future due to changes in demand.
- iv. With regards to why this occupation is hard to fill, the company reported that there were few job applicants.
- v. To address this shortage, the company reported raising wages and retraining current employees.
- vi. Due to this shortage, the company reported difficulty in meeting product/service quality standards.

Bottom-up evidence (continuation):

- vii. Our consultation with MCMC showed that some companies were finding it difficult to hire enough VAS Engineers. Specialists in this field are very important because without them, telecommunications companies cannot integrate their digital services with their revenue stream.
- viii. MCMC highlighted network support jobs as being critical. There is a growing demand for well-rounded technicians capable of performing different tasks in maintenance and operations. Currently, the available support technicians are only skilled in some areas, and companies have to train these workers themselves. Examples of these jobs include IP Engineers.
- ix. MCMC highlighted telecommunications specialists as another critical job, although they are only needed in small numbers. Companies reported these jobs being hard to fill, because of the distinct training requirements. Such jobs include land mobile planning specialists, cellular network specialists, digital broadcast specialists, and radio specialists.

Occupation: Building Architects			
MASCO 2013 (4-Digit Code): 2161			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Architect, Interior Architect, Building Architect	
Evidence received from: Top-down data; TalentCorp administrative data			
Top-down data: This occupation passes 1 out of 3 indicators from Top-down evidence			
1. Employment growth - 1 year	-19.46	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	84.71	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	6.67	6. Wage premium - 1 year	NA
Bottom-up evidence:			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. Top-down data indicated that this occupation is sought after. ii. Looking into our internal administrative data, we observed that architects are sought after as companies have been increasingly taking measures to fill up these positions through our various initiatives. Concurrently, according to our data, architect professionals were able to secure employment in this position easily through TalentCorp’s initiatives. iii. We placed a heavier emphasis on the Top-down evidence for this occupation given that we did not cover this occupation in the survey. We decided that the small variety of job titles under this occupation group means that the Top-down evidence is sufficiently relevant. Additional contextual data from TalentCorp also provides sufficient evidence for the inclusion of this occupation in the Critical Occupations List. 			
Note: We did not receive survey information from any employers with regards to this occupation.			

Occupation: Cartographers and Surveyors			
MASCO 2013 (4-Digit Code): 2165			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Marine Surveyor, Land Surveyor, Railway Surveyor, Survey Engineer	
Evidence received from: Top-down data; TalentCorp administrative data			
Top-down data: This occupation passes 3 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	30.26	4. Median wage growth - 1 year	16.67
2. Employment growth - 3 years	16.54	5. Median wage growth - 3 years	16.67
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	5.30
Bottom-up evidence:			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. Top-down data indicated that this occupation is sought after. ii. Looking into our internal administrative data, we observed that surveyors are sought after as companies have been increasingly taking measures to fill up these positions through our various initiatives. Concurrently, according to our data, surveyor professionals were able to secure employment in this position easily through TalentCorp’s initiatives. iii. We placed a heavier emphasis on the Top-down evidence for this occupation given that we did not cover this occupation in the survey. We decided that the small variety of job titles under this occupation group means that the Top-down evidence is sufficiently relevant. Additional contextual data from TalentCorp also provides sufficient evidence for the inclusion of this occupation in the Critical Occupations List. 			
Note: We did not receive survey information from any employers with regards to this occupation.			

Occupation: Graphic and Multimedia Designers			
MASCO 2013 (4-Digit Code): 2166			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Web Designer, Graphic Designer, Designer, Digital Artist, Animator, Screenwriter, 3D Artist, 3D Modeller	
Evidence received from: Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data			
Top-down data: This occupation passes 1 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	5.54	4. Median wage growth - 1 year	-16.67
2. Employment growth - 3 years	-7.43	5. Median wage growth - 3 years	38.89
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	-0.24
Bottom-up evidence:			
General qualifications needed: Diploma Note: Two companies indicated that they require applicant to have specialised professional certification.			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 4 companies reporting a total of 57 vacancies and 210 employed persons (27% vacancy) from the following sectors: Telecommunications & Multimedia, and Information & Communications Technology. ii. Most companies reported taking more than two months to fill up this occupation. Half the companies expect this occupation to be harder to fill in the future. iii. With regards to why this occupation is hard to fill, companies reported that job applicants lacked the required experience and skills. iv. To address this shortage, we were told by the companies that they have been hiring less qualified applicants, expanding local and international recruitment efforts and increasing training for existing employees. Additionally, some companies also reported expanding partnerships with education training providers, hiring temporary contract workers and outsourcing this job function. v. Due to this shortage, companies reported increasing workload for current employees and increasing operational costs. They also reported that they faced decreased ability in developing new products and difficulty in setting strategic objectives. vi. Consultation with MCMC showed that the graphics and multimedia industry is a growing one, and jobs such as concept artists and digital animators may be in higher demand. 			

Bottom-up evidence (continuation):

- vii. Validation with MDEC showed that Malaysia is experiencing a surge for these for these specialists due to demand for local content from the local producer and media companies.

Occupation: Ship Engineers			
MASCO 2013 (4-Digit Code): 2171			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Aircraft Engineer, Aircraft Design Engineer, Aeronautical Engineer, Structural & Stress Engineers, Tooling Design Engineer	
Evidence received from: Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Diploma Note: Companies indicated that they require applicants to have the Aircraft Maintenance Engineer Licence issued by Department of Civil Aviation			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 2 companies reporting a total of 15 vacancies and 74 employed persons (20% vacancy) from the Aerospace sector. ii. Companies reported taking one to two months to fill up this occupation, and that the occupation is just as hard to fill compared to one year ago. iii. With regards to why this occupation is hard to fill, companies reported that applicants expected salaries beyond what they were offering, and that there is strong competition from overseas employers. iv. Our consultation with NAICO indicated that workers were not sufficiently trained, and that there is a need for workers competent in handling various aircraft parts in addition to recognised qualifications. v. NAICO also noted that qualified engineers tend to migrate to the Middle East countries for better pay and benefits. vi. A company reported preferring workers with at least five years of experience, while another reported preferring workers with Aircraft Maintenance Engineer Licenses (issued by the Department of Civil Aviation). 			

Bottom-up evidence (continuation):

- vii. To address this shortage, companies reported raising wages, hiring temporary workers and expanding local and international recruitment efforts. Additionally, some companies also reported they took measures of expanding training partnerships and convincing workers to delay retirement.
- viii. Due to this shortage, companies reported loss of orders and revenue, and increasing workload for employees. They also reported that they faced difficulty in meeting customer objectives, and a decreased ability to develop new products and strategic objectives.

Occupation: Aircraft Pilots and Related Professionals			
MASCO 2013 (4-Digit Code): 2173			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Pilot	
Evidence received from: Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: -			
Note: Companies indicated that they require applicants to have specialised professional certification or license			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received a nomination for this occupation from 1 large Aerospace company reporting a total of 50 vacancies and 400 employed persons (13% vacancy). ii. The company reported taking two to six months to fill this position. iii. With regards to why this occupation is hard to fill, the company reported that they faced competition for pilots from other local/overseas employers. iv. To address these shortages, the company reported hiring less well qualified applicants. v. Consultation with NAICO showed that pilots are in high demand. 			

Occupation: Manufacturing Professionals			
MASCO 2013 (4-Digit Code): 2182			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Manufacturing Executive, Quality Assurance Executive, Quality Control Executive, Maintenance Executive, Procurement Engineer, Manufacturing Quality Controller Executive, Product Quality Controller	
Evidence received from: Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); TalentCorp administrative data			
Top-down data: This occupation passes 3 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	23.78	4. Median wage growth - 1 year	6.25
2. Employment growth - 3 years	43.59	5. Median wage growth - 3 years	41.67
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	0.85
Bottom-up evidence:			
General qualifications needed: Bachelors or Diploma			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 3 companies reporting a total of 39 vacancies and 885 employed persons (4% vacancy) from the following sector: Aerospace, Other Manufacturing, and Electrical & Electronics. ii. Companies reported taking one to two months to fill up this occupation. Companies reported that the occupation is harder to fill compared to one year ago, and expect the trend to continue in the future. iii. With regards to why this occupation is hard to fill, companies reported that there were few job applicants generally, and they lack relevant job experience and technical skills. Additionally, potential workers also did not like the working conditions, and companies reported there was hiring competition from other industries/sectors. iv. To address this shortage, companies reported raising wages, expanding international recruitment, and increasing training. v. Due to this shortage, companies reported increasing workload for current employees, increasing operational costs, and facing difficulty in meeting customer service objectives. 			

Occupation: University and Higher Education Professional Teachers

MASCO 2013 (4-Digit Code): 2311

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

University Lecturer, University Lecturer (Clinical – Medicine), University Lecturer (IT), University Lecturer (Engineering), University Lecturer (Actuarial Science)

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysian Association of Private Colleges and University (MAPCU); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	11.06	4. Median wage growth - 1 year	1.55
2. Employment growth - 3 years	11.27	5. Median wage growth - 3 years	28.10
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	1.78

Bottom-up evidence:

General qualifications needed:

Bachelors, Masters, or PhD.

Note: Companies indicated that they require applicants to have specialised professional certification or license.

This debut occupation is in the COL 2016/2017 for the following reasons:

- i. We received evidence from 6 companies reporting a total of 296 vacancies and 2802 employed persons (11% vacancy) from the Education sector.
- ii. Companies reported different amounts of time required to fill up this occupation. They reported that the occupation is just as hard to fill compared to one year ago, and expect the trend to continue in the future.
- iii. With regards to why this occupation is hard to fill, companies reported there are too few applicants generally, and they lack the required credentials and relevant job experience. Also, they were expecting salaries beyond what companies were offering.
- iv. To address this shortage, companies reported expanding local and international recruitment efforts, hiring temporary/contract workers, and converting part-time workers to full-time workers.
- v. Due to this shortage, companies resulted in increased workload for current employees, decreased ability to set strategic objectives and new products, and increased operational cost.
- vi. Universities reported that they are looking to hire lecturers with PhD or Masters Degrees, which are rare amongst local hires.

Occupation: Accountants**MASCO 2013 (4-Digit Code):** 2411**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Certified Accountant, Tax Accountant, Tax Consultant, Liquidator, Management Accountant, Bank Accounting Analyst, Financial Controller, Auditor, Audit and Risk Assessment Executive, Project Accountant, Compliance Analyst, GST Specialist

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Malaysian Institute of Accountants (MIA); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	9.39	4. Median wage growth - 1 year	0
2. Employment growth - 3 years	13.93	5. Median wage growth - 3 years	10.00
3. Median hours worked growth - 1 year	-6.25	6. Wage premium - 1 year	2.31

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: 4 companies indicated that they require applicants to have specialised professional certification. Common types of industry certifications are ACCA, CIMA, CPA Australia, ICAEW, MICPA, CAA NZ. To be a member in public practice, one must register with the Malaysian Institute of Accountants (MIA).

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. Despite the weak Top-down evidence, we placed a heavier emphasis on Bottom-up evidence given the frequency that this occupation was nominated by companies across industries.
- ii. We received evidence from 7 companies reporting a total of 54 vacancies and 3337 employed persons (1% vacancy) from the following sectors: Professional Services, Business Services, Financial Services (including Takaful/Insurance services), Oil, Gas & Energy (including Petrochemicals), and Electrical & Electronics.
- iii. Most companies reported taking two to six months to fill up this occupation. Most companies expect this occupation to be harder to fill in the future.
- iv. With regards to why this occupation is hard to fill, companies reported that job applicants lack the required experience, and expected salaries beyond what companies were offering. There was also hiring competition from other industries.
- v. To address this shortage, companies reported raising wages, filling spots with less qualified applicants, and expanding local and international recruitment efforts.

Bottom-up evidence (continuation):

- vi. Due to this shortage, companies resulted in increased workload for current employees, increased operational costs, and loss of revenue and business. Additionally, they also reported that they faced difficulty in meeting customer demands and setting strategic objectives.
- vii. Validation with MIA showed that accountants are in demand due to several reasons: the recent implementation of GST, amendments to the Malaysian Private Entities Reporting Standard (MPERS), growth of big data analytics involving accounts. Some job titles are sought after, including GST specialists, auditors, and liquidators.
- viii. In particular, MIA highlighted liquidator as a critical occupation. There are only about 200 liquidators in Malaysia, and many are more than 60 years old. Under the 1965 Companies Act, accountants must have an approved audit licence, with the required level of experience in insolvency type of works and certifications to become an approved liquidator. Additionally, the job involves in-depth knowledge of various regulations and compliances needed from a highly competent professional.
- ix. MIA also reported that the requirement for audit licences will change with the New Companies Act 2016 because of the decoupling regime introduced.

Occupation: Finance and Investment Advisers			
MASCO 2013 (4-Digit Code): 2412			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Corporate Financial Adviser, Financial and Investment Adviser, E-Commerce Adviser, Bank Executive Officer, Financial Planner, Investment Consultant, Finance Executive	
Evidence received from: Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Persatuan Insuran Am Malaysia (PIAM); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data			
Top-down data: This occupation passes 2 out of 3 indicators from Top-down evidence			
1. Employment growth - 1 year	47.60	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	18.18	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	7.14	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Bachelors Note: Most companies indicated that they require applicants to have specialised profession certification or license.			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 4 companies reporting a total of 13 vacancies and 120 employed persons (10% vacancy) from the following sectors: Financial Services (including Takaful/Insurance services), and Electrical & Electronics. ii. Most companies reported taking two to six months to fill up this occupation. The occupation is just as hard to fill compared to one year ago, and most companies expect this trend to continue in the future. iii. With regards to why this occupation is hard to fill, companies reported to us that job applicants lack relevant job experience and other required skills. Additionally, they also expect salaries beyond what companies could offer. iv. To address this shortage, companies reported raising wages and hiring less well qualified workers. v. Due to this shortage, companies resulted in increased workload for employees, loss of business, difficulty in meeting customer service objectives, and decreased ability to develop new products or services. 			

Occupation: Financial Analyst**MASCO 2013 (4-Digit Code):** 2413**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Finance Analyst, Fraud Specialist, Risk Operation Analyst, Pricing Analyst, Research Analyst, Investment Analyst, Rating Analyst, Financial Condition Management Analyst

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Persatuan Insuran Am Malaysia (PIAM); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data

Top-down data:

This occupation passes 3 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-1.97	4. Median wage growth - 1 year	0
2. Employment growth - 3 years	39.76	5. Median wage growth - 3 years	0
3. Median hours worked growth - 1 year	4.35	6. Wage premium - 1 year	2.46

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: Almost all companies indicated that they require applicants to have specialised professional certification.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 8 companies reporting a total of 34 vacancies and 243 employed persons (14% vacancy) from the following sectors: Financial services (including Takaful/Insurance services), Electrical & Electronics, Aerospace, and Other Manufacturing.
- ii. Most companies reported taking two to six months to fill up this occupation.
- iii. With regards to why this occupation is hard to fill, companies reported a lack of job applicants generally, and that applicants lack experience, technical skills, and required certification to practice as a financial analyst. There was also hiring competition from employers abroad.
- iv. To address this shortage, companies reported raising wages, hiring and training less well qualified applicants, expanding recruitment efforts, and establishing partnerships with education institutions.
- v. Due to this shortage, companies reported increasing workload for current employees, and a decreasing ability to set strategic objectives and meet customer service objectives.

Occupation: Management and Organization Analyst**MASCO 2013 (4-Digit Code):** 2421**All job titles within this occupation are included in the Critical Occupations List (COL):**

Organization and Methods Analyst, Research and Information Analyst, Operation Research Analyst, Management Consultant, Business Consultant, Strategy Analyst

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Life Insurance Association of Malaysia (LIAM); Malaysia Communications Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-12.56	4. Median wage growth - 1 year	-1.1
2. Employment growth - 3 years	1.95	5. Median wage growth - 3 years	36.26
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	1.09

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: One company indicated that they require applicants to have consulting background

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. Despite the weak Top-down evidence, we placed a heavier emphasis on Bottom-up evidence and our consultation with various regulatory body.
- i. We received evidence from 3 companies reporting a total of 9 vacancies and 36 employed persons (27% vacancy) from the following sectors: Financial services (including Takaful/Insurance services), and Telecommunications & Multimedia.
- ii. Companies reported taking two to six months to fill up this occupation, but that the occupation will become slightly easier to fill in the future, due to changes in demand.
- iii. With regards to why this occupation is hard to fill, companies reported to us that job applicants lack the relevant job experience, the required soft skills and technical skills, and the required certifications. Job applicants also expect salaries beyond what companies could offer.
- iv. To address this shortage, companies reported raising wages, hiring less well qualified applicants, and expanding local and international recruitment efforts. Companies also reported that they took measures of increasing partnership with education providers, and outsourcing this job function.
- v. Due to this shortage, companies resulted in increased workload for current employees, and decreased ability to upgrade technological upgrades and set strategic objectives.
- vi. Our consultation session with LIAM and MDEC further reaffirms that this occupation is sought after.

Occupation: ICT Sales Professionals			
MASCO 2013 (4-Digit Code): 2434			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Product Support Engineer, Product Development Engineer, IT Sales Engineer, Customer Support Representative, Engineering and Technical Operations	
Evidence received from: Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Diploma, Advanced Diploma or Bachelors Note: One company indicated that they require applicants to have knowledge on Python or C++ applications			
This debut occupation is in the COL 2016/2017 for the following reasons: <ul style="list-style-type: none"> i. We received evidence from 4 companies reporting a total of 52 vacancies and 1,355 employed (4% vacancy) from the following sectors: Electrical & Electronics, Financial Services (including Takaful/Insurance services), and Telecommunications & Multimedia. ii. Most companies reported taking two to six months to fill up this occupation. Companies also reported that the occupation is harder to fill now than a year ago, and that the trend will continue in the future. iii. With regards to why this occupation is hard to fill, companies reported to us that applicants lack the relevant job experience and technical skills. Additionally, job applicants expect salaries beyond what companies could offer and companies also reported hiring competition from overseas employers. iv. To address this shortage, companies reported raising wages, expanding local recruitment efforts, and establishing partnerships with training providers. v. Our consultations with MDEC and MCMC reaffirms that this occupation is sought after. MDEC has highlighted several job titles as being critical: Customer Support Engineer, IT Sales Engineer and Product Development Engineer. 			

Occupation: Systems Analyst

MASCO 2013 (4-Digit Code): 2511

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

Electronic Data Processing Analyst, Management Information Systems (MIS) Analyst, Computer Systems Analyst, IT Systems Consultant, IT Business Analyst, IT Security Analyst, .Net Consultant, .Net Application Consultant, Java Consultant, IT System Analyst (JDE), Enterprise Systems Specialist, IT Specialist (SAP), Integrated Circuit (IC) Designer (IT), Technical Helpdesk Analyst

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 3 indicators from Top-down evidence

1. Employment growth - 1 year	11.76	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	-7.36	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	NA

Bottom-up evidence:

General qualifications needed:

Bachelors

Note: Companies indicated that they require applicants to have knowledge on programming language, such as PEGA, Node JS, JavaScript, PHP, AS400 or Cobol

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. Despite the weak Top-down evidence, we placed a heavier emphasis on Bottom-up evidence given the frequency that this occupation was nominated by companies across industries.
- ii. We received evidence from 10 companies reporting a total of 155 vacancies and 1,416 employed (11% vacancy) from the following sectors: Education, Electrical & Electronics, Financial Services (including Takaful/Insurance services), Information & Communications Technology, Oil, Gas & Energy (including Petrochemicals), Telecommunications & Multimedia, and Transportation & Storage.
- iii. Most companies reported that this occupation is slightly harder to fill now than a year ago, and they expect the occupation to be harder to fill in the future.
- iv. With regards to why this occupation is hard to fill, companies told us that job applicants lack relevant job experience and technical skills. Half of the companies also reported strong competition for these workers from abroad.

Bottom-up evidence (continuation):

- v. To address this shortage, companies reported expanding local and international recruitment efforts. Additionally, they also reported that they took measures of increasing training and expanding partnerships with training providers.
- vi. Validation with MDEC showed that system security analysts are in high demand as companies are prioritising cybersecurity. MDEC also indicated that this occupation has become more specialised and niche as the industry has grown in recent years.

Occupation: Software Developers**MASCO 2013 (4-Digit Code):** 2512**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Software Developer, Software Designer, Software Engineer, Design Engineer, Application Developer (.Net), Java Developer, Hypertext Preprocessor (PHP) Developer, System Architect (IT), Software Analyst, OpenText Developer, BIOS Engineer

Evidence received from:

Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysian Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors or Diploma

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 7 companies reporting a total of 18 vacancies and 120 employed (15% vacancy) from the following sectors: Electrical & Electronics, Financial Services (including Takaful/Insurance services) and Information & Communications Technology (ICT).
- ii. Most companies reported taking more than two months to fill up this occupation. Also, this occupation is harder to fill than a year ago, and the trend is expected to continue in the future.
- iii. With regards to why this occupation is hard to fill, companies reported a lack of job applicants and the lack of applicants with relevant job experience. Applicants also expect salaries beyond what companies were offering. Most companies also reported facing competition for these workers from abroad.
- iv. To address this shortage, companies reported expanding local and international recruitment efforts and hiring less well qualified applicants.
- v. The consultation and validation sessions with MDEC and MCMC confirm that this occupation is sought after.

Occupation: Applications Programmers

MASCO 2013 (4-Digit Code): 2514

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

Systems Programmer, Analyst Programmer, Applications Programmer, .Net Programmer, C/C++ Programmer, Cobol Programmer, Java Programmer, Hypertext Preprocessor (PHP) Programmer, Android/iOS Programmer, Animation Programmer, Computer Games Programmer, User Interface (UI)/ Gameplay Coders, Game Engine Programmers, Computer Infrastructure Specialist

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data

Top-down data:

This occupation passes 0 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-6.04	4. Median wage growth - 1 year	-5.00
2. Employment growth - 3 years	14.16	5. Median wage growth - 3 years	8.57
3. Median hours worked growth – 1 year	0	6. Wage premium - 1 year	-0.85

Bottom-up evidence:

General qualifications needed:

Bachelors or Diploma

Note: Companies indicated that they require applicants to have specialised professional certification.

This occupation appeared on COL 2015/2016. Despite the lack of Top-down evidence, the occupation continues to remain on the COL this year, based on the following reasons:

- i. We received evidence from 4 companies reporting a total of 32 vacancies and 54 employed (60% vacancy) from the following sectors: Aerospace, Business Services, and Information & Communications Technology (ICT).
- ii. Companies reported taking more than six months to fill up this occupation. Most companies reported that the occupation is slightly harder to fill compared to one year ago, and expect the position to become much harder to fill in future.
- iii. With regards to why this occupation is hard to fill, companies told us that applicants lack relevant job experience and technical skills. All companies also reported that they face strong competition for these workers from abroad.
- iv. To address this shortage, companies reported raising wages and expanding local and international recruitment efforts.
- v. Further consultation and validation with MDEC and LIAM confirms that this occupation is still sought after and companies are having difficulties in filling these positions.

Occupation: Software and Applications Developers and Analysts Not Elsewhere Classified**MASCO 2013 (4-Digit Code):** 2519**All job titles within this occupation are included in the Critical Occupations List (COL):**

Quality Assurance Analyst (IT), Test Engineer (IT), Solution Architect (IT), Software Quality Assurance Engineer (IT), Application Consultant

Evidence received from:

Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysian Communications and Multimedia Commission (MCMC)

Top-down data:

This occupation did not have enough sample size from Top-down evidence

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: One company indicated that they require applicants to have specialised professional certification

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. For 2016, we lacked the sample size requirement for the Top-down evidence of this occupation. Given that this occupation was on the previous COL, we decided to place a heavier emphasis on our consultation with various regulatory body in our decision making.
- ii. We received evidence from 2 companies reporting a total 17 vacancies and 62 employed (27% vacancy) from the following sectors: Financial Services (including Takaful/Insurance services), and Telecommunications & Multimedia.
- iii. All companies reported taking more than two months to fill up this occupation. Companies also reported that the occupation is harder to fill compared to one year ago.
- iv. With regards to why this occupation is hard to fill, companies reported to us that applicants expected salaries beyond what companies were offering, and that there is strong competition for applicants from other industries and overseas companies.
- v. To address this shortage, companies reported raising wages and outsourcing this job function.
- vi. Our consultation and validation with MDEC confirms that this occupation is sought after.

Occupation: Database Designers and Administrators

MASCO 2013 (4-Digit Code): 2521

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

Database Architect, Database Analyst, Database Administrator, Database Designer, Computer Auditor, Oracle Database Engineer, Structured Query Language (SQL) Database Engineer, Data Warehouse Specialist

Evidence received from:

Malaysia Digital Economy Corporation (MDEC); Life Insurance Association of Malaysia (LIAM); Malaysian Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. For 2016, we lacked the sample size requirement for the Top-down evidence of this occupation. Given that this occupation was on the previous COL, we decided to place a heavier emphasis on our consultation with various regulatory body in our decision making.
- ii. TalentCorp administrative data showed that that the following job titles are sought after: Database Analyst, Database Administrator and Oracle Database Specialist.
- iii. Our consultation with MDEC confirms that this occupation is sought after, due to advent of Big data analytics.
- iv. Our consultation with LIAM showed that database architects (enterprise) are sought after in the Insurance industry.
- v. Our consultation with MCMC highlighted that this occupation is a critical job. They indicated that more companies are investing in emerging area such as cloud computing, Internet of Things (IOT), and data analytics in the future, they are aggressively searching for talent in this area.
- vi. This job also plays a strategic role in ensuring the successful delivery of business intelligence information to the respective organisation. Core competencies include data architecture, data modelling, database technology (ETL, OLAP, DBMS, etc), database management technology and data warehouse solutions.

Bottom-up evidence (continuation):

Additional note: This is in line with the growing industry need for people with knowledge on Big Data in Malaysia. Hays recent study highlighted Big Data as one of the top 10 talent trends in Malaysia for 2016. This coincides with a recent study by LinkedIn that shows data mining skills are among the top skills to in demand.

Occupation: Systems Administrators**MASCO 2013 (4-Digit Code):** 2522**Only the following job titles within this occupation are included in the Critical Occupations List (COL):**

Project Coordinator (IT), Computer Support Engineer, System Engineer (IT), SAP Application Administrator, Cloud Computing Solution Architect, Web and Mobility Developer

Evidence received from:

Top-down data; Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Malaysia Communications and Multimedia Commission (MCMC); Life Insurance Association of Malaysia (LIAM); TalentCorp administrative data

Top-down data:

This occupation passes 1 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-25.75	4. Median wage growth - 1 year	1.45
2. Employment growth - 3 years	52.00	5. Median wage growth - 3 years	-2.78
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	1.09

Bottom-up evidence:**General qualifications needed:**

Diploma or Bachelors

Note: Companies indicated that they require applicants to have specialised professional certification.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. Despite the weak Top-down evidence, we placed a heavier emphasis on our consultation with various regulatory body.
- ii. We received evidence from 2 companies reporting a total of 4 vacancies and 70 employed (6% vacancy) from the following sectors: Electrical & Electronics, and Information & Communications Technology (ICT).
- iii. Companies reported taking more than two months to fill up this occupation. All companies expect the occupation to be harder to fill in the near future.
- iv. With regards to why this occupation is hard to fill, companies reported to us that the job applicants lack technical skills and appropriate credentials/certifications. One company also reported facing strong competition for these workers from abroad.
- v. To address this shortage, companies reported raising wages and expanding local and international recruitment efforts.
- vi. Our consultation and validation with MDEC, MCMC and LIAM indicated that this occupation is sought after.
- vii. TalentCorp administrative data showed that this occupation is sought after.

Occupation: Computer Network Professionals**MASCO 2013 (4-Digit Code): 2523****All job titles within this occupation are included in the Critical Occupations List (COL):**

Network Analyst, Network Services Consultant, Network Administrator, Network Infrastructure Administrator, Network Engineer, Network Systems Engineer, Cloud Specialist, Radio Network Planning Consultant, Network Performance Consultant, IT Network System Engineer

Evidence received from:

Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Malaysia Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:**General qualifications needed:**

Bachelors

Note: Company indicated that they require applicants to have specialised professional certification.

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We received evidence from 1 company reporting a total of 2 vacancies and 5 employed (40% vacancy) from the Information & Communications Technology (ICT) sector.
- ii. The company reported taking two to six months to fill up this occupation.
- iii. With regards on why this occupation is hard to fill, the company reported to us that job applicants lack relevant job experience and occupational skills.
- iv. To address this shortage, the company reported raising wages, hiring less qualified applicants, and increasing training and working hours.
- v. Our consultation and validation with MDEC and MCMC reaffirm that this occupation is sought after.
- vi. TalentCorp administrative data shows that some job additional titles are sought after, such as IP Network Architecture and RAN Network Architecture specialist.

Occupation: Database and Network Professionals Not Elsewhere Classified			
MASCO 2013 (4-Digit Code): 2529			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Digital Forensic Specialist, Security Specialist (IT), IT Security Architect, Penetration Testers	
Evidence received from: Malaysia Digital Economy Corporation (MDEC); Malaysian Communications and Multimedia Commission (MCMC); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. Despite the insufficient Top-down evidence, we placed a heavier emphasis on our consultation with various regulatory body in our decision making. ii. Consultation and validation with MDEC showed a growing need for security architects/in Malaysia as companies are prioritising cybersecurity in the areas of provisioning, penetration testing and digital forensic. As an example, MDEC has indicated that a person in this occupation should be able to produce highly specialised review and evaluation of incoming security information to determine its usefulness for intelligence. Companies are also looking for individuals who are able to perform system implementation and configuration. iii. This occupation has become more specialised and niched as the industry has grown a lot in recent years. MDEC highlighted to us that digital forensics and provisioning of secure IT systems as key skills being sought after. iv. TalentCorp administrative data showed that IT security specialists and IT security system administrators are sought after. v. MCMC highlighted network security specialists as being critical, as they are needed to fulfil ISO security systems compliance. This job requires specialised certification. 			

Occupation: Film, Stage and Related Directors and Producers

MASCO 2013 (4-Digit Code): 2844

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

Multimedia Producer, Motion Picture Producer, Television Producer, Scriptwriter

Evidence received from:

Bottom-up data (CFE survey); Malaysia Digital Economy Corporation (MDEC); Malaysian Communications and Multimedia Commission (MCMC); TalentCorp administrative data

Top-down data:

This occupation did not have enough sample size from Top-down evidence.

1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA

Bottom-up evidence:

General qualifications needed:

Bachelors

Note: Company indicated that they require applicants to have specialised professional certification.

This debut occupation is in the COL 2016/2017 for the following reasons:

- i. We received evidence from 1 company reporting 1 vacancy and 5 employed (20% vacancy) from the Telecommunications & Multimedia sector.
- ii. The company reported taking one to two months to fill up this occupation. This occupation is harder to fill than a year ago, and the trend is expected to continue in the future.
- iii. With regards to why this occupation is hard to fill, the company reported the lack of job applicants as well as applicants who lack the relevant job experience and required credentials/certifications. They also reported facing strong competition for these workers from abroad.
- iv. To address this shortage, the company reported raising wages, expanding recruitment efforts, increasing training, hiring less qualified applicants, and outsourcing job function.
- v. Validation with MDEC showed that media companies are looking for candidates to fill this occupation, especially producers for TV series. For example, one major media company is pushing for major development of local content and is planning to hire a number of people in this occupation within the next six to twelve months.
- vi. TalentCorp administrative data shows that multimedia producers are being hired.

Occupation: Electrical Engineering Technicians			
MASCO 2013 (4-Digit Code): 3113			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Electrical Technician, Debug Technician	
Evidence received from: Top-down data; Bottom-up data (CFE survey); Internal consultation with TalentCorp’s Sector Relationship Manager; TalentCorp administrative data			
Top-down data: This occupation passes 0 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	-5.88	4. Median wage growth - 1 year	0
2. Employment growth - 3 years	-12.41	5. Median wage growth - 3 years	19.05
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	1.09
Bottom-up evidence:			
General qualifications needed: Diploma or Bachelors			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 3 companies reporting a total of 35 vacancies and 208 employed (17% vacancy) from the Electrical & Electronics sector. ii. Companies reported taking more than two months to fill up this occupation, and that the occupation is just as difficult to fill compared to a year ago. iii. With regards to why this occupation is hard to fill, companies reported to us that job applicants lack relevant job experience and technical skills. Additionally, there is strong competition for applicants from other industries. iv. To address this shortage, companies reported raising wages, increasing training, and expanding local recruitment efforts. v. TalentCorp administrative data showed that this occupation is sought after. vi. Additional evidence from the Environmental Scan for the M&E and ESI sector indicated that this occupation is critical in the industry. 			

Occupation: Electronics Engineering Technicians			
MASCO 2013 (4-Digit Code): 3114			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Electronics Technician, Test Technician, Computer-aided Design (CAD)/Computer-aided Manufacturing (CAM) Technician	
Evidence received from: Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); TalentCorp administrative data			
Top-down data: This occupation passes 1 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	-10.40	4. Median wage growth - 1 year	0
2. Employment growth - 3 years	8.69	5. Median wage growth - 3 years	25.00
3. Median hours worked growth – 1 year	0	6. Wage premium - 1 year	2.10
Bottom-up evidence:			
General qualifications needed: Diploma			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. Overall, the availability of Top-down and Bottom-up data is somewhat contradictory. Given that this occupation was on the previous COL, we decided to place a heavier emphasis on our Bottom-up evidence in order to identify if the shortages persist on more specific levels. ii. We received evidence from 2 companies reporting a total of 67 vacancies and 439 employed (15% vacancy) from the Electrical & Electronics sector. iii. Companies reported taking one to six months to fill up this occupation. Companies reported that this occupation is harder to fill than a year ago, and that the trend will continue in the future. iv. With regards to why this occupation is hard to fill, companies reported to us that job applicants lack relevant job experience and technical skills. Companies reported facing strong competition for these workers from other industries and abroad. v. To address this shortage, companies reported raising wages, expanding recruitment efforts, and hiring less well qualified applicants. vi. TalentCorp administrative data showed that companies are looking for specific skill sets (ex: TVET, SKM3/4) instead of degree qualifications from applicants for this specific job scope. 			

Bottom-up evidence (continuation):

- viii. Our discussion with NAICO and E&E sector relationship managers indicated that specific job titles under this occupation is sought after. While we do not see the full picture of shortages, we have taken into account the strategic importance of the E&E and aerospace sector in deciding to maintain this occupation on the list.

Occupation: Mechanical Engineering Technicians

MASCO 2013 (4-Digit Code): 3115

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

Aerospace (Mechanical) Engineering Technician, Aeronautical Engineering Technician, Mechanical Engineering Technician (Industrial Machinery and Tools), Aeronautical (Mechanical) and Equipment Engineering Assistant, Computer Numerical Control (CNC) Technician, Welding Technician, Hydraulic Workover Unit Supervisor

Evidence received from:

Top-down data; Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); Malaysian Investment Development Authority (MIDA); TalentCorp administrative data

Top-down data:

This occupation passes 0 out of 6 indicators from Top-down evidence

1. Employment growth - 1 year	-0.25	4. Median wage growth - 1 year	2.04
2. Employment growth - 3 years	-0.12	5. Median wage growth - 3 years	14.68
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	1.19

Bottom-up evidence:

General qualifications needed:

At least apprenticeship, Diploma or Bachelors

Note: Some companies require applicants to have specialised professional certification, such as IWCF Level

This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:

- i. We placed a heavier emphasis on Bottom-up evidence given the frequency that this occupation was nominated by companies across industries.
- ii. We received evidence from 5 companies reporting a total of 10 vacancies and 96 employed (10% vacancy) from the following sectors: Aerospace, Healthcare (including Medical Devices and Pharmaceutical), Oil, Gas & Energy (including Petrochemicals), and Manufacturing.
- iii. Companies reported that the occupation is harder to fill than last year, and expect the occupation to be harder to fill in the future.
- iv. With regards to why this occupation is hard to fill, companies reported to us that job applicants lack relevant job experience and technical skills. Companies also reported facing strong competition for these workers from abroad.
- v. To address this shortage, companies reported raising wages, expanding recruitment efforts, and increasing training.

Bottom-up evidence (continuation):

- vi. Companies reported that machinists/engineers who can operate CNC machines are sought after. However, the companies reported that current graduates do not find the job scope appealing and that they lack programming skills relevant to the industry.
- vii. Our consultation with MIDA shows that this occupation is sought after.
- viii. The Environmental Scan for the M&E and ESI sector showed mechanical engineering technicians are among the top 2 critical occupations in the industry.
- ix. NAICO highlighted CNC specialists as a critical job.

Occupation: Aircraft Technicians			
MASCO 2013 (4-Digit Code): 3151			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Aircraft Technician, Aircraft Service Technician, Aircraft Maintenance Technician (Airframes)	
Evidence received from: Bottom-up data (CFE survey); National Aerospace Industry Coordinating Office (NAICO); TalentCorp administrative data			
Top-down data: This occupation did not have enough sample size from Top-down evidence.			
1. Employment growth - 1 year	NA	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	NA	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	NA	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualifications needed: Diploma Note: One company indicated that they require applicants to have professional license, while another company require applicants to have Sijil Kemahiran Malaysia in Composite Manufacturing & NDT Level 2			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 3 companies from the aerospace industry reporting 479 vacancies and 2139 employed (23% vacancy). ii. The companies reported taking one to six months to fill up this occupation. While companies reported that this occupation is just as hard to fill as a year ago, they expect it to be slightly easier to fill in the future. iii. With regards to why this occupation is hard to fill, the companies reported to us that job applicants lack the technical skills and required credentials/certification. Companies also reported that they face strong competition from other industries and abroad. iv. To address this shortage, the companies reported establishing partnerships with training providers, expanding recruitment efforts and increasing training. 			

Occupation: Valuers and Loss Assessors			
MASCO 2013 (4-Digit Code): 3315			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Claims Assessor	
Evidence received from: Top-down data; Bottom-up data (CFE survey); Life Insurance Association of Malaysia (LIAM)			
Top-down data: This occupation passes 1 out of 3 indicators from Top-down evidence			
1. Employment growth - 1 year	-12.42	4. Median wage growth - 1 year	NA
2. Employment growth - 3 years	-16.06	5. Median wage growth - 3 years	NA
3. Median hours worked growth - 1 year	12.5	6. Wage premium - 1 year	NA
Bottom-up evidence:			
General qualification needed: Bachelors Note: Companies indicated that they require applicants to have specialised professional certification.			
This debut occupation is in the COL 2016/2017 for the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 2 companies reporting 9 vacancies and 99 employed (9% vacancy) from the Financial Services (including Takaful/Insurance services) sector. ii. Most companies reported taking two to six months to fill up this occupation. They also indicated that this occupation is slightly harder to fill than a year ago, and that the trend will continue in the future. iii. With regards on why this occupation is hard to fill, the companies indicated that job applicants lack the relevant technical skills. Additionally, there is stiff hiring competition from other industries and overseas employers. iv. To address this shortage, the companies reported raising wages, hiring less well qualified applicants and increasing training. v. Our consultation and validation with LIAM showed that this occupation is sought after. 			

Occupation: Insurance Agents			
MASCO 2013 (4-Digit Code): 3321			
Only the following job titles within this occupation are included in the Critical Occupations List (COL):		Insurance Underwriter, Reinsurance Underwriter	
Evidence received from: Top-down data; Bottom-up data (CFE survey); Persatuan Insuran Am Malaysia (PIAM); Life Insurance Association of Malaysia (LIAM)			
Top-down data: This occupation passes 4 out of 6 indicators from Top-down evidence			
1. Employment growth - 1 year	22.80	4. Median wage growth - 1 year	0
2. Employment growth - 3 years	25.46	5. Median wage growth - 3 years	50.00
3. Median hours worked growth - 1 year	0	6. Wage premium - 1 year	2.97
Bottom-up evidence:			
General qualifications needed: Bachelors Note: All companies require applicants to have underwriting professional certification			
This occupation appeared on COL 2015/2016. The occupation continues to remain on the COL this year based on the following reasons:			
<ul style="list-style-type: none"> i. We received evidence from 3 companies reporting a total of 10 vacancies and 96 employed persons (10% vacancy) from the Financial Services (including Takaful/Insurance services) industry. ii. The companies reported taking two to six months to fill up this occupation. They also noted that the occupation is just as hard to fill and in some cases even harder to fill compared to one year ago, and expect the occupation to be harder to fill in the future. iii. With regards to why underwriter positions are hard to fill, the companies reported to us that job applicants lack the relevant technical skills and professional certifications. They also reported facing strong competition for underwriters from abroad. iv. To address this shortage, the companies reported raising wages, expanding recruitment efforts, and increasing training. v. Consultation with PIAM shows that there is a shortage of underwriters in highly specialised fields such as reinsurance, marine, engineering, and energy - where the amount insured tends to be significant. vi. PIAM also noted that applicants for the underwriter position requires insurance qualifications (AMII, ACII) from Malaysian Insurance Institute and Chartered Insurance Institute. 			

APPENDIX I

Description of Critical Occupations in Table 3

1. Managing Directors and Chief Executives (1121)

MASCO Description

Managing Directors and Chief Executives formulate and review policies and plan, direct, coordinate and evaluate the overall activities of enterprises or organisations (except special interest organisations and government departments) with the support of other managers.

2. Finance Managers (1211)

MASCO Description

Finance managers plan, direct and coordinate the financial operations and participates in formulating the financial policy within a government agency, corporate business, or organisation.

3. Human Resource Managers (1212)

MASCO Description

Human Resource Managers plan, organise, direct, control and coordinate policies concerning the personnel, industrial relations and occupational safety and health of an enterprise or organisation.

4. Policy and Planning Managers (1213)

MASCO Description

Policy and Planning Managers plan, organise, coordinate and advise on policy and strategic planning activities within the government or for non-government organisations and private sector agencies.

5. Business Services Managers (1214)

MASCO Description

Business services managers plan, organise, direct, control and coordinate sales and marketing activities of an enterprise or organisation.

6. Sales and Marketing Managers (1221)

MASCO Description

Sales and Marketing Managers plan, organise, direct, control and coordinate activities concerning the sales and marketing of an enterprise or organisation.

7. Advertising and Public Relations Managers (1222)

MASCO Description

Advertising and Public Relations Managers plan, organise, direct, control and coordinate the advertising and public relations activities of enterprises and organisations.

8. Research and Development Managers (1223)

MASCO Description

Research and Development Managers plan, organise, direct, control and coordinate the research and development activities of organisations.

9. Manufacturing Managers (1321)

MASCO Description

Manufacturing Managers plan, organise, direct, control and coordinate manufacturing production activities of large enterprises or manage a small manufacturing company.

10. Mining Managers (1322)

MASCO Description

Mining Managers plan, organise, direct, control and coordinate the activities concerning mining, quarrying and oil and gas extraction operations.

11. Supply, Distribution and Related Managers (1324)

MASCO Description

Supply, Distribution and Related Managers plan, organise, direct, control and coordinate the supply, transport, storage and distribution of goods.

12. Information and Communications Technology (ICT) Managers (1511)

MASCO Description

Information and Communications Technology Managers organise, plan, direct, control and coordinate the acquisition, development, maintenance and use of computers and telecommunications systems.

13. Geologists and Geophysicists (2114)

MASCO Description

Geologists and Geophysicists conduct research, improve or develop concepts, theories and operational methods, or apply scientific knowledge relating to geology and geophysics in such fields as oil, gas and mineral exploitation, water conservation, civil engineering, telecommunications and navigation, and assess development projects and the effects of waste disposal on the environment.

14. Mathematicians, Actuaries and Statisticians (2121)

MASCO Description

Mathematicians, Actuaries and Statisticians conduct research and improve or develop mathematical, actuarial and statistical concepts, theories, operational methods, and techniques, and advise on or engage in their practical application in such fields as engineering, business, social and other sciences.

15. Industrial and Production Engineers (2141)

MASCO Description

Industrial and Production Engineers plan, conduct research, design and oversee the construction, operation and maintenance process and installation of plants. They establish programmes for the coordination of manufacturing activities and assess the cost effectiveness and safety.

16. Mechanical Engineers (2144)

MASCO Description

Mechanical Engineers conduct research and advise on design, and direct the production of machinery and equipment and industrial plant systems, and advise on and direct their functioning, maintenance and repairs, or study and advise on technological aspects of particular materials, products or processes.

17. Mining Engineers, Metallurgists and Related Professionals (2146)

MASCO Description

Mining Engineers, Metallurgists and Related Professionals conduct research, design and develop and maintain commercial-scale methods of extracting metals from their ores or minerals, water and oil or gas from the earth and of developing new alloys, ceramic and other materials, or study and advise on technological aspects of particular materials, products or processes.

18. Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified (2149)

MASCO Description

This unit group covers Engineering Professionals (Excluding Electrotechnology) Not Elsewhere Classified in Minor Group 214: Engineering Professionals (Excluding Electrotechnology).

19. Electrical Engineers (2151)

MASCO Description

Electrical Engineers conduct research and advise on, design and direct the construction and operation of electrical systems, components, motors and equipment, and advise on and direct their maintenance and repair, or study and advise on technological aspects of electrical engineering materials, products and processes.

20. Electronic Engineers (2152)

MASCO Description

Electronic Engineers conduct research on, design and direct the maintenance and repair of electronic systems. They study and advise on technological aspects of electronic engineering materials, products and processes.

21. Telecommunications Engineers (2153)

MASCO Description

Telecommunications Engineers conduct research, design and direct the maintenance, repair of systems and telecommunications equipment. They study and advise on technological aspects of materials, products and processes in telecommunications engineering.

22. Building Architects (2161)

MASCO Description

Building Architects plan, advise on and design recreational, institutional, residential, commercial and industrial buildings, and plan and monitor their construction, maintenance and rehabilitation.

23. Cartographers and Surveyors (2165)

MASCO Description

Cartographers and Surveyors apply surveying methods and techniques to determine the exact position of natural and constructed features and boundaries of land, seas, underground areas and celestial bodies, and prepare or revise digital, graphic and pictorial representations of maps and charts, applying scientific and mathematical principles.

24. Graphic and Multimedia Designers (2166)

MASCO Description

Graphic and Multimedia Designers design information content for visual and audio communication, publications and display using film, electronic, digital and other forms of visual and audio media.

25. Ships Engineers (2171)

MASCO Description

Ship Engineers control and participate in the operation, maintenance and repair of electrical and electronic equipment and machinery on board, or perform related supporting functions.

26. Aircraft Pilots and Related Professionals (2173)

MASCO Description

Aircraft Pilots and Related Professionals control the operation of mechanical, electrical and electronic equipment in order to navigate aircraft and perform pre-flight and in-flight tasks.

27. Manufacturing Professionals (2182)

MASCO Description

Manufacturing Professionals conduct research and improve or develop concepts, theories and operational methods, or apply existing knowledge concerning the production of food, paper, sawmill, warehouse as well as quality assurance.

28. University and Higher Education Professional Teachers (2311)

MASCO Description

University and Higher Education Teaching Professionals prepare and deliver lectures and conduct tutorials in one or more subjects within a prescribed course of study at a university or other higher educational institution. They conduct research and prepare academic papers and books.

29. Accountants (2411)

MASCO Description

Accountants plan, organise and administer accounting systems, and examine and analyse the accounting and financial records of individuals and establishments to ensure accuracy and compliance with established accounting standards and procedures.

30. Financial and Investment Advisers (2412)

MASCO Description

Financial and Investment Advisers develop financial plans for individuals and organisations and invest and manage funds on their behalf.

31. Financial Analysts (2413)

MASCO Description

Financial Analysts conduct quantitative analyses of information affecting investments in public and private institutions.

32. Management and Organization Analysts (2421)

MASCO Description

Management and Organisation Analysts assist organisations to achieve greater efficiency and solve organisational problems. They study organisational structures, methods, systems and procedures.

33. Information and Communications Technology (ICT) Sales Professionals (2434)

MASCO Description

Information and Communications Technology (ICT) Sales Professionals sell a range of computer hardware, software and other information and communications technology goods and services including installation and provide specialised information as required.

34. Systems Analysts (2511)

MASCO Description

Systems Analysts gather and analyse facts on operations, procedures and systems for transfer into a program appropriate for data processing equipment, and recommend computer use to increase productivity efficiency and organisational profit.

35. Software Developers (2512)

MASCO Description:

Software Developers study, analyse and evaluate requirements for existing or new software applications and operating systems, and design, develop, test and maintain software solutions to meet the requirements.

36. Applications Programmers (2514)

MASCO Description

Application Programmers write and maintain programmable code outlined in technical instructions and specifications for software applications and operating systems.

37. Software and Applications Developers Not Elsewhere Classified (2519)

MASCO Description

This unit group covers Software and Application Developers and Analysts Not Elsewhere Classified in minor group 251: Software and Application Developers and Analysts.

38. Databases and Administrators (2521)

MASCO Description

Database Designers and Administrators design, develop, control, maintain and support the optimal performance and security of databases.

39. Systems Administrators (2522)

MASCO Description

System Administrators develop, maintain and support optimal performance and control security of information technology systems.

40. Computer Network Professionals (2523)

MASCO Description

Computer Network Professionals research, analyse and recommend strategies for network architecture and development. They implement, manage, maintain and configure network hardware and software, and monitor, troubleshoot and optimise performance.

41. Database and Network Professionals Not Elsewhere Classified (2529)

MASCO Description

This unit group covers Database and Network Professionals Not Elsewhere Classified in Minor Group 252: Database and Network Professionals.

42. Film, Stage and Related Directors and Producers (2844)

MASCO Description

Film, Stage and Related Directors and Producers oversee, control and direct the technical and artistic aspects in film, television or radio productions or stage shows.

43. Electrical Engineering Technicians (3113)

MASCO Description

Electrical Engineering Technicians perform technical tasks to aid in electrical engineering research, and in the design, manufacture, assembly, construction, operation, maintenance and repair of electrical equipment, facilities and distribution systems.

44. Electronics Engineering Technicians (3114)

MASCO Description

Electronics Engineering Technicians perform technical tasks to aid in electronic research, and in the design, manufacture, assembly, construction, operation, maintenance and repair of electronic equipment.

45. Mechanical Engineering Technicians (3115)

MASCO Description

Mechanical Engineering Technicians perform technical tasks to aid in mechanical engineering research, and in the design, manufacture, assembly, construction, operation, maintenance and repair of machines, components and mechanical equipment.

46. Aircraft Technicians (3151)

MASCO Description

Aircraft Technicians repair, overhaul, examine, test and service aircraft engines and other aircraft mechanical equipment.

47. Valuers and Loss Assessors (3315)

MASCO Description

Valuers and Loss Assessors value property and various goods and assess losses covered by insurance policies.

48. Insurance Agents (3321)

MASCO Description

Insurance Agents advise on and sell life, accident, automobile, liability, endowment, fire, marine and other types of insurance to new and existing clients.

Note: Insurance Underwriters is under MASCO 3321 (Insurance Agents)

APPENDIX II

Labour Market Statistics

Labour Market Indicator	2011	2012	2013	2014 _r	2015 _p
Labour Force ('000 persons)	12,740.7	13,221.7	13,980.5	14,263.6	14,518.0
Employment ('000 persons)	12,351.5	12,820.5	13,545.4	13,852.6	14,067.7
Unemployment Rate (%)	3.1	3.0	3.1	2.9	3.1
Graduate Unemployment Rate (%)*	24.0	25.6	25.0	24.9	23.9
Youth Unemployment Rate**	9.7	10.0	9.7	9.5	10.7
Labour Force Participation Rate (%)					
Total	64.5	65.6	67.3	67.6	67.9
Female	48.0	49.5	52.6	53.7	54.1
Male	79.7	80.5	81.0	80.6	80.6
Labour Force by Educational Attainment (% Share)					
Primary	17.0	17.0	17.1	15.9	15.4
Secondary	55.3	55.7	55.6	55.3	54.0
Tertiary	24.3	24.2	24.1	26.1	27.6
Employment by Skill Category (% Share)					
High-skilled	26.1	25.1	24.2	24.6	25.5
Semi-skilled	61.6	62.4	62.5	62.3	60.7
Low-skilled	12.3	12.6	13.3	13.1	13.8
Employment by Educational Attainment (% Share)					
Primary	17.2	17.2	17.3	16.1	15.6
Secondary	55.3	55.6	55.6	55.3	53.9
Tertiary	24.2	24.1	24.0	25.8	27.4
Employment by Economic Sector (% Share)					
Agriculture, Forestry & Fishing	11.5	12.7	13.0	12.2	12.5
Manufacturing	18.2	17.7	17.1	17.1	16.5
Services	58.6	58.3	58.1	59.7	60.0
Mining & Quarrying	0.6	0.6	0.6	0.6	0.7
Construction	9.3	9.2	9.5	9.2	9.3

Source: Department of Statistics, Malaysia

* Graduate Unemployment Rate Statistics is sourced from Tracer Studies by the Ministry of Education.

** Based on revised figures from the Department of Statistics Malaysia.

APPENDIX III

Additional Details on the COL Methodology

THE CSC'S APPROACH IN USING OCCUPATIONS AND JOB TITLES

For the COL, we use occupations as the unit of measurement, as opposed to skills, based on international best practices. An occupation is defined as a set of tasks or duties to be carried out by one person during employment. Skills, however, is subject to different interpretations by employers, and can be easily perceived interchangeably as soft skills, technical skills or qualifications.

Identifying occupations in the labour market where imbalances exist requires us to form and communicate a clear and consistent view of what we mean by 'occupation'. We therefore use the Malaysia Standard Classifications of Occupations 2013 (MASCO 2013), which has been developed following international standards and norms. MASCO is broken down into five main levels, namely, major groups, sub-major groups, minor groups, unit groups and small unit groups. The higher the digit for the occupation level (i.e. 1-digit, 2-digit, etc.), the more specific an occupation is in a particular occupation group. Similarly to other countries (UK and Australia) we use the 4-digit level for our analysis, as a more disaggregated level would not provide a statistically reliable picture of the associated occupations.

While the usage of MASCO is central to this report, employers often think of skills imbalances in more specific terms. In some cases, there is a need to look beyond occupations and instead look at more specific job titles. As no statistically representative national-level data are available at the job-title level, we have where possible, included critical job titles under the critical occupations, based on the Bottom-up consultations and validation with sector regulars and industry lead bodies.

TOP-DOWN ANALYSIS: ADDITIONAL DETAILS

The CSC has made several key improvements in the Top-down methodology for the COL 2016 based on previous years' experience. The changes are summarised as follows:

	Key Changes	Rationale
1.	Use of 6 indicators instead of 2 indicators	Additional indicators to enhance the effectiveness of the “disequilibrium” approach
2.	For each indicator, a minimum of 30 observations are <u>required for all years</u> instead of using an average of at least 30 observations	To ensure better precision and representativeness of data
3.	Use of a benchmark period to determine thresholds	Following the UK and Mexico examples, the CSC calculated the thresholds based on the distribution of the indicators in a period of high economic growth. In the case of Malaysia, we identified 2014-2013 as a period of high economic growth

Is It Skilled?

In the current version of the COL, our analysis focuses on high-skilled occupations. We identify high-skilled occupations if it falls within the first three major groups of the Malaysian Standard Classification of Occupations 2013 list (MASCO 2013)⁶, which has been developed in line with international standards. These groups include (i) Managers; (ii) Professionals; and (iii) Technical and Associate Professionals.

As we further review and develop our processes and methodology, we aim to study semi-skilled occupations for the coming versions of the COL. The inclusion of these occupations into our analysis is important in the policy context of training and upskilling workers, particularly in the space of Technical Vocational Education and Training (TEVT).

Is it Sought-after?

The second criterion imposed in constructing our COL is “sought-after”, in which we use selected labour market indicators (LMIs) to determine if an occupation is demanded by firms. For COL 2015, we selected average wage growth and employment growth as our key indicators. For 2016, however, we studied a range of available LMIs following international best practices from the UK and Australia to finally narrow our selection to 6 indicators that falls under 2 broad categories (i) volume-based indicator and (ii) price-based indicator:

⁶ The MASCO is Malaysia's version of the International Standard Classification of Occupations (ISCO) developed by the United Nations.

	Volume-based Indicators	Rationale
1.	Employment growth (1 year)	Rising employment suggests relative demand is rising.
2.	Employment growth (3 years)	Similar reasoning to that of indicator No. 1, but taking into account potential cyclical fluctuations
3.	Median hours worked growth (1 year)	An increase in the median number of hours worked in an occupation could be linked to an increase in demand for that occupation.
	Price-based Indicators*	Rationale
4.	Median monthly wage growth (1 year)	A rise in median wages in an occupation relative to others could be linked to an increase in demand for that occupation.
5.	Median monthly wage growth (3 years)	Similar reasoning to that of indicator No. 4, but taking into account potential cyclical fluctuations
6.	Wage premium growth (1 year)	Similar reasoning to that of indicator No. 4, but controlling for age, age squared and education

*Wage is defined as total wages including overtime

Four sequential steps are taken to determine if an occupation is sought-after. First, we calculate the indicators for each occupation for the reference period (2014 – 2015: for one year change; 2012 – 2015: for three years changes). We then calculate the threshold for each indicator across all occupations in the benchmark period (period of high economic growth). Specifically, the benchmark period is (2013 – 2014: for one year change; 2011 – 2014: for three years changes). The thresholds used (based on the analysis of distribution of indicator) are as follows:

Indicator	Threshold
Employment growth (all workers) – 1 year	Median+50% of Median
Employment growth (all workers) –3 years	Median+50% of Median
Median hours worked growth (all workers) – 1 year	Top Quartile
Median wage growth (all workers) - 1 year	Median+50% of Median
Median wage growth (all workers) - 3 years	Median+50% of Median
Wage premium (all workers) – 1 year	Top Quartile

Third, we shortlist the occupations with indicators that exceed their respective thresholds. Lastly, an occupation is determined to be in critical if at least half of all available indicators are above their respective thresholds or at least 2 indicators are above their respective thresholds if only 3 indicators are available.

The CSC has also explored the possibility of adding (i) average wage growth and (ii) total hours worked as additional indicators, but further analysis has shown that:

- The average wage growth indicator is highly correlated with the median wage growth and wage premium growth indicators. As such, we have decided to omit the average growth indicators as it will likely only lead to double-counting without adding any new information
- The “median hours worked” indicator is used because “total hours worked” was shown to be highly correlated with the employment growth indicator

In further improving our methodology, we aim to include more LMIs into the model in the future to increase the accuracy and robustness of the list.

Is It Strategic?

Our final criterion for the Top-down analysis requires that a “skilled” and “sought-after” occupation be in a “strategic” sector. This ensures that the COL does not merely represent skilled and desired occupations by firms, but also occupations in sectors that Malaysia needs to develop in line with its investment and economic aspirations.

The COL 2016/2017 focuses on ten strategic sectors. The CSC intends to extend coverage to other sectors in future COLs. Currently, the ten sectors are (i) Oil, Gas and Energy, (ii) Electrical and Electronics (E&E), (iii) Financial Services, (iv) Telecommunications and Multimedia, (v) Information and Communications Technology (ICT) and Global Business Services (GBS), (vi) Professional Services (Accounting), (vii) Aerospace, (viii) Education, (ix) Petrochemicals and (x) Medical Devices. The sectors were selected based on their high concentration of knowledge workers as well as the significant roles they play in contributing to Malaysia’s transformation into a knowledge-intensive, high-income economy.

The Critical Occupations Derived from Top-down Analysis

From the Top-down analysis, we were able to identify 42 occupations as critical: skilled, sought-after and strategic. The Top-down analysis was then combined with the Bottom-up evidence to produce a preliminary COL list. This list was then utilised to seek validation and feedback by employers. The final COL has a total of 48 occupations listed as critical.

Data Challenges and Limitations in Top-Down Analysis

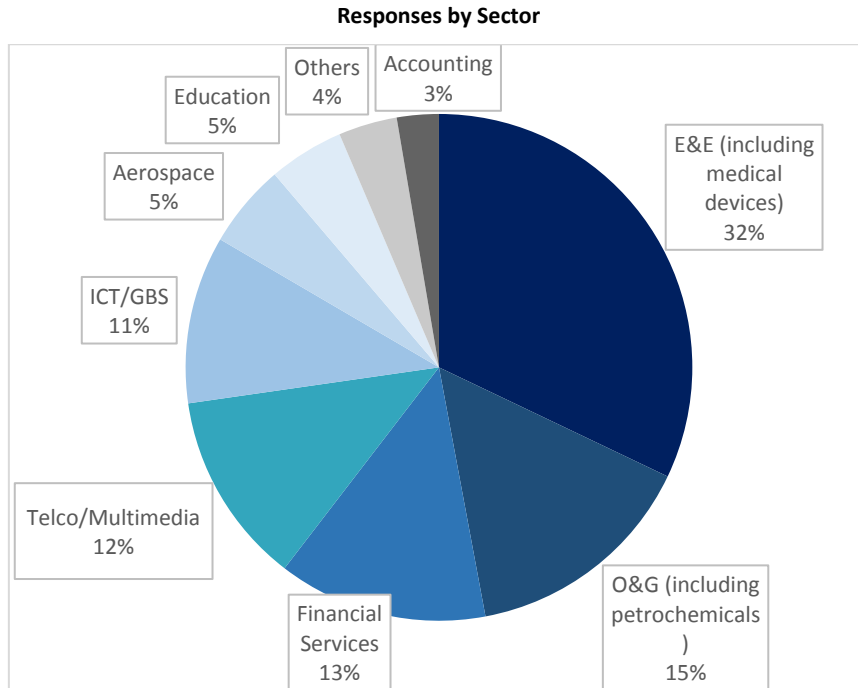
A clear lesson from international experience in critical skills monitoring is that reliable and consistent labour market information is required. In our Top-down analysis, we are currently only able to use two key data sets compiled by the Department of Statistics, Malaysia (DOSM). These are the Labour Force Survey (LFS) and the Salaries and Wages Survey over the period of 2011-2015.

The LFS data set is detailed at a 4-digit MASCO level, which is a level that most national labour statistics are usually available at. However, this is often not at the level at which employers think about skills imbalances. While a more detailed break-down would be ideal, sample sizes may be inadequate to guarantee reliable results, even if the national data can theoretically be disaggregated to the appropriate level. The data limitations emphasise the importance of Bottom-up evidence in mitigating any of the analytical challenges arising from the data constraints.

We recognised that more diverse source of datasets for the LMIs are needed and are in the process to identify additional sources to enrich the COL. As the CSC improves and reviews its processes, we aim to add more indicators and data sources into the analysis, as we determine the accuracy, consistency and usability of these datasets.

BOTTOM-UP ENGAGEMENTS: ADDITIONAL DETAILS ON THE CFE SURVEY

The CFE survey was sent to a total of 678 companies in October 2016. Of this, 187 companies replied. Most of the respondents are in the E&E sector (including medical device companies), followed by the Oil, Gas & Energy sector (including petrochemicals), and the Telecommunications & Multimedia sector.



Source: CSC

The survey was split into three compulsory sections:

1. Respondent Background Information
2. Nomination of Occupation(s)
3. Details on Nominated Occupation

Respondents first selected the sector that best fits their company's activities from a drop-down window. Most companies identified themselves with a very specific part of the value chain. For example, in Oil, Gas & Energy sector, several respondents identified themselves as shipping, construction or chemical manufacturing companies, although these companies' activities were mainly in Oil, Gas & Energy sector, but in different parts of the value chain. Similarly, a few companies in the E&E value chain identified themselves as manufacturers of semiconductors, connectors and copper products.

Next, companies are asked to nominate critical occupations based on the MASCO classification. The survey defined critical occupations as being highly skilled, sought after, and of strategic importance to the Malaysian economy. Altogether, companies nominated 223 job titles across 82 occupations. Many of these job titles corresponded to the same MASCO code, while others were not covered.

Through the survey, respondents reported the reasons for difficulty in hiring these job titles. 64% of responses cited applicants did not have sufficient work experience, while 56% cited applicants did not have sufficient technical skills.

Reasons for difficulty in hiring for critical occupations

Sectors	Company is unable to meet the salary/benefits requested	Applicants did not have sufficient work experience	Applicants did not have sufficient technical skills	Applicants did not possess required soft skills (e.g. creativity, communication)
Aerospace	43%	57%	70%	17%
Business Services	22%	67%	33%	44%
Education	42%	58%	42%	33%
E&E	48%	69%	67%	48%
Financial Services	43%	57%	57%	21%
Medical Devices	52%	72%	68%	56%
ICT	40%	47%	60%	33%
Oil, Gas & Energy (incl Petrochemicals)	34%	82%	68%	11%
Telecommunications and Multimedia	30%	65%	35%	39%

Source: CSC

Respondents also reported the consequences for not filling in these critical occupations. Almost 60% of the responses cited increased workload of existing employees, while 31% cited difficulties in meeting quality objectives for products/services.

Negative impact of not filling in critical occupations

Sectors	Increased work for existing employees	Difficulty in giving quality products/services	Increased costs	Difficulty in meeting customer needs
Aerospace	30%	61%	39%	57%
Business Services	78%	33%	11%	33%
Education	67%	25%	50%	42%

E&E	71%	42%	35%	35%
Financial Services	72%	38%	21%	34%
Medical Devices	48%	12%	16%	4%
ICT	33%	40%	13%	20%
Oil, Gas & Energy (incl. Petrochemicals)	59%	9%	34%	9%
Telecommunications and Multimedia	61%	22%	30%	22%

Source: CSC

To address these difficulties in hiring, companies reported trying different measures (selected from a drop-down list in the survey). 55% of the responses reported increasing local recruitment efforts such as career fairs and job advertising. The next most popular response (44%) was to raise wages.

Measures to address difficulties in hiring critical occupations

Sectors	Expanding local recruitment efforts	Raising wages	Expanding international recruitment efforts	Increasing worker training
Aerospace	61%	52%	43%	48%
Business Services	67%	33%	44%	22%
Education	50%	42%	42%	17%
E&E	73%	44%	52%	33%
Financial Services	66%	46%	36%	28%
Medical Devices	52%	20%	8%	32%
ICT	33%	27%	53%	20%
Oil, Gas & Energy	55%	48%	45%	30%
Telecommunications and Multimedia	22%	48%	9%	22%

Source: CSC

THE CALL FOR EVIDENCE (CFE) SURVEY

SECTION 0: RESPONDENT BACKGROUND INFORMATION

An asterisk (*) means that a question must be answered.

1. Your Name*: _____
2. Your Title*: _____
3. Contact information:
*Telephone**: _____ *Email**: _____
Mailing address: _____
4. What organization [name] do you represent for the purpose of this submission?*
5. What is the main sector of your business (or those you represent)?*
6. Company registration number (if applicable): _____
7. Would you be willing to be contacted by TalentCorp to discuss any of your answers in more detail?
8. Please check the box below if you would you like this submission to be treated as confidential. If you check this box your name, that of the organization you represent, and your individual responses will not be made publicly available. The information you submit will still be used by the CSC and partners for evaluating occupations for inclusion on the Critical Occupations List. The information you provide may also be combined with other submissions and made available in aggregate form.

SECTION 1: NOMINATION OF OCCUPATIONS

The CSC uses three very specific criteria to evaluate occupations and job titles for inclusion on the Critical Occupations List:

- 1) **Is the occupation highly skilled?** We identify high-skill occupations as those falling within the first three major groups of the Malaysian Standard Classification of Occupations 2008 list (MASCO 2008), which has been developed in line with international standards. These groups include (i) Managers; (ii) Professionals; and (iii) Technical and Associate Professionals.
 - 2) **Is the occupation sought-after in the labor market?** Sought-after means that for a given occupation or job the demand for workers exceeds the supply of appropriately qualified applicants despite extensive efforts on the part of employers to find suitable workers.
 - 3) **Is the occupation of strategic importance to the Malaysian economy?** Strategic means that occupations support sectors or perform job functions that Malaysia needs to develop in line with its investment and economic aspirations. These aspirations are laid out in the 11th Malaysia Plan and in policies based to this plan. For this submission, please consider any occupation that is of critical importance to your operations or the health of your industry strategic.
-

Please answer the following questions to the best of your ability.

9. Please use the dropdown menu to suggest an occupation or job title that your company would like to on the COL based on the criteria above. If the exact job title you wish to nominate is not present, please select the occupation below that most closely corresponds to the one you wish to nominate. (You may add as many occupations and job titles as necessary by clicking the 'Add Occupation' button at the end of this section.)*

<> 1. Please select the major group that describes the occupation or job title you wish to nominate

<> 2. Please select the sub-major group that describes the occupation or job title you wish to nominate

<> 3. Please select the minor group that describes the occupation or job title you wish to nominate

<> 4. Please select the occupation group you wish to nominate

<> 5. If applicable, please select the specific job title you wish to nominate

10. If the title used by your firm of the occupation or job you wish to nominate differs from your selection above, please write in the title used by your firm here. _____.

11. How many employees with this occupation or job title are currently employed in your firm (Full Time Equivalent)?* _____

12. How many non-Malaysian employees currently work in this position?

13. How many current vacancies do you have for this occupation or job title?*

14. On average, what is the time-to-fill (in months) of vacancies for this occupation or job title from the moment your company undertakes any type of recruitment measures?*

- Less than one month
- Between one month and two months
- Between two months and six months
- More than six months

15. What minimum level of qualification is generally needed for this occupation?

- Apprenticeship or internship
- Diploma
- Advanced Diploma
- Bachelors
- Masters
- PhD
- Others
- Unsure

16. Based on your company's experience, why is this occupation or job title hard-to-fill (please select all that apply)?

- No or too few applicants generally
- Applicants lack the required credential or certification
- Applicants lack relevant job experience
- Applicants lack the required technical or occupational skills
- 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.)
- Applicants' expected compensation are beyond what we can offer
- Applicants did not like working conditions
- There is strong competition for applicants from other industries/sectors
- There is strong competition for applicants from employers abroad
- Other, please elaborate: _____
- Unsure

17. Is this occupation or job title particularly hard-to-fill in only in certain states/territories or is it hard-to-fill nationwide?

- It is hard-to-fill nationwide
- It is only hard-to-fill in the states/territories marked below:
 - *Johor*
 - *Kedah*
 - *Kelantan*
 - *Kuala Lumpur*
 - *Labuan*
 - *Melaka*
 - *Negeri Sembilan*
 - *Pahang*
 - *Perak*
 - *Perlis*
 - *Pulau Pinang*
 - *Putrajaya*
 - *Sabah*
 - *Sarawak*
 - *Selangor*
 - *Terengganu*
 - Unsure

18. In the past year, what strategies has your company used to try to meet your labor needs for this occupation or job title (please select all that apply)?*

- Raising wages
- Hiring less well qualified applicants
- Expanding local recruitment efforts (e.g., wider distribution of job opening, increased presence at career fairs, increased use of recruitment firms, etc.)
- Expanding international recruitment efforts
- Increased worker training
- Establishing or expanding partnerships with education or training providers focused on recruitment of graduates
- Increasing worker hours or overtime
- Convincing workers to delay retirement
- Converting part-time workers to full time status

- Hiring temporary or contracts workers
- Outsourcing this job function
- Others

19. In the past year, what has been the impact to your business (or to those you represent) of difficulty finding qualified workers in the occupation or job title identified (please select all that apply)?*

- Increased workload for current employees
- Increased operational costs
- Loss of revenue
- Loss of business or orders to competitors
- Difficulty in meeting customer service objectives
- Difficulty in product or service quality objectives
- Decreased ability to develop new products or services
- Decreased ability to introduce technological or process upgrades
- Decreased ability to set strategic objectives and/or plan for the future
- None
- Unsure

20. Do you think that this occupation will be more or less hard-to-fill now than it was one year ago?*

- Much more hard-to-fill
- Slightly more hard-to-fill
- Neither more nor less hard-to-fill
- Slightly less hard-to-fill
- Much less hard-to-fill
- Unsure

21. Do you think that this occupation will be more or less hard-to-fill in the medium to long-term?*

- Much more hard-to-fill
- Slightly more hard-to-fill
- Neither more nor less hard-to-fill
- Slightly less hard-to-fill
- Much less hard-to-fill
- Unsure

22. What is the main reason for your company's answer to question 21?*

- I do not think that there will be a significant change or am unsure if there will be a change
- The number of appropriately skilled candidates coming out of the education and training system will change
- The number of workers retiring will change
- The availability of non-Malaysian workers will change
- My industry's demand for workers in this occupation or job title will change
- Other industries' demand for workers in this occupation or job title will change
- Other, please specify: _____

23. Does your company face international competition for suitably qualified workers?

- Yes
- No

*Add another
occupation*

24. Please submit any materials (data, reports, etc.) containing information that support your responses above that you would like to be considered. Please note that the quality of information submitted here will be used to evaluate the weight that we can assign to your responses above in considering occupations and job titles for the COL.

UPLOAD

SECTION 2: FEEDBACK ON COL METHODOLOGY (OPTIONAL)

25. How did you hear about this round of CFE?

- Contact with TalentCorp Staff
- Email from TalentCorp/PE Research
- Through an Industry Association,
- Through a Regulator
- TalentCorp Website
- Attending a TalentCorp Consultation
- Other, please specify: _____

26. How much effort was required to gather the information needed to respond to this survey?

- Almost no effort
- A little bit of effort
- Some effort
- Quite a bit of effort
- A tremendous amount of effort

27. Is there anything that would make your participation in a subsequent round of the CFE more likely (please select all that apply)?

- No
- Yes, more time to complete the CfE
- Yes, better instructions on how to complete the CfE
- Yes, greater accessibility of TalentCorp staff
- Yes, more frequent follow up from TalentCorp
- Yes, less frequent follow up from TalentCorp
- Yes, access to aggregate and sector-level CfE results
- Yes, information on how CfE data are being used to inform TalentCorp programs
- Yes, events that provide an opportunity to interact with other skills stakeholders
- Other, please specify: _____

28. Do you have any additional comments on the COL? Please elaborate below.

29. Would you be willing to be contacted by TalentCorp to discuss any of your answers in more detail?*
- Yes
 - No

Please check the box below if you would you like this submission to be treated as confidential. If you check this box public records will not contain your name or that of the organization you represent. The information you submit will be used in the deliberative process and may be made publicly available in aggregate form only.*

- Please keep my submission confidential