THE PILOT CRITICAL OCCUPATIONS LIST REPORT

2015/2016

CSC

Critical Skills Monitoring Committee

CONTENTS

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PART I: INTRODUCTION AND CONTEXT

CHAPTER I: INTRODUCTION

The Critical Skills Monitoring Committee (CSC) has been established under the 11th Malaysia Plan, as part of policy initiatives to mitigate skills mismatches within the labour market and support the human capital requirements of the shift to a knowledge-based high income economy. The work of the CSC is jointly undertaken by Talent Corporation (TalentCorp) and the Institute of Labour Market Information and Analysis (ILMIA).

The principal task of the CSC is the development of the Critical Occupations List (COL), which lists the jobs most in demand in key sectors of the economy, and for which industries may be facing shortages or difficulties in hiring. More pertinently, the COL is to become the primary mechanism and input for the formulation of diverse human resources management and development policy measures, such as those related to immigration, reskilling & upskilling, scholarships, higher education and TVET. The COL is generated in a multi-step process, involving initially an aggregate assessment of labour market information, followed by syndication with employers and sector bodies. The COL is thus evidence-based and incorporates the views of industry.

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.

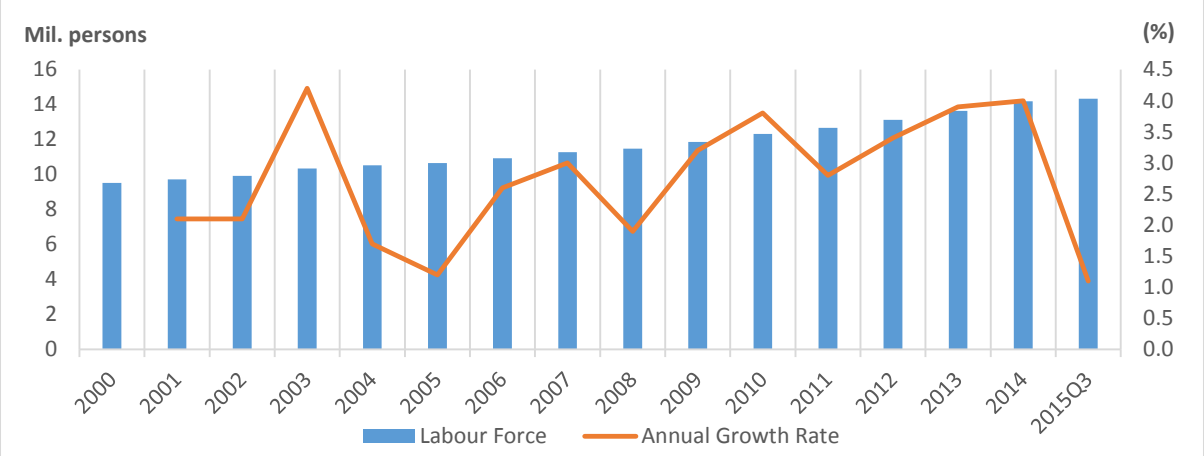
This publication presents the first COL for 2015/2016. It also outlines the context and methodology for constructing the COL, how it should be used and the CSC's efforts to continuously improve it going forward.

CHAPTER 2: STATE OF PLAY – MALAYSIA'S LABOUR MARKET LANDSCAPE

2.1 The Malaysian Labour Market in 2014

Amidst uncertain and challenging global economic conditions, Malaysia's working age population in 2014 continued to increase to 20.6 million from 20.3 million in 2013, representing 68% of the total population in Malaysia. Within this total, the workforce, which is composed of all those seeking a job, expanded in 2014 to 13.9 million persons from 13.6 million in 2013. This implied that the labour force participation rate for Malaysia rose to 67.5% in 2014 continuing a rising trend from the 63.7% experienced in 2010 - a positive development given the tight labour market situation facing Malaysia.

Chart 1: Malaysia's Labour Force

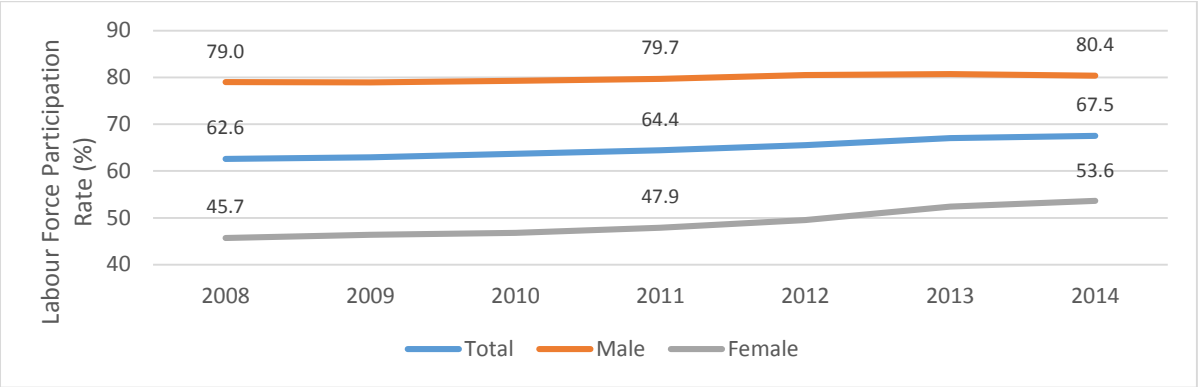


Source: Labour Force Survey, Department of Statistics, Malaysia

Since 2010, the increase in the labour force participation rate was mostly driven by the female population, as the female labour force participation rate increased by 6.8 percentage points to 53.6% in 2014, while the male labour force participation rate increased by only 1.1 percentage points to 80.4% in 2014. Female participation across several age groups were higher in 2014, exceeding 55% in the 25-34, 35-44 and 45-54 age groups.[1]

[1] Based on the World Bank database, the Labour Force Participation Rate (LFPR) in Malaysia continued to be lower than many countries in the region such as Thailand, Singapore, Vietnam and Cambodia. This can be attributed to the relatively low female LFPR in Malaysia compared to: Thailand 64%, Singapore 59%, Cambodia 79% and Vietnam 73%.

Chart 2: Labour Force Participation Rate



Source: Labour Force Survey, Department of Statistics, Malaysia

The increase in the labour force participation also happened concurrently with steady employment growth. Between 2010 and 2014, employment grew at an average yearly pace of 3.2%. During this period, close to 1.6 million new jobs were added to the labour market with the employed workforce totalling 13.5 million persons at the end of 2014. As a whole, the economy continued to experience almost full employment with the unemployment rate falling to 2.9% at the end of 2014.

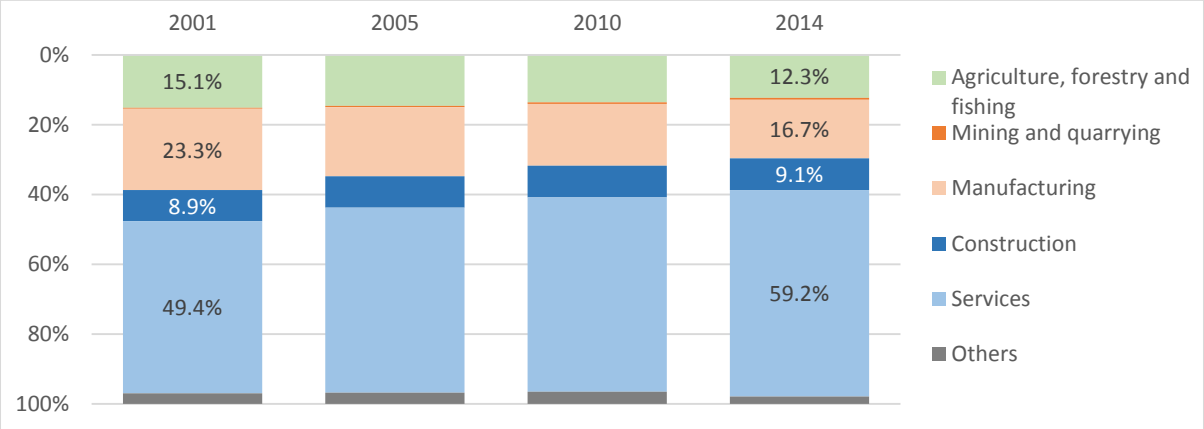
Chart 3: Employment in Malaysia (2000-2014)

Source: Labour Force Survey, Department of Statistics, Malaysia

Selangor has the largest share of the workforce (21.3%), followed by Sabah (12.2%) and Johor (11.7%). The services sector accounted for the largest share of employed workers (59.2%), mainly in the sub-sector of wholesale and retail trade. This was followed by the manufacturing (16.7%) and agriculture sectors (12.3%). Between 2001 and 2014, the proportion of employment in the agriculture and manufacturing industries has declined from a total of 38.5% to 29%, while in contrast the share of employment in the service industry grew from 49.4% to 59.2% of total employment. This clear shift

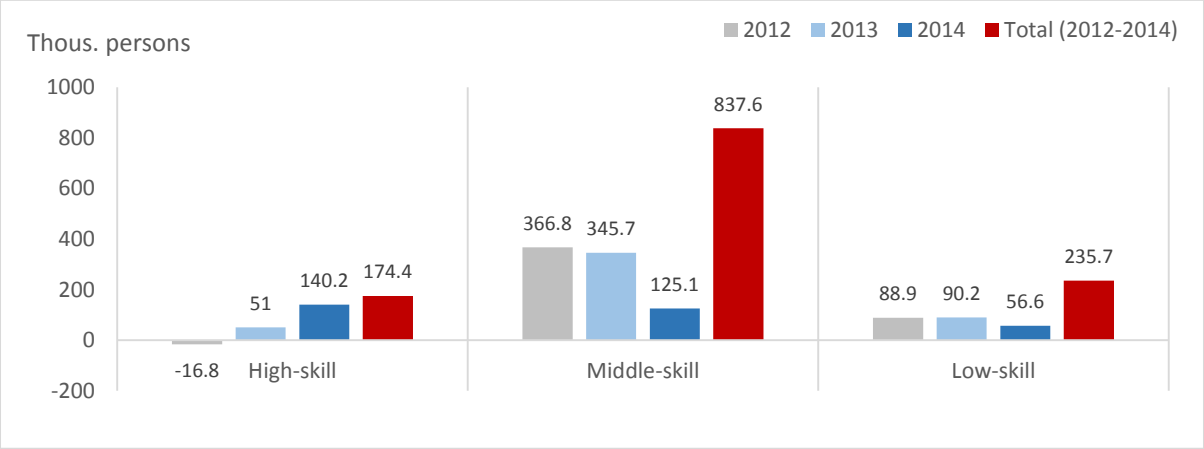
towards a more services-oriented economic structure can be attributed to policy efforts favouring growth in technology-driven and knowledge-intensive activities.

Chart 4: Employment by Industry



Source: Labour Force Survey, Department of Statistics, Malaysia

Chart 5: Net Job Creation by Skill Level (2012-2014)

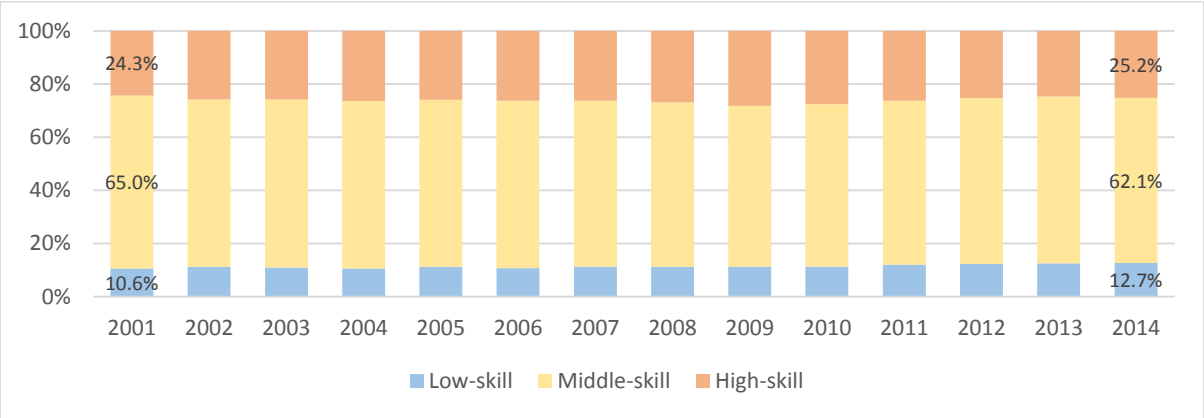


Source: CSC's calculation based on the Labour Force Survey, Department of Statistics, Malaysia

While a large number of new jobs has been created, most of these jobs were in the semi-skilled category. Within the 2012 to 2014 period, 14% of the new jobs created were in the high-skill category, while 67% and 19% were in the semi-skill and low-skill categories respectively.[2]

[2] Occupations in MASCO level 1-3 are high-skilled, occupations in MASCO level 4-8 are semi-skilled and occupations in MASCO level 9 is low-skilled.

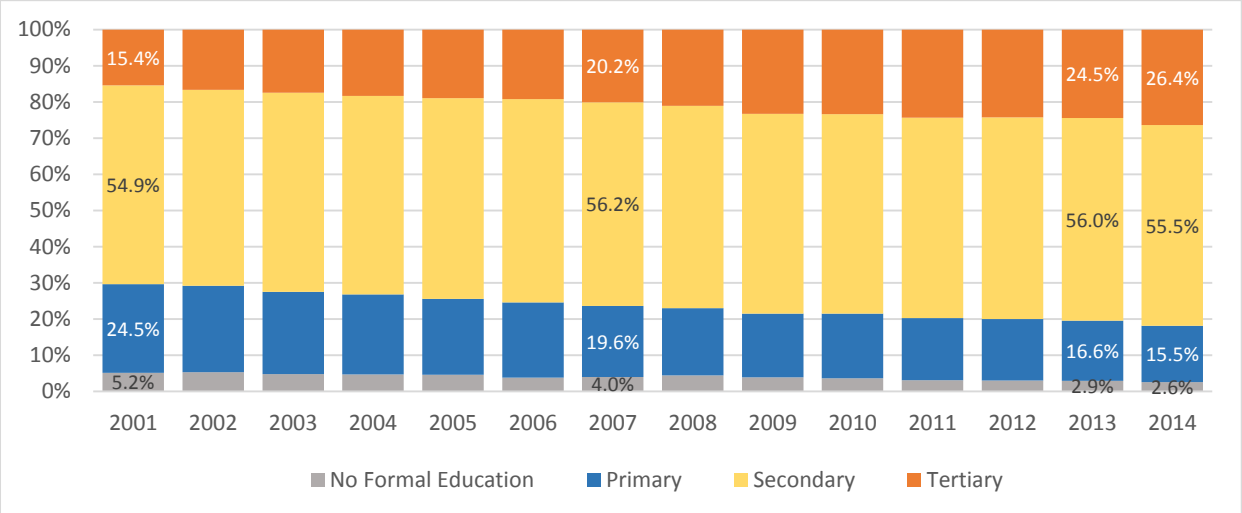
Chart 6: Share of Employment by Skill Level



Source: Labour Force Survey, Department of Statistics, Malaysia

Over the last 14 years, between 2001 and 2014, the composition of high-skilled employment in the workforce has displayed little improvement. In fact, in recent years, the share of low-skilled workers has even risen somewhat to 12.7%.[3] With greater emphasis being placed on high value-added and knowledge-intensive activities, stronger efforts are needed to increase the skill level of the workforce.

Chart 7: Employment by Educational Attainment

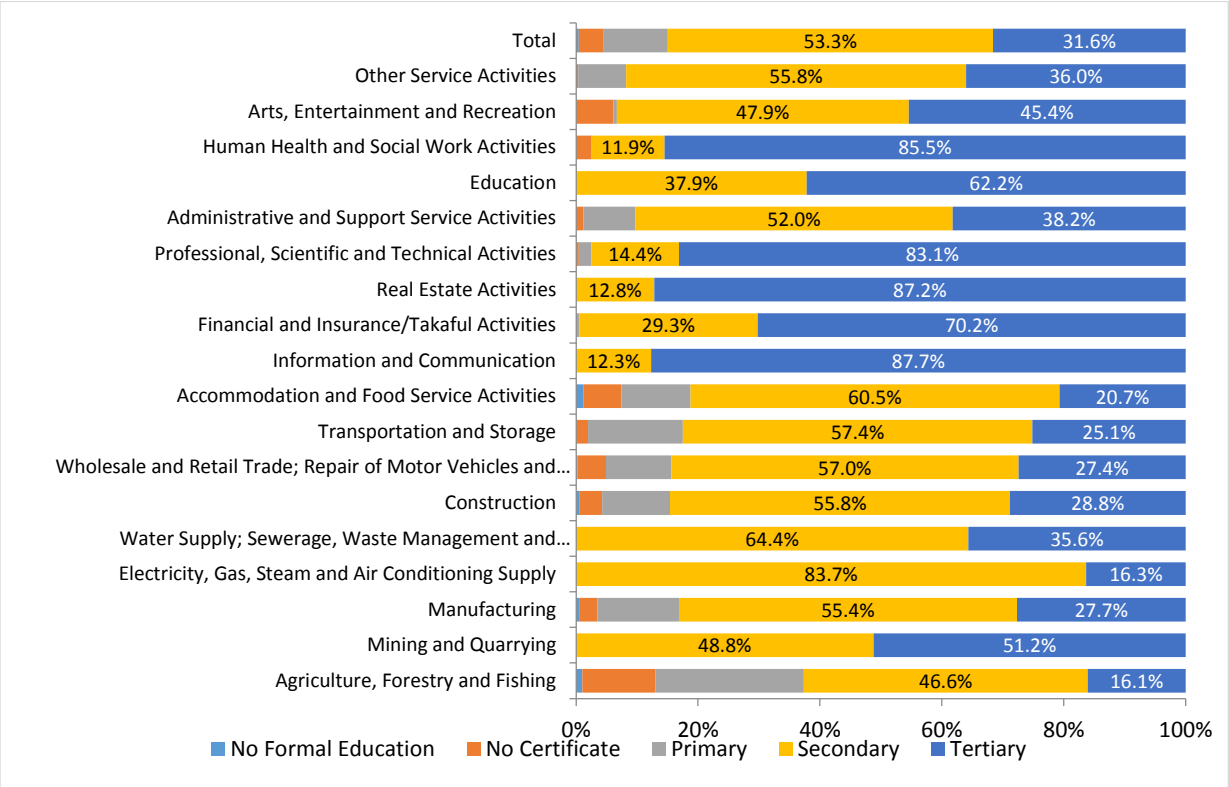


Source: Labour Force Survey, Department of Statistics, Malaysia

In terms of educational attainment, however, Malaysia's workers are becoming increasingly more educated, as the share of the employed with tertiary education rose by 1.9 percentage points to 26.4% in 2014. This is corroborated with a decline in the share of workers with no formal education by 0.3 percentage points to 2.6% of total employment.

[3]Corresponding share of employment by skill level in other countries based on World Economic Forum, ILO. (HS= High-skilled; SS = Semi-skilled; LS = Low-skilled) - Thailand (HS: 14%, SS: 77%; LS: 9%), Singapore (HS: 55%, SS: 38%, LS: 7%), Indonesia (HS: 9%, SS: 75%, LS: 16%) Republic of Korea (HS: 22%, SS: 65%, LS: 13%)

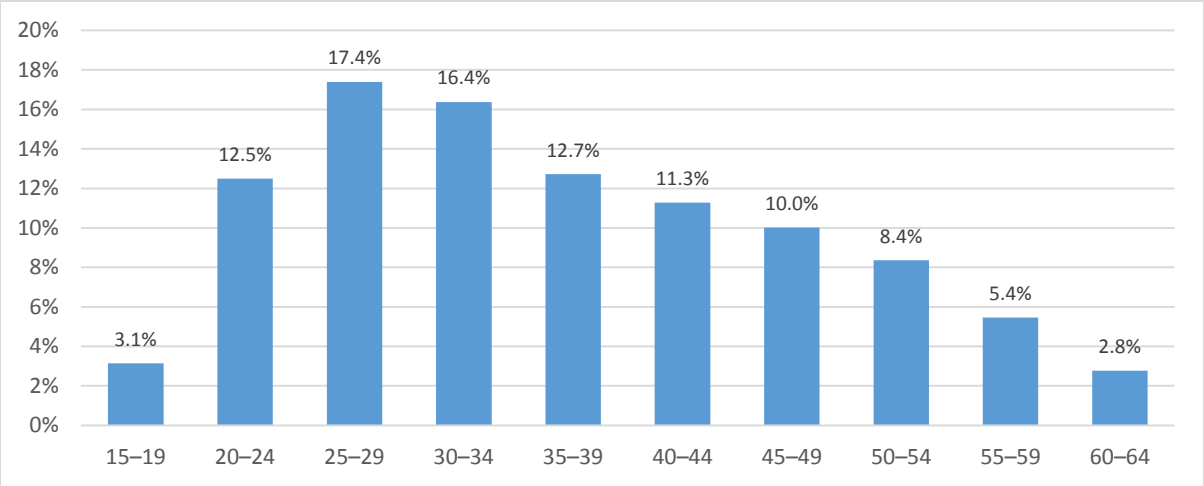
Chart 8: Employment by Industry and Educational Attainment in 2014



Source: Labour Force Survey, Department of Statistics, Malaysia

As Malaysia continues to move towards a more services-oriented economy, education which emphasises enhancing of skills becomes an increasingly crucial factor, as industries such as the finance and insurance; human health and social work activities; information and communication; and professional, scientific and technical activities employ mainly tertiary-educated workers.

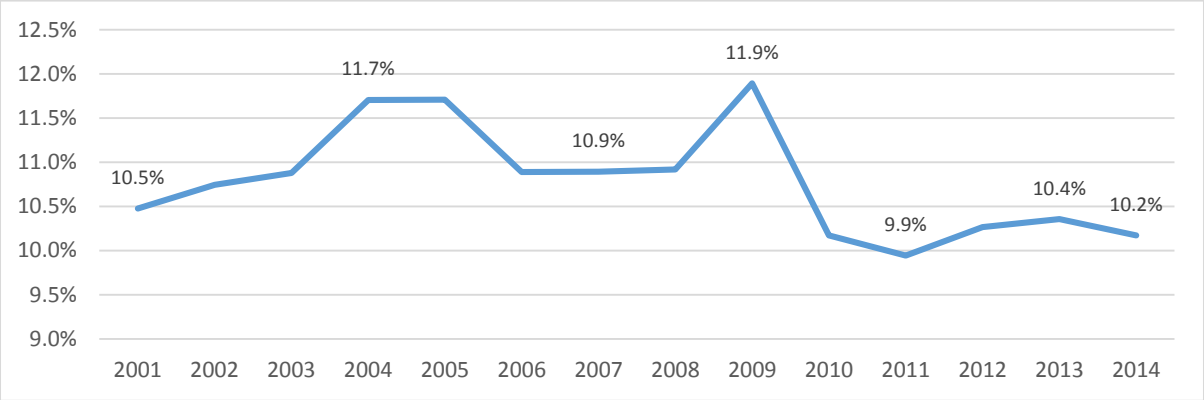
Chart 9: Breakdown of Employment by Age Group



Source: Labour Force Survey, Department of Statistics, Malaysia

Education is also key in the context of Malaysia's young and growing workforce. Malaysia's working population is relatively young, with the largest share of employment (33.8%) within the age group of 25-34 years.

Chart 10: Youth Unemployment 2001-2014[4]



Source: Labour Force Survey, Department of Statistics, Malaysia

Moving forward, to meet the aspirations of the youth and the high income objective, Malaysia needs to ensure the development of talent and the provision of the right jobs for the future. While the youth unemployment rate declined slightly to 10.2% in 2014 (2013: 10.4%), it remains disproportionately high relative to the overall low unemployment rate. The share of unemployed youths to total unemployed persons increased to 60% in 2014 (2013: 57%) and among them the share of those with tertiary education appears to be on the rise.[5] This indicates the need to address unemployment issues among Malaysia's young workforce and to better prepare them for an increasingly global and dynamic workplace.

Chart 11: Median Wages (2013-2014)

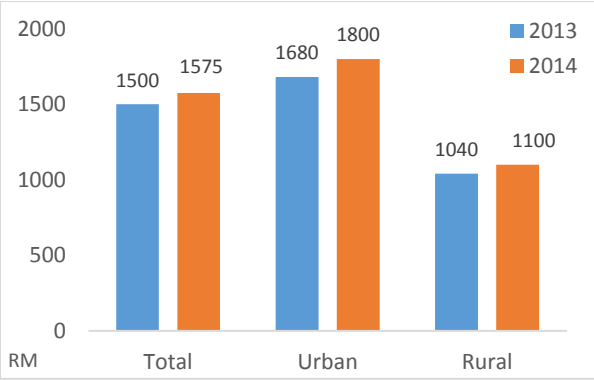
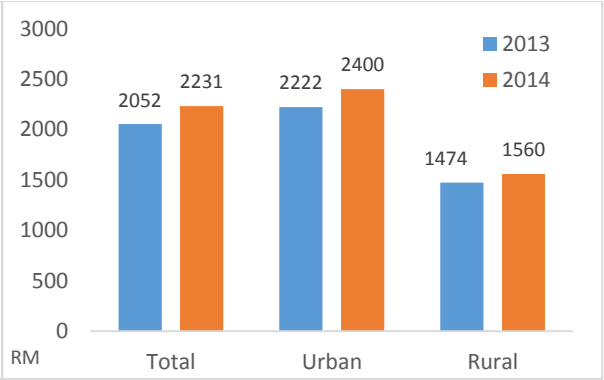


Chart 12: Mean Wages (2013-2014)



Source: Salaries & Wages Survey, Department of Statistics, Malaysia

[4] Youth here is defined as the age cohort of 15-24 years, as also defined by the United Nations.
[5] As a comparison, the share of youth unemployed to total unemployment in selected other countries based on ILO (2014) are lower than in Malaysia (Australia: 37%, Japan: 14%, Singapore: 21%, Republic of Korea: 19%).

The median monthly nominal salaries and wages received by paid employees increased to RM1,575 in 2014 compared with RM1,500 in 2013, recording an annual growth rate of 4.9%. Meanwhile, the mean monthly salaries and wages increased by 8.4% during the same period that is from RM2,052 to RM2,231. The charts above reflect the growing gap between income growth among urban and rural workers for the period of 2013 to 2014.

Table 1: Median and mean monthly salaries & wages of employees by industry 2013-2014

Industry	RM					
	2012		2013		2014	
	Median	Mean	Median	Mean	Median	Mean
Agriculture, forestry and fishing	825	1,015	900	1,054	1,000	1,138
Mining and quarrying	2,300	3,423	2,400	3,663	3,500	4,904
Manufacturing	1,250	1,723	1,300	1,798	1,500	2,050
Electricity, gas, steam and air conditioning supply	2,195	2,683	2,500	3,203	2,500	2,863
Water supply; sewerage, waste management and remediation activities	1,350	1,609	1,400	1,637	1,500	1,911
Construction	1,200	1,626	1,300	1,731	1,375	1,869
Wholesale and retail trade; repair of motor vehicles and motorcycles	1,200	1,448	1,200	1,568	1,200	1,675
Transportation and storage	1,500	1,973	1,700	1,996	1,798	2,175
Accommodation and food and beverage service activities	900	1,163	1,000	1,277	1,060	1,331
Information and communication	2,700	3,285	3,000	3,551	3,000	3,593
Financial and insurance/takaful activities	2,500	3,149	2,500	3,156	3,000	3,613
Real estate activities	2,000	2,812	2,500	3,226	2,700	3,887
Professional, scientific and technical activities	2,000	2,822	2,200	2,982	2,500	3,315
Administrative and support service activities	900	1,167	1,000	1,333	1,050	1,460
Public administration and defence; compulsory social security	2,245	2,577	2,485	2,870	2,798	3,156
Education	3,063	3,137	3,385	3,420	3,715	3,772
Human health and social work activities	2,095	2,455	2,300	2,689	2,500	2,971
Arts, entertainment and recreation	1,000	1,436	1,400	1,627	1,500	1,763
Other service activities	1,200	1,384	1,300	1,556	1,400	1,709
Total	**1,465**	**1,916**	**1500**	**2052**	**1575**	**2231**

Source: Salaries & Wages Survey, Department of Statistics, Malaysia

By sector, the mining and quarrying sector recorded the highest average wage (RM4,904) in 2014, followed by real estate activities (RM3,887) and education (RM3,772). The lowest average wages were recorded in the agriculture, forestry and fishing sector (RM1,138).

While Malaysia's labour market conditions remain tight, the generally positive economic outlook continues to support moderate employment generation. Nevertheless, critical structural issues within the job market in closing the skills gap and in better matching the creation of skilled, high income jobs with sufficient supply of sought after human resources remain a big challenge in the preparation of our workforce for the future. In order to fully maximise the benefits from our transition towards more high-value added and knowledge-intensive activity, evident and persistent gaps in the labour market need to be bridged to allow for Malaysians to adjust, adapt and reap the gains from sustained economic growth through globalisation. The challenges arising from skills imbalances are discussed in further detail in the next section.

2.2 Skills Imbalances in Malaysia and the Importance of a Critical Occupations List

Skills imbalances is defined as the effect of a "market disequilibrium" that results in either an over- or under-supply of skills relative to a given level of demand. Usually, skills imbalances are resolved by the market, but occasionally, some skills imbalances persist over time. Skills imbalances can take multiple forms and these include:

- ***Skills shortages*** **-** An inadequate number of persons in specified occupations and/or with specified qualifications
- ***Skills gaps*** **-** An inadequate supply of specific skills or attributes within a given occupation
- ***Over-education or over-skilling*** **-** Where a worker is employed in a job that underutilises his or her qualifications, skills or abilities

In any growing market-led economy, an imbalance is likely to happen between the skills that firms demand and what the human capital development system is able to supply. Only in an insular, isolated economy, that uses the same technology year after year, would such imbalances never emerge. In Malaysia, it is likely that there exists pockets of skills imbalances within the labour market. For example, the high graduate unemployment rate, despite the growing number of tertiary educated labour force participants, reflects a misalignment between the supply and demand of Malaysian graduates in some sectors of the economy.

Table 2: 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

To some extent, the sort of skills imbalances apparent in Malaysia reflects growth and the adoption of new productivity-enhancing technologies. However, these imbalances could threaten the Government's aspiration of transformation into a high-income economy if they persist, particularly alongside untapped, inactive supplies of labour and human capital both within and beyond the country's borders. Economic theory suggests that skills imbalances that persist over time can potentially impose large costs on individuals, firms and economies, such as:

- ***Employers*** **-** Through higher costs, lower output, reduced competitiveness, below capacity long-term performance and constrained investment
- ***Employees-*** Through lower wages, job satisfaction, job security and limited career prospects
- ***The broader economy –*** Through lower returns in human capital investment, lower productivity and slower economic performance

Against this risk, Malaysia deploys a wide array of policies to fill skills deficits and correct mismatches. The Government is not yet able to systematically monitor skills imbalances – both shortages and surpluses- accurately, or in a manner that is sufficiently timely to effectively inform policy actions in its human capital strategy. This is due to three specific and fundamental factors:

- First, **the education and training system in Malaysia is heavily supply-side driven**, with very few formal or effective channels for information from the productive economy to flow to policy-makers, education and training providers or even to households eager to invest in human capital.
- Second, **formal responsibility for identifying the skills that are needed to propel the economy is dispersed**, and existing efforts to do so are fragmented and duplicated across a number of government ministries, agencies and state-owned enterprises, adding to, rather than correcting the information asymmetry within the labour market.
- Third, **existing efforts to identify skills in shortage follow an outdated 'manpower planning' approach,** which predicts quantities of specific occupations needed in the future. This method is widely regarded as ill-suited to keep pace with a dynamic, globally-integrated, market-led economy.

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. Based on recommendations from analysis of Malaysia's workforce development system by the World Bank and other international experts, the CSC has been tasked to conduct skills monitoring and to develop a Critical Occupations List (COL).

The COL will increase the return on public investments in skills development and employment assistance programs by allocating resources according to labour market demands. Understanding the specific skills that are demanded by the labour market would help 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. At present, the plethora of programs and initiatives are financed with little reference to value-for-money assessments or the priority needs of the market. Few if any programs are subject to performance evaluation, making it difficult for policymakers to understand which interventions are most effective and efficient in closing the skills gap. The COL will be used to prioritise all public interventions so that Malaysia can fully benefit from the investments it has made in human capital.[6] Chapters 3, 4 and 5 detail the CSC's methodology in skills monitoring and in identifying critical occupations.

[6] Source: Gil Sander, Frederico; Packard, Truman; Purnamasari, Ririn Salwa; Testaverde, Mauro; Wacker, Konstantin M.; Yap, Wei Aun; Yoong, Pui Shen. 2014. Malaysia Economic Monitor: Towards a Middle-class Society. Washington, DC; World Bank Group.

PART II: CONSTRUCTING THE CRITICAL SKILLS OCCUPATIONS LIST

CHAPTER 3: CONCEPTUAL METHODOLOGY

3.1 The Disequilibrium Approach: A New Direction in Monitoring Skills Imbalances

Historically, Malaysia has adopted a quantity-based workforce planning approach in addressing its skills gaps. This approach analyses the demand by industries and supply from the education system for specific occupations, and tries to bridge the gap by influencing the number of supply in the years to come. However, the limitations of this approach lie in its reliance on too many assumptions about the present and future state of the labour market, information that policy-makers have little insight and influence on. The predictions arising from this approach therefore often fails to take important structural changes in the labour market into consideration. The workforce planning approach may be well-suited for a highly-managed and planned economy, but experience has increasingly shown that it is suboptimal and problematical for dynamic, market-system economies like Malaysia.

The COL is being designed to become the leading initiative that will catalyse the transition of Malaysia's human capital policies from the old workforce planning approach to the new disequilibrium approach in addressing labour market imbalances. Whilst workforce planning relies directly on observing employment stocks – which does not necessarily address and pick-up other changes in the labour market - the disequilibrium approach relies on observing flows, which amplify the market signals caused by change. The main advantage of the new approach is its reliability on more than one type of indicator and flexibility in utilising multiple sets of data. 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.

It is important to note that the disequilibrium approach requires good national-level statistics that will enable us to not only evaluate the changes in labour market indicators from one observation period to another, but also across sectors and occupations. The data employed in this study, as well as the limitations faced, is discussed further in Section 4.5.

3.2 The CSC's Approach

Occupations and Job Titles

For the COL, we use occupations as the unit of measurement, as opposed to skills, based on international best practices[7]. 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 2008 (MASCO 2008)[8]** 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. Due to data limitations, we use the MASCO at a 4-digit level for our analysis of the COL, even though MASCO 2008 has occupations up to the 5-digit level.

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 relevant national-level data are available at the job-title level, we have where possible, included examples of job titles under the MASCO occupations listed as critical. The job titles used are sourced from sector studies as well consultations with employers and are intended to be used as a reference for users to better understand the occupations list.

Constructing the COL

Using lessons from international experiences such as the UK (Migration Advisory Committee) and Australia (Australian Workforce and Productivity, Department of Employment and Department of Industry, innovation and Science), Malaysia's Critical Skills Monitoring framework is developed through a combined approach of **Top-down** analysis (rigorous analysis of national-level labour statistics) and **Bottom-up** (comprehensive engagement with industry).

[7] The same approach is also used by the UK and Australia.

[8] The data to derive the COL is based on DOSM' surveys which through 2015 categorises occupations on the basis of MASCO 2008. It is expected that future DOSM surveys would adopt the revised MASCO 2013.

Top-down analysis is conducted by 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 for feedback on the Top-down analysis and gathering additional information on recruitment experiences in order to add granularity and depth to the COL. The bottom-up approach is principally focused on employers, but it could be used to consult with other stakeholders, such as regulators or training providers as the policy objectives may require.

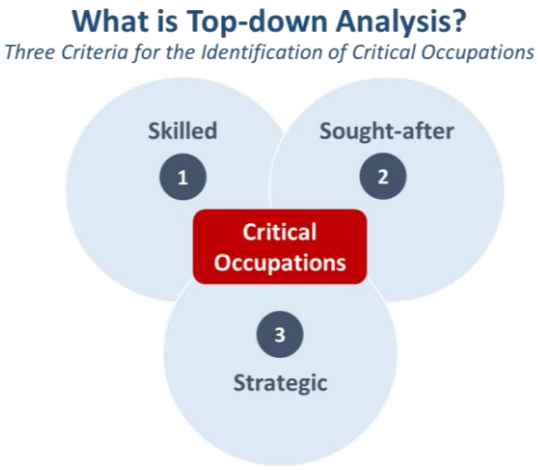
We stress that the two sources of evidence serve as complements to each other, and not as substitutes. We cannot argue that strengthening the collection of either Top-down or Bottom-up category will reduce the need for high-quality collection of the other category. Both are needed and are interpreted together.

CHAPTER 4: TOP-DOWN ANALYSIS

In the Top-down analysis, three criteria are considered when determining if an occupation is critical:

i. First, we identify occupations under the MASCO code that are **skilled or semi-skilled**;
ii. Then, we assess whether the occupation is **sought-after** based on selected labour market indicators (LMIs); and
iii. Finally, we consider whether the occupations identified as skilled or semi-skilled and sought after is also **strategic,** and should be developed in line with Malaysia's investment and economic goals

Chart 13: The Three Criteria for the Identification of Critical Occupations (Top-down Analysis)



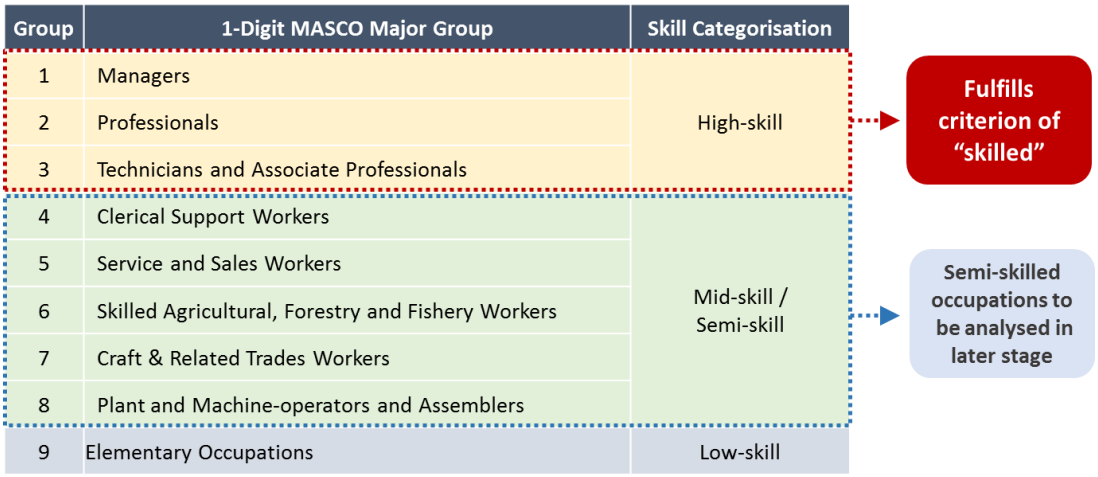
4.1 Is It Skilled?

In the current version of the COL, our analysis focuses on high-skilled occupations (we will include analysis of semi-skilled occupations in the next COL). We identify high-skilled occupations if it falls within the first three major groups of the Malaysian Standard Classification of Occupations 2008 list (MASCO 2008)[9], which has been developed in line with international standards. These groups include (i) Managers; (ii) Professionals; and (iii) Technical and Associate Professionals. Under the MASCO 2008, 483 occupations (at the 4-digit level) are categorised within these three groups.

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 Education and Vocational Training (TEVT), which most semi-skilled workers require.

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

Chart 14: Nine Major Occupation Groups under MASCO



Group	1-Digit MASCO Major Group	Skill Categorisation
1	Managers	High-skill
2	Professionals	
3	Technicians and Associate Professionals	
4	Clerical Support Workers	Mid-skill / Semi-skill
5	Service and Sales Workers	
6	Skilled Agricultural, Forestry and Fishery Workers	
7	Craft & Related Trades Workers	
8	Plant and Machine-operators and Assemblers	
9	Elementary Occupations	Low-skill

Source: Malaysia Standard Classification of Occupations (MASCO)

4.2 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. Adopting international best practices from the UK and Australia, we studied a range of available LMIs and due to current limitations and availability of data, narrowed our selection to two, namely (i) growth in employment and (ii) growth in the wages of occupations during our observation period of 2011 to 2014. High growth in employment and wages in a particular occupation serves as an indication of high demand by firms for employment in those jobs.

Four sequential steps are taken to determine if an occupation is sought-after. First, we compute the average growth rates of both employment and wages in the skilled occupations between 2011 and 2014. We then categorise occupations into percentile groups based on their LMI growth rates and assign each group a score. Finally, we average the scores of both the employment and wage LMIs for each occupation. Occupations with an average LMI score of more than 1.5 fulfils the criterion of being sought-after.

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. One of the main challenges faced in constructing the COL is the availability of accurate and consistent micro-data. These issues and how we plan to overcome them are discussed further in Section 4.5.

4.3 Is It Strategic?

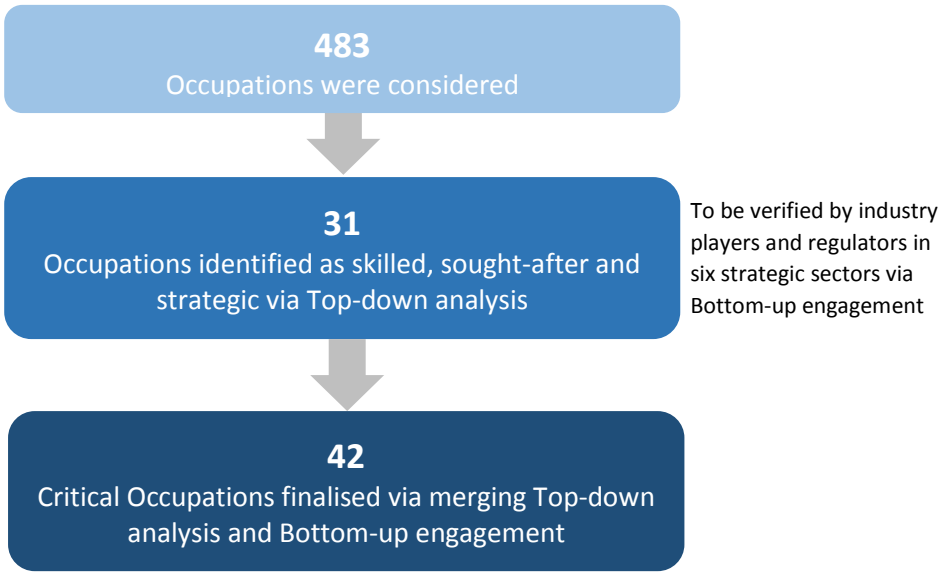
Our final criterion for the Top-down analysis requires that a "skilled" and "sought-after" occupation be in a "strategic" sector. This ensures that the COL does not merely represent skilled and desired occupations by firms, but also occupations in sectors that Malaysia needs to develop in line with its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

In Malaysia, for this initial exercise six strategic sectors have been selected for the COL. The six sectors are (i) Oil and Gas, (ii) Electrical and Electronics (E&E), (iii) Financial Services, (iv) Telecommunications and Multimedia, (v) Information and Communications Technology (ICT), and (vi) Professional Services. The sectors were selected based on their high concentration of knowledge workers and Science, Technology, Engineering and Mathematics (STEM) -related occupations, as well as the significant roles they play in contributing to Malaysia's transformation into a knowledge-intensive, high-income economy.

4.4 The Critical Occupations Derived from Top-down Analysis

From the Top-down analysis, we were able to identify 31 occupations as critical; skilled, sought-after and strategic. This list was then utilised in our Bottom-up approach, for validation and feedback by employers. The Top-down analysis was then combined with the Bottom-up evidence we obtained, and the list was expanded to 42 occupations. This process is further discussed in Chapter 5.

Chart 15: Critical Occupations Identified from the Top-down Analysis



4.5 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 2011-2014. We recognise that a more diverse set of LMIs is needed and will strive to develop a greater variety of applicable LMIs over time to enrich the COL.

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.

Currently, we use two labour market indicators for our "sought-after" filter of the Top-down analysis; (i) employment as a volume-based indicator, and (ii) wages as a price-based indicator. In constructing the COL, employment is defined as the number of workers employed in the private and public sectors. Wages is defined as total salary and wages (including allowances and other non-cash income). The growth of employment is used because an increase in employment reflects demand for workers in an occupation. An increase in wage growth, on the other hand, is indicative of market pressures stemming from excess of demand over supply.

DOSM's survey coverage of occupations in the two selected LMIs turned out to be almost complete. Of 483 occupations covered in the MASCO 2008, 245 are in the first three major groups identified as "skilled". However, only 236 of these occupations were captured in the LFS and Salaries and Wages Survey over the period 2011-2014. We also removed occupations with a sample size of less than 30 from our analysis, further narrowing the list of "skilled" occupations to 85.

Table 3: Skilled Occupations That Are Not Covered in the Surveys

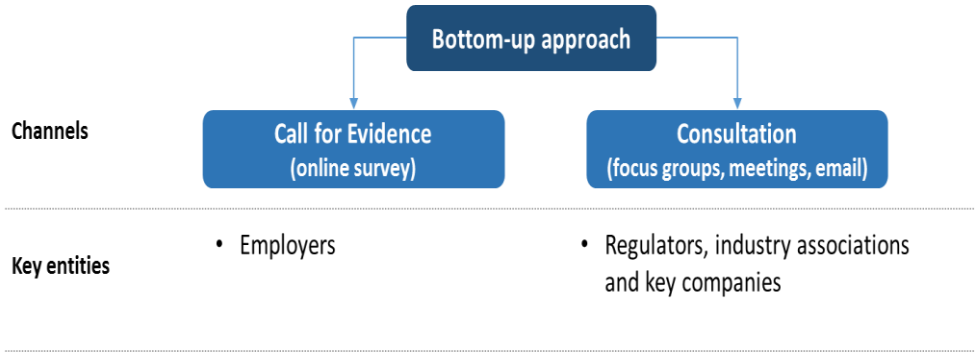
Major Group	MASCO 4D	Not covered in survey at all
1	1439	Services Managers Not Elsewhere Classified
2	2268	Occupational Therapists
2	2269	Health Professionals Not Elsewhere Classified
2	2353	Performing Arts Teachers
2	2442	Taxation and Excise Officials Professionals
2	2443	Government Social Benefits Officials Professionals
2	2633	Philosophers, Historians and Political Scientists
2	2659	Creative and Performing Artists Not Elsewhere Classified
3	3215	Orthotic and Prosthetic Technicians

The data limitations emphasise the importance of Bottom-up evidence in mitigating any of the analytical challenges arising from the data constraints. 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. The CSC will continue to review possible indicators and data sets in enhancing the COL.

CHAPTER 5: BOTTOM-UP EVIDENCE

The CSC's Bottom-up approach comprised two main components: (1) periodical consultations with regulators and industry lead bodies, and (2) a Call for Evidence (CFE) survey to 341 companies across the six key sectors.

Chart 16: Bottom-up Approach



Source: CSC

The consultation process started in 1Q 2015 and accelerated in 4Q 2015, coinciding with the Call for Evidence survey period. In March 2015, a "Critical Skills Mini Lab" was held to test the idea of a critical skills framework for Malaysia with relevant parties. Following this workshop, we outlined the best practices in terms of methodology and took note of various feedback and insights from government agencies, regulators and industry lead bodies.

In September 2015, a second workshop was organised by EPU, ILMIA and TalentCorp on "Industrial Engagement on Talent Demand for Skilled Workers". This workshop presented an opportunity to recapitulate the concept of the COL and its importance for human capital policy coordination, present preliminary findings on the list, and alert key regulators and lead bodies on the upcoming Call for Evidence survey.

The pilot CFE survey, launched in October 2015, was designed to validate the findings of the preliminary top-down analysis, which resulted in 31 occupations characterised as skilled, sought-after and strategic. The survey will run as an annual exercise to ensure that the COL is based on up-to-date information, and to create a channel for regular engagement with industry.

5.1 Consultations with Regulators, Industry Lead Bodies and Companies

As we learned from international best practices, the consultation process enhances the robustness of the COL, to complement data analysis from the Top-down approach. The main purpose of these discussions was to confirm that occupations included in the COL are indeed critical, and; to allow regulators to suggest occupations that are critical but are not in the list based on the Top-down method. In Malaysia's case, since this COL was a pilot exercise, the discussions with regulators, industry lead bodies and key authorities on human capital also served to explain the concept of a COL; why we are embarking on this exercise, and; to lay the groundwork for future collaboration. The consultation process centred around nine key regulators and industry lead bodies – Bank Negara Malaysia (BNM), Securities Commission Malaysia (SC), Malaysian Investment Development Authority (MIDA), Malaysia Petroleum Resources Corporation (MPRC), Malaysian Oil & Gas Services Council (MOGSC), PETRONAS, Malaysian Communications and Multimedia Commission (MCMC), Multimedia Development Corporation (MDeC) and Malaysian Institute of Accountants (MIA). PETRONAS was referred to as both a company (thus, participated in the CFE survey) and also an industry lead body.

Table 4: List of Regulators and Industry Lead Bodies by Sector

Sectors	Regulators
E&E	▪ MIDA
Oil and Gas	▪ MPRC ▪ PETRONAS ▪ MOGSC
Telecommunications & Multimedia	▪ MCMC
ICT & GBS	▪ MDeC
Financial Services	▪ BNM ▪ SC
Accounting	▪ MIA

Source: CSC

The nine regulators and lead bodies had done extensive work on human capital needs in their respective sectors. For example, MIDA, in its "E&E Strategic Roadmap", had identified parts of the E&E ecosystem with solid growth potential, suggesting the need for human capital investments in these areas. In addition to MIDA's study, we had also referred to the "Ipsos-TalentCorp E&E Sector Study on the Supply-Demand of Talent in Malaysia (2012)", conducted by Ipsos Business Consulting and TalentCorp. In the financial sector, BNM had established the Financial Sector Talent Council (FSTC) to identify the future talent demands of the Malaysian financial sector and recommend strategies to develop, attract, retain and deploy domestic and international talent to meet the demand. In 2015, MPRC had published rankings of Oil and Gas services firms based on 2013 revenue and these rankings differentiated companies through their involvement in the value chain, from exploration and

production to products. For the Oil & Gas sector, we also referred to the PwC-TalentCorp "Study on Talent Demand and Supply in the Oil & Gas Sector (2012)". Meanwhile, MCMC published its final report on a Talent Gap Study for the Communications Sector in Malaysia in October 2015; a collaboration between PwC and ILMIA.

The first milestone in the consultation process was the five-day Critical Skills Mini Lab in March 2015, organised by TalentCorp, EPU and ILMIA. The participants included both public and private sector entities, as well as international experts on critical skills monitoring. The mini lab included presentations on the critical skills framework and discussions to gather insights from participants. Broadly, the mini lab presentations highlighted:

- The need for a critical skills framework to monitor and mitigate skills mismatches in Malaysia
- The role of government agencies in designing and managing this framework
- The importance of incorporating industry feedback as a key component in the framework
- Possible approaches and data requirements
- Utilising the framework to inform human capital-related policies such as education, immigration, TVET and upskilling

Presenters such as representatives from the World Bank, the UK MAC, the Australian Department of Industry and Science and Flinders University provided useful insights into international best practices; and contextualised these to suit Malaysia's needs, where possible. These best practices were adapted into the process flow in designing Malaysia's critical skills framework, comprising macroeconomic data analysis (Top-down), syndication with key industry players (Bottom-up) and communication strategies. TalentCorp presented the plans for a critical skills framework for Malaysia, which was designed in collaboration with the World Bank. After the mini lab, a guiding document, "Critical Skills Framework for Malaysia" by Professor Kostas Mavromaras from Flinders University summarised several main points on the methodology from the mini lab.

The second part of the mini lab consisted of discussions on the proposed critical skills framework to gather early insights and concerns from key government agencies and companies. The valuable feedback was where possible, incorporated into the CSC's framework. Broadly, government agencies and regulators expressed their support for the COL to inform policymaking on human capital. Several agencies also outlined their possible roles in terms of supporting data needs (DOSM) and participation in the Bottom-up approach (MIDA). Other entities such as MPRC and Intel stressed on the need for a transparent and clear communications strategy.

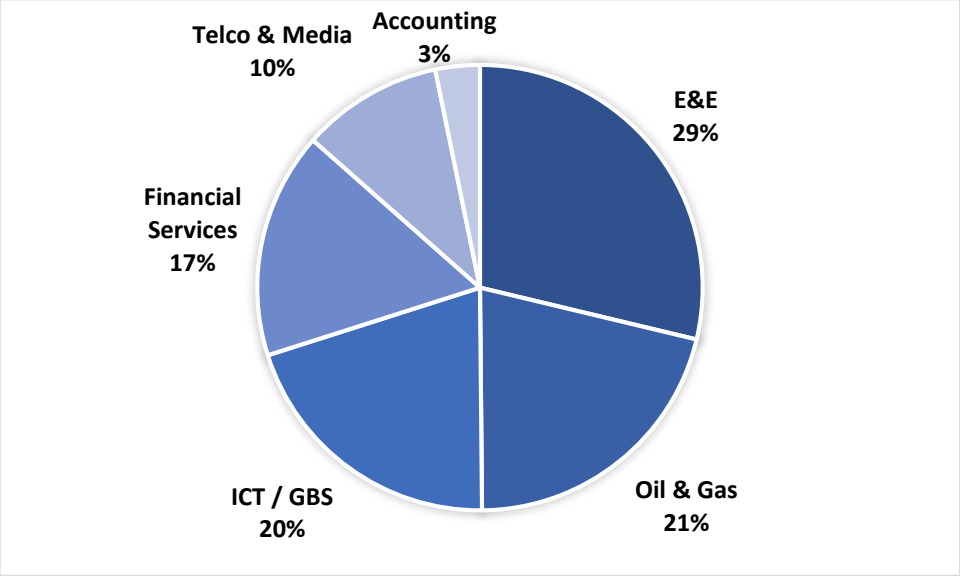
In September 2015, EPU, ILMIA and TalentCorp organised a two-day workshop on "Industrial Engagement on Talent Demand for Skilled Workers". The attendees were mainly from the public sector, including key regulators and industry lead bodies involved in our Bottom-up syndication. Throughout the event, we took the opportunity to alert these key entities on the preliminary COL, CFE survey and briefings on the COL in November 2015. While TalentCorp provided a progress update on the preliminary COL, other participants took part in presentations and discussions relating to similar issues. For example, the first presentation by the World Bank encompassed issues related to high-skill talent, including the impact of technological change on the job market, the importance of life-long learning and income or social support for selected segments of the labour market (e.g. those in training or those which cannot be re-trained). In addition, regulators such as MCMC and MDeC presented human capital studies on the Telecommunications and Multimedia and ICT and GBS, respectively; highlighting talent needs and issues related to talent.

The consultation process with regulators continued in November and December 2015, after the results from the CFE survey were analysed. Their feedback was crucial in deciding on the final list (more details in Section 5.3). In addition, a Steering Committee on Critical Skills Committee Monitoring was convened on 25 November 2015 to present the results of the preliminary COL. The meeting was chaired by the Economic Planning Unit (EPU), and comprised mainly key government authorities on human capital. Attendees included representatives from MOHR, Department of Skills Development, DOSM, MIDA, Ministry of International Trade and Industry (MITI), Human Resources Development Council (HRDF) and Employees Provident Fund (EPF).

5.2 Call for Evidence (CFE) Survey

The remainder of this chapter focuses on the CFE survey design and sectoral results in terms of employment conditions by sector (e.g. why certain occupations are hard-to-fill, why additional occupations suggested by firms are considered "critical", etc). The details on merging the CFE results with regulator consultations and Top-down results are covered in the next chapter. The CFE survey was undertaken from 9th to 30th October 2015. The link to the online survey was emailed to 341 companies, of which 177 were placed on a "priority list" due to their importance to the sector in terms of market share and employment. Of the 341 companies, the E&E industry comprised the largest share (98 companies or 28.7% share), followed by the Oil and Gas sector (72 companies or 21.1% share) and the ICT and GBS (69 companies or 20.2% share) sectors.

Chart 17: Survey Sample by Sector



Source: CSC

The choice of companies was also based on consultations with selected regulators and industry lead bodies, to ensure sufficient representation of companies across the value chain of each sector. For example, the Oil and Gas sector not only includes upstream firms, but also the industry's service providers. While firms were not targeted by region or location, the non-central regions (those outside the Klang Valley area) are represented in the survey by selected sectors. For example, E&E firms in the Northern region (Penang, Kedah) and Southern region (Johor); as well as Oil and Gas companies in East Malaysia were included in our survey sample. For the remaining sectors (Financial Services, Accounting, ICT and GBS, Telecommunications and Multimedia), the companies surveyed were predominantly based in the Klang Valley. The survey was also circulated simultaneously to the regulators and industry lead bodies to inform them of this exercise.

The survey was split into three parts. All sections were compulsory, meaning that respondents would not be able to submit their responses until all the questions were answered.

- *Section One*: Background of the Firm and Respondent
- *Section Two*: Identified Critical Occupations for the Sector
- *Section Three*: Your Company's Recruitment Experience

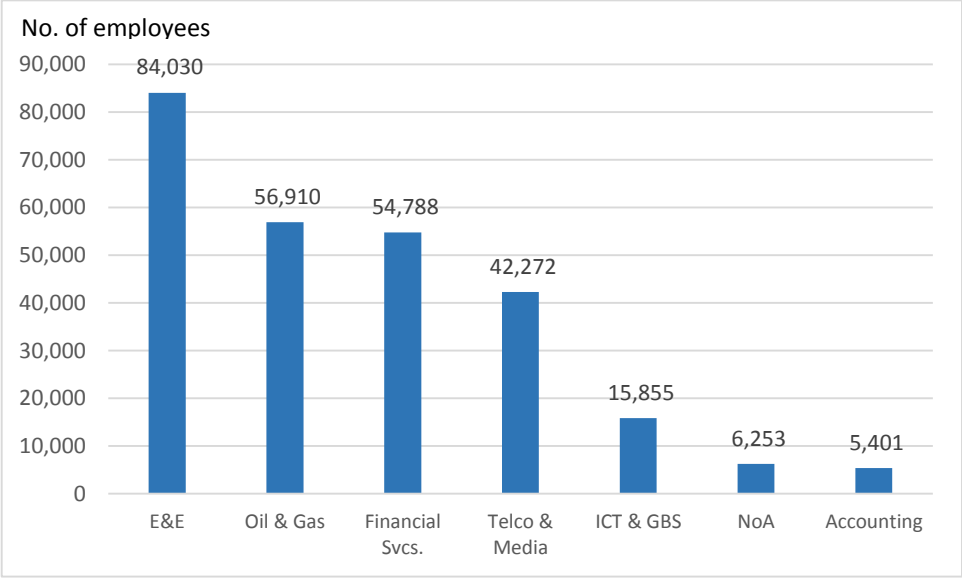
In *Section One*, respondents could select the sector that "best fits" their company's activities from a drop-down window. On top of the six sectors, respondents had the option of choosing "None of the Above" and to specify which sector they were in. Most companies identified themselves with a very specific part of the value chain. For example, in Oil and Gas, several respondents identified themselves

as shipping, construction or chemical manufacturing companies, although these companies' activities were mainly in Oil and Gas, 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.

Second, the identification of sectors posed a challenge to receiving the desired response on the COL. Upon the selection of a sector, respondents would move on to Section Two, where the identified critical occupations for the selected sector automatically appear in the next page. Respondents selecting "None of the Above" would move to Section Three without validating the COL. We then worked with PE Research to contact these respondents to explain to them on the importance of validating the COL and highlighted certain occupations that might be of interest to them. Some were successfully persuaded to re-do the survey for a sector that best fit them.

Overall, the survey was completed by 167 companies (response rate: 49%), representing 265,500 employees. By comparison, the annual consultation of Australia's 2015-2016 Skilled Occupations List was based on the views of 127 submissions[10]. Of the 167 companies in Malaysia's survey, 24 companies had identified themselves as "None of the Above" in terms of sector. In the six key sectors, the response rates ranged from 33% to 73%.

Chart 18: No. of Employees of CFE Survey Respondents by Sector



Source: CSC

[10] Department of Education and Training, Australia

In *Section Two*, the full COL for the respective sector was displayed on one page. For each occupation, a list of job titles were included as examples. These job titles were obtained from several sources, including the MASCO 2008, and sector studies conducted by regulators and industry lead bodies. In addition, we eliminated occupations that are too generic and prioritised those that are specific to the sector. These decisions were made based on consulting internal staff who had prior experience in the sector. The survey defined critical occupations as "high-skilled talent that are important to a company's success and growth; and are in short supply". Respondents could choose to "include" or "exclude" an occupation (encompassing all the job titles in that occupation), or to remain "neutral". During follow-up calls to companies, we note that some companies were reluctant to validate the COL when they felt only one or two occupations on the list could be deemed "critical". As such, we explained that it is also important to inform us on occupations that could be excluded.

Upon choosing to "include" an occupation, respondents were asked to indicate whether the occupation was "hard-to-fill" (defined as vacancies that were unfilled for three months or longer, despite recruitment efforts). Following this, respondents could choose one or more reasons on why these vacancies were hard-to-fill. Broadly, 50-80% of respondents indicated that these critical occupations were "hard-to-fill". The main reason selected by respondents, consistent across all sectors, was that applicants did not meet the required skills or experience level. Conversely, the lack of education qualifications was the least-cited reason for hard-to-fill. These results suggest that there is a sizeable skills gap across the six key sectors.

Table 5: Reasons for Hard-to-Fill by Sector

Sectors	None or insufficient applicants	Applicants did not have the required educational qualifications	Applicants did not meet the required skills/ experiences	Applicants did not possess required soft, interpersonal skills (e.g. attitude or communication skills)	Applicants are qualified for the job, but company is unable to meet the salary/benefits requested
Oil & Gas	14%	10%	39%	22%	15%
E&E	18%	5%	38%	20%	19%
ICT & GBS	21%	14%	28%	18%	19%
Telco & Media	16%	5%	34%	17%	25%
Accounting	21%	14%	25%	14%	25%
Financial Services	17%	10%	40%	14%	19%

Source: CSC

Once respondents had validated the COL, they were also given the option to add occupations they deemed critical to their industry, but was not in the preliminary COL. They were also asked to describe the additional critical occupations and to indicate if they were hard-to-fill and why. Across the six sectors, around 100 job titles were suggested by companies, which were then matched to MASCO occupations. Many of these job titles[11] corresponded to the same MASCO code (e.g. six job title suggestions from E&E firms were parked under MASCO occupation code 2141: Industrial and Production Engineers). In addition, some of these job titles corresponded to MASCO occupations that were already in the preliminary COL. In general, the job titles suggested by companies were mainly technical jobs from various engineering and ICT-related fields.

Respondents also selected reasons for adding these critical occupations/job titles from a drop-down window (they were allowed to choose more than one reason). Generally, the top two reasons for criticality of the additional occupation/job title was "to support innovation or technological changes", and "to gain/maintain market share or avoid losing business orders to competitors". The "development of new products and services was the third reason.

Table 6: Reasons for Criticality of Additional Occupation/Job Title by Sector

Sectors	To support innovation/ technological changes	To support development of new products and services	To gain/maintain market share or avoid losing business orders to competitors	To ease the workload amongst existing staff	Other reasons
Oil & Gas	32%	22%	20%	10%	16%
E&E	36%	29%	23%	5%	7%
ICT & GBS	35%	37%	19%	9%	0%
Telco & Media	29%	29%	33%	0%	8%
Accounting	24%	24%	32%	8%	12%
Financial Services	9%	22%	22%	9%	39%

Source: CSC

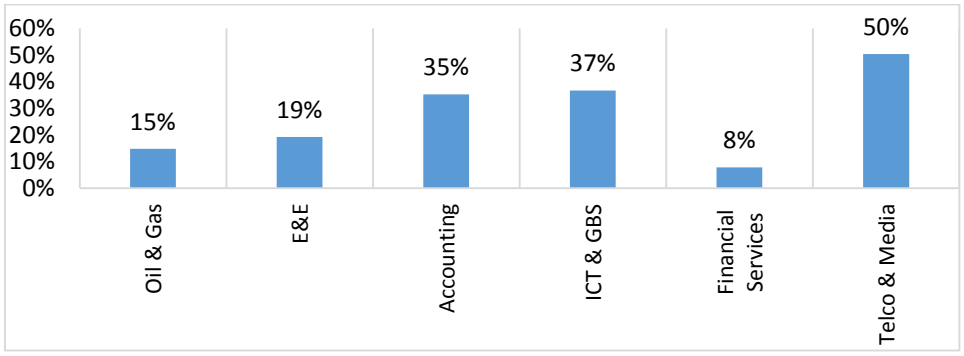
Section Three was designed to gauge respondents' recruitment experience, particularly in occupations that they had indicated as "critical". Respondents answered questions on headcount and vacancies in critical occupations, newly created jobs and salary premiums for more experienced hires. In follow-up calls to companies, several respondents raised the issue of difficulty in sharing the online survey with colleagues who would need to provide data. This was addressed by emailing PDF copies of the survey to ease coordination within these companies.

[11] While the survey asked for additional *occupations*, almost all respondents answered in terms of fairly specific *job titles*.

The results of Section Three of the survey gave us some indication of skills shortages across the key sectors.

- Critical occupations accounted for 8% to 50% of total employment by sector; the Telecommunications and Multimedia and ICT and GBS recorded the highest shares of 50% and 37%, respectively.

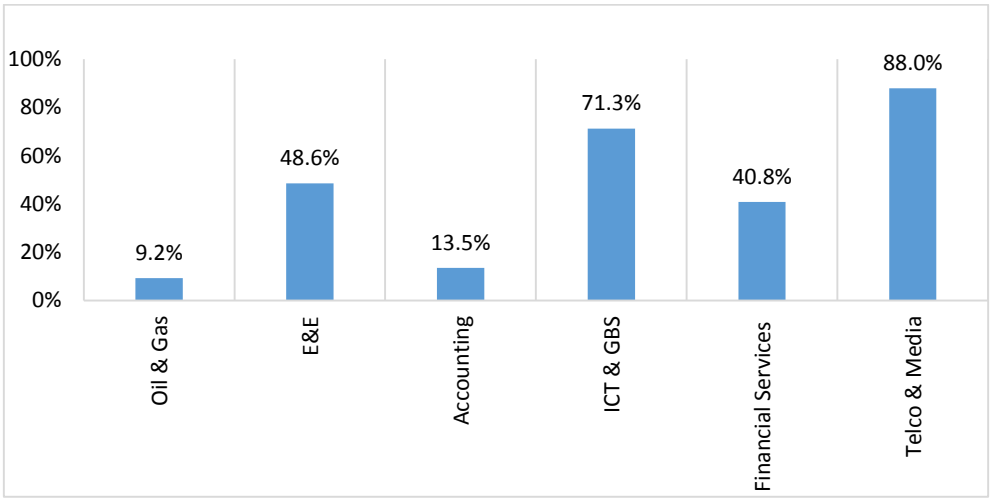
Chart 19: Share of Critical Occupations to Total Employment by Sector



Source: CSC

- Meanwhile, respondents were also asked to identify "newly-created" vacancies, meaning vacancies that were created for reasons other than staff turnover or retirement. By sector, Telecommunications and Multimedia and ICT and GBS industries reported the highest share of newly-created vacancies to total vacancies.

Chart 20: Share of newly-created vacancies from total critical occupations vacancies (mean)

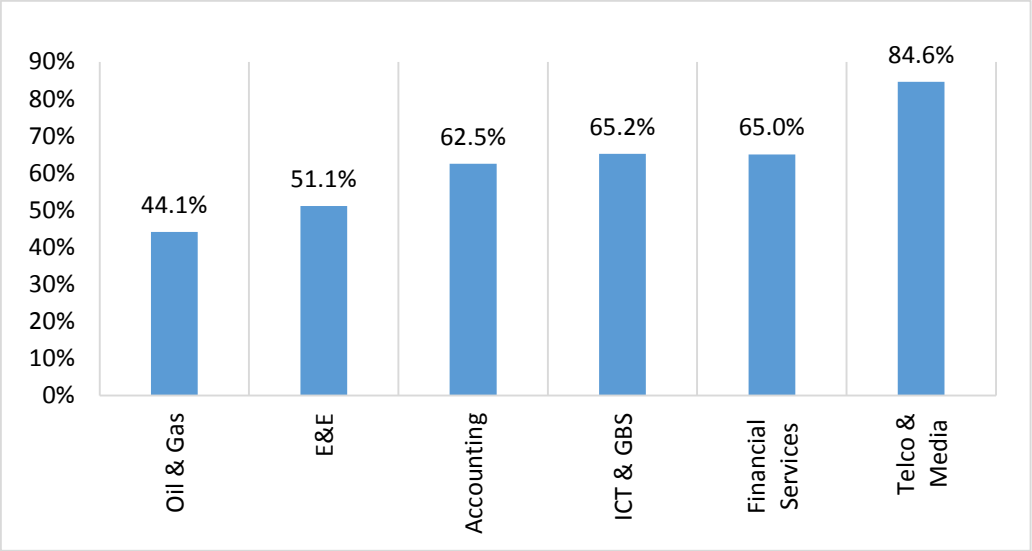


Source: CSC

- And finally, respondents were asked if they would give salary premium to candidates with more experience over another. Around 85% of respondents in the Telecommunications and

Multimedia sector were willing to give salary premiums, compared to only 44% of respondents in the Oil and Gas sector.

Chart 21: Share of Firms which Grant Salary Premiums by Sector



Source: CSC

Overview of six pilot sectors

The rationale for the selection of the six pilot sectors was covered in Chapter 4 (Top-down). This section provides a snapshot of the sectors in terms of sub-sectors (or "clusters") and recent developments. A recurring theme in discussions with regulators was the need to demarcate the sectors into clusters, to better represent these occupations. As such, the clusters included in the final COL are as follows, in Table **7**.

The Bottom-up approach was conducted between March and December 2015. During this period, the sentiment for both businesses and consumers in Malaysia reflected a sense of cautiousness[12], given the moderate outlook for global growth and low commodity prices[13] – both of which affect the Malaysian economy. Perhaps the sector most directly impacted by these developments was the Oil and Gas industry, where lower oil prices affected profits, as well as investment and hiring plans[14]. The E&E sector, meanwhile, has continued to grow[15]. The other four sectors under the pilot COL (ICT and GBS, Telecommunications and Multimedia, Financial Services, Accounting) are domestic-based services sectors – demand for these services broadly reflect the general growth of the economy.

[12] The MIER Business Confidence Index and Consumer Sentiment Index remained below 100 between 1Q to 3Q2015. Readings below the 100-point threshold are a signal of weak sentiment.
[13] World Economic Outlook, IMF (October 2015)
[14] Based on engagement with regulators and news flow
[15] Malaysia Economic Monitor, World Bank (December 2015): Solid E&E export performance and continued growth in E&E sector wages in 1Q to 3Q2015

Table 7: Sectoral Clusters

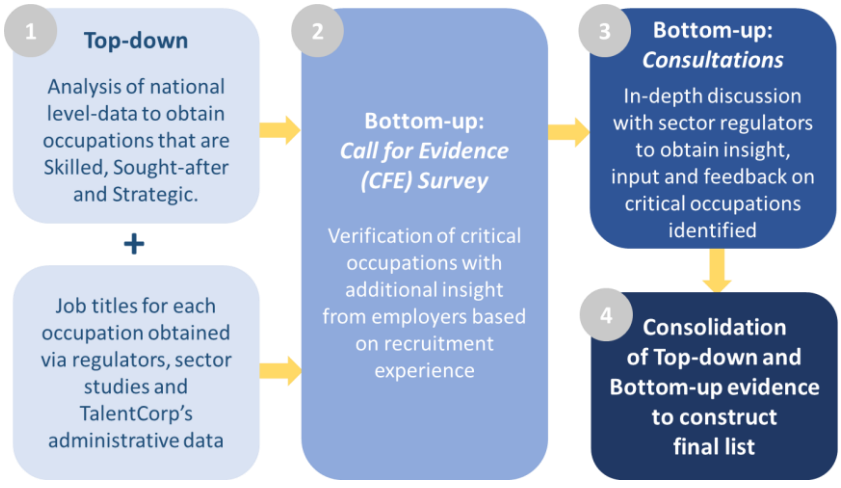
Sectors	Clusters
Oil & Gas	• Tier 1: Production Sharing Companies • Tier 2: Oil & Gas Services and Equipment
E&E	• Automation • Electronic Components • Industrial Electronics • Semiconductor • LED • Solar
ICT & GBS	• Creative multimedia • System design & development • Information technology • Shared services & outsourcing
Telco & Multimedia	• Infrastructure for wireless technology • Infrastructure for fixed line technology • Information & network security • Emerging technologies (cloud computing & big data analytics)
Financial Services	• Commercial/Islamic Banking • Investment Banking • Insurance/Takaful
Accounting	• NA

Source: CSC

5.3 Using the Bottom-up Evidence to Strengthen Top-down Analysis

Dovetailing the Bottom-up evidence with the Top-down analysis involved a rigorous process of (a) analysing the CFE survey results and (b) several rounds of consultations with regulators and Steering Committee members via meetings and emails.

Chart 22: Overall Process Flow of the COL



Source: CSC

First, a preliminary COL was constructed based on the CFE survey results. An occupation would be included in the preliminary COL if more than 50% of companies chose to include the occupation. In the case of occupations which appear in more than one sector, we would include the occupation even if only one sector had validated it. All job titles from the CFE under these occupations would be included in the preliminary COL. Next, from the additional job titles suggested by respondents in the CFE, we mapped these job titles to MASCO occupations. In several cases, these job titles would match MASCO occupations that were already included in the COL. Next, we assessed whether these job titles were suggested by firms that were large enough to represent the views of the industry, and; checked these job titles against TalentCorp's administrative data[16] and the sector studies.

Then, the preliminary COL (including both occupations and job titles), was disseminated to the regulators and industry lead bodies via briefings and emails. This process was repeated several times in some sectors, especially with regard to occupations with a long list of job titles. Ideally, we would have liked to check further with CFE respondents as well - but due to time constraints, we felt that regulators would be in the best position to comment on the COL. As the framework for the COL becomes more established, and; as firms become more familiar with the COL in the future, we expect to have more engagement with firms.

The regulators were asked to verify the COL, in terms of whether the job titles are correctly placed under the occupations; whether these occupations are considered "critical" to their sector, and; to suggest any additional job titles or occupations that are critical, but does not appear in our preliminary list. Broadly, regulators suggested several additional occupations and job titles, some of which were in line with those suggested by firms in the CFE. In addition, we also received feedback on the COL from members of the Steering Committee meeting.

After several rounds of gathering feedback, we emailed the final COL to the aforementioned stakeholders to inform them that the COL would be published on the TalentCorp website in end-December 2015; and that we continue to welcome comments to improve the COL. Firms which responded to the CFE survey were also emailed to inform them of the results and to provide an avenue for further feedback.

Beyond the Pilot COL 2015/2016, regulators and the Steering Committee meeting members made several helpful suggestions and offered further collaborative opportunities for next year's work on

[16] Referring to data from applications for TalentCorp's Returning Expert Programme (REP) and Residence Pass-Talent (RP-T)

the COL. Several regulators suggested that we leverage on their list of companies for the CFE survey next year, to better represent the sector's views. Another key feedback was on the importance of adding details on qualifications, years of experience and competencies to the COL, where possible. To some extent, we have addressed this concern by adding the link to the relevant sector studies in this year's COL. The regulators and Steering Committee meeting members also noted that since this year's COL is a pilot exercise, they would be interested in learning of the outcomes of the COL's usefulness in policymaking.

PART III: RESULTS AND NEXT STEPS

CHAPTER 6: MALAYSIA'S RECOMMENDED CRITICAL OCCUPATIONS LIST

The **Pilot Critical Occupations List (COL)** reflects occupations that are **Skilled, Sought-after** and **Strategic** in six key sectors in Malaysia.

Table 8 presents the full COL across the six sectors, alongside additional information on each occupation. For further detail on each occupation, please click on the occupation within the table, or refer to Appendix I. **Table 9 to Table 14** present the critical occupations within each of the six key sectors.

Table 8: Critical Occupations List – Full List (42 Occupations)

No.	Critical Occupation (MASCO Code)	Additional Information
1	Finance Managers (1211)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector-(Commercial/Islamic Banking and Investment Banking Clusters) *Financial Reporting Analysts; Tax Managers; Credit Risk Management; Financial Controllers* - Accounting Sector *Finance Directors; Financial Controllers; Chief Financial Controllers* • Bottom-up evidence also indicates that the occupation is **hard-to-fill** due to skills mismatch. • Common types of **qualifications**[17]: Degree in Economics; Accountancy; Finance; Banking; Commerce
2	Policy and Planning Managers (1213)	• Bottom-up evidence received includes the following **job titles** in this sector: - Electrical & Electronics Sector *Project Managers; Project Leaders; Program Managers* Further reference: *Ipsos-TalentCorp E&E Sector Study on the Supply-Demand of Talent in Malaysia (pg. 134 - 147)*

[17] Based on Resident Pass Talent (RPT) and Returning Expert Programme (REP)

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
3	Business Services Managers (1214)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Oil & Gas Sector *Technical Sales Engineers; Wireline Sales Engineers* - Electrical & Electronics Sector *Sales Engineers; Marketing Engineers* - Telecommunications & Multimedia Sector *Production & Operation Manager; Business Services/Development Manager* *Further reference:* *PwC|MCMC Talent Gap Study for the Communications Sector in Malaysia (pg. 94 – 116)* - Financial Services Sector *Production and Operation/Business Managers; Business Services/Development Managers; Compliance Officers; Shariah Compliance Officers* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Telco/Multimedia sector.
4	Administrative Managers (1215)	• Bottom-up evidence received includes the following **job titles** in this sectors: - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector– (Shared Services and Outsourcing Cluster) *Contact Centre Managers* • Common types of **qualifications**: Diploma or higher in Computer Science/ Information Technology/ Engineering or equivalent.
5	Research and Development Managers (1223)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector– (Commercial/Islamic Banking and Investment Banking Clusters) *Trade Product Specialist; Product Manager; Islamic Product Manager; Credit and Lending Product Developers*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
6	Information and Communications Technology (ICT) Services Managers (1330)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Telecommunications & Multimedia Sector– (Wireless Technology and Fixed Line Technology Cluster) *Network Strategists; Technology Strategists; IT Project Managers; Infrastructure Specialists; Database Specialists; Software Developers; Network Performance Managers; Network Operations Managers* Further reference: *PwC|MCMC Talent Gap Study for the Communications Sector in Malaysia (pg. 94 – 116)* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector *Production and Operation/ Communications Managers; Information Systems Managers; Information Technology Managers; Computer Services Managers; Data Processing Managers* - Financial Services Sector *Software Analysts; Data Warehouse Specialist/ Modellers/ Scientists; Digital Banking/ Internet Technology Specialists; IT Security Specialists; Big Data/ Hadoop Engineers; Cloud Specialists* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics sector.
7	Geologists and Geophysicists (2114)	• Bottom-up evidence received includes the following **job titles** in this sector: - Oil & Gas Sector (Tier 1: Production Sharing Employers) *Petroleum Geoscientists; Geologists; Oceanographers; Well Site Geologists; Operation Geologists; Reservoir Geologists; Sedimentologists; Subsurface Managers; Geophysicists; Seismic Interpreters* Further reference: *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107–174)* • This occupation is mainly involved in the following **phases** of the Oil & Gas industry: Exploration, Development, Production • Common types of **qualifications**[18]: Degree or higher in Applied Geology; Geophysics; Geology or Physics

[15] Based on Resident Pass Talent (RPT) and Returning Expert Programme (REP)

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
8	Mathematicians, Actuaries and Statisticians (2120)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *Data Scientists; Data Analysts* - Telecommunications & Multimedia Sector– (Emerging Technologies Cluster) *Data Scientists; Predictive Analysts; Data Mining Analysts* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector *Data Scientists; Data Modellers, Data Analysts; Data Miners; Big Data and Analytics; Analytical Consultants* - Financial Services Sector– (Insurance/Takaful Cluster) *Appointed Actuaries; Pricing Actuaries; Valuation Actuaries* • Common types of **qualifications**: Degree in Economics; Mathematics and Statistics; Actuarial Science
9	Industrial and Production Engineers (2141)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Oil & Gas Sector *Automation Design – Electrical Engineers; Reliability Engineers; Process Development Engineers (Moulding)* - Electrical & Electronics Sector *Process Engineers; Preventive Maintenance (Facility); Packaging Engineers; Facilities Competent Engineers; Industrial Engineers*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
10	Civil Engineers (2142)	• Bottom-up evidence received includes the following **job titles** in this sector: - Oil & Gas Sector (Tier 1: Production Sharing Employers) *Structural Engineers; Facilities Project Managers; Foundation Engineers; Reliability and Safety Engineers; Construction Engineers* Further reference: *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107 – 174)* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the oil & gas sector • Common types of **qualifications**: Degree in Mechanical Engineering; Civil Engineering or Petroleum Engineering
11	Mechanical Engineers (2144)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Oil & Gas Sector *Mechanical Design Engineers; Facilities Engineers; Mechanical Maintenance Engineers; Reliability and Safety Engineers; Rotating Equipment Engineers; Operations Engineers; Fabrication Engineers* *Further reference:* *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107 – 174)* - Electrical & Electronics Sector *Engineering Technologists; Mechanical Technologists; Industrial Machinery and Tools Engineers; Maintenance Engineers; Product Engineers* *Further reference:* *Ipsos-TalentCorp E&E Sector Study on the Supply-Demand of Talent in Malaysia (pg. 134 -147)* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Oil & Gas and Electrical & Electronics sectors • Common types of **qualifications**: Degree in Mechanical Engineering

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
12	Chemical Engineers (2145)	• Bottom-up evidence received includes the following **job titles** in this sector: - Oil & Gas Sector *Corrosion Engineers; Project Engineer/Managers; Product Quality Control/Assurance; Process Control Engineers; Terminal Managers* *Further reference:* *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107 – 174)* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Oil & Gas sector. • Sought-after **knowledge areas**: Corrosion monitoring; Product quality control/assurance; process control; Terminal management
13	Mining Engineers, Metallurgists and Related Professions (2146)	• Bottom-up evidence received includes the following **job titles** in this sector: - Oil & Gas Sector *Reservoir Engineers; Drilling Engineers; Petroleum Engineers; Well Engineers; Pipeline / Piping Engineers; Instrumentation Engineers* Further reference: *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107 – 174)* • Common types of **qualifications**: Degree or higher in Mechanical Engineering; Petroleum Engineering; Applied Physics; Chemistry; Geology

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
14	Engineering Professionals Not Elsewhere Classified (2149)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Oil & Gas Sector *Procurement Engineers; Commissioning Engineers; Research Engineers* - Electrical & Electronics Sector *Photonic Engineers; Sputter Process Engineers; Module Characterisation Engineers; Aerospace Engineers; Sputter Equipment Engineers* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Oil & Gas and Electrical & Electronics sectors
15	Electrical Engineers (2151)	• Bottom-up evidence received includes the following **job titles** in this sector: - Electrical & Electronics Sector *IC Design Engineers; Embedded System/Firmware Engineers; RF Engineers; Media Process Engineers; Wafer Fabrication Process Engineers* Further *reference:* *Ipsos-TalentCorp E&E Sector Study on the Supply-Demand of Talent in Malaysia (pg. 134 - 147)* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics sector. • Common types of **qualifications**: Degree in Electrical & Electronics; Computer Engineering; Telecommunications; Mechanical Engineering; Material Engineering; Emphasis in IC Design/Microelectronic

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
16	Electronic Engineers (2152)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *RF Engineers; Embedded System/Firmware Engineers; Wafer Fabrication Process Engineers; IC Design Engineers;* Further reference: *Ipsos-TalentCorp E&E Sector Study on the Supply-Demand of Talent in Malaysia (pg. 134 - 147)* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector– System Design and Development Cluster *Computer Engineers; Audio And Video Equipment Engineers; System Architects; Structural Designers* Further reference: *MSC Malaysia Skills Competency Matrix 2.0* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics sector • Common types of **qualifications**: Degree in Electrical & Electronics; Computer Engineering; Telecommunications; Mechanical Engineering; Material Engineering; Emphasis in IC Design/Microelectronic
17	Telecommunications Engineers (2153)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Telecommunications & Multimedia Sector– (Infrastructure for Wireless Technology and Infrastructure for Fixed Line Technology Cluster) *Wireless Network Engineers; Radio Optimisation & Capacity Engineers; Core Network Service Assurance Engineers; Data Network Engineers; Network Deployment Managers; Value-added Services (VAS) Engineers; Transmission Network; IP Engineers; Network and System Engineers* Further reference: *PwC|MCMC Talent Gap Study for the Communications Sector in Malaysia (pg. 94 – 116)*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
18	Graphic and Multimedia Designers (2166)	• Bottom-up evidence received includes the following **job titles** in this sector: - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector– (Creative Multimedia Cluster) *Web Designers; Graphics And Sound Specialists; Computer Specialists; Graphic Designers; Animators; 3D Modellers; Visual Effects Artists; 2D Animators, 3D Artists, Animation Directors* • Common types of **qualifications**: Degree or higher in Creative Multimedia; Computer Science; Information Technology or equivalent; Professional Certificate or higher in Art; Design; Creative Multimedia or equivalent • Common types of **industry certification**: Adobe Certified Associate, HTML Developer Certificate, Autodesk Maya
19	Manufacturing Professionals (2182)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *Manufacturing Specialists; Quality Assurance Executives; Production Executives; Warehouse Executives; Boiler Superintendents; Health and Safety Executive & Manager* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector *Supply Chain/ Procurement Specialists; Presales Storage Consultants; Product Planners* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics sector.

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
20	Accountants (2411)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Oil & Gas Sector *Operations Accountants; Production Accountants; Project Accountants; Drilling Accountants; Management Accountants* Further reference: *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107 – 174)* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector (Shared Services and Outsourcing Cluster) *Accountants; Auditors; Tax consultants; Liquidators; Chartered Accountants; Transaction Monitoring Managers* Further reference: *MSC Malaysia Skills Competency Matrix 2.0* - Financial Services Sector *Accountant/ Chartered Accountants; Auditors; Tax Consultants; Tax Managers; Adjusters* - Accounting Sector *Auditors; Accountants; Tax Consultants; Tax Managers; Technical Managers (Accounting)* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in ICT/Global Business Services and Accounting sectors • Common types of **industry certification**: MIA, ACCA, CIMA, CPA Australia, ICAEW, MICPA, CAANZ • Must be registered with Malaysian Institute of Accountants (MIA): Refer to MIA website for a list of recognised degrees and certifications
21	Financial and Investment Advisers (2412)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector– (Commercial/Islamic Banking Cluster) *Sales Managers; Sales Analysts; Client Relationship Managers; Wealth Managers; Financial Planners; Corporate Finance Advisers; High-net-worth Client Advisers*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
22	Financial Analysts (2413)	• Bottom-up evidence received includes the following **job titles** in these sectors: - <u>Telecommunications & Multimedia Sector</u> *Pricing Analysts* - <u>Information & Communications Technology (ICT) and Global Business Services (GBS) Sector-(Shared Services and Outsourcing Cluster)</u> *Operational Risk Analysts; Financial Services Leaders; Solutions Consultants* - <u>Financial Services Sector– (Investment Banking Clusters)</u> *Research Analysts; Debt Analysts; Equity Analysts; Investment Analysts; Financial Officers; Risk Management Officers, Market Risk Officers; Credit Risk Officers* - <u>Accounting Sector</u> *Fraud Specialists; Transfer Pricing; Fraud & Investigation Consultants* • Common types of **industry certification**: ACCA, Certified Financial Analyst (CFA), Chartered Financial Analyst (CFA), Certified Fraud Specialist (CFS)
23	Management and Organisation Analysts (2421)	• Bottom-up evidence received includes the following **job titles** in this sector: - <u>Telecommunications & Multimedia Sector</u> *Market Research/ Business Analysts; Strategy Analysts* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Financial Services sector

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
24	Personnel and Career Professionals (2423)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector (Shared Services and Outsourcing Cluster) *Human Resource Analysts; HR Assistants; HR Consultants; Talent Acquisition Consultants* - Financial Services Sector *Human Resource Professionals*
25	Advertising and Marketing Professionals (2431)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector *Marketing Communications Specialists*
26	Systems Analysts (2511)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *Computer Analyst; Business (Information Technology) Analysts* - Telecommunications & Multimedia Sector *Systems/Computer Analysts; Business (IT) Analysts* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector- (IT Cluster) *Computer Analysts; Business (Information Technology) Analysts; JDE Consultants; RPG Programmers* Further reference: *MSC Malaysia Skills Competency Matrix 2.0* - Financial Services Sector *Computer and System Administrators; System Analysis Engineers* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics, ICT/Global Business Services and Financial Services sectors • Common types of **industry certification** in ICT/Global business services sector: Microsoft Certified Professional Developer (MCPD); Microsoft Certified Solution Developer (MCSD)

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
27	Software Developers (2512)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *Computer Programmers; Multimedia Programmers; Information Technology Researchers; Software Engineers; Root Cause Failure Analysis (RCFA) Engineers* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector-(Information Technology Cluster) *SAP Application Developers;* Common types of **qualifications**: Degree or higher in Computer Science; Information Technology • Common types of **industry certification** in ICT/Global Business Services sector: SAP Certified – Associate Business Foundation & Integration with SAP ERP 6.0 EHP5; SAP Certified Development Consultant SAP NetWeaver 2004 – Application Development Focus ABAP
28	Applications Programmers (2514)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *CAD Engineers* - Telecommunications & Multimedia Sector– (Infrastructure for Wireless Technology and Infrastructure for Fixed Line Technology Clusters) *Software Developers; Systems Programmers* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector-(Creative Multimedia, Information Technology and System Design & Development Clusters) *Computer Programmers; Communications Programmers; Multimedia Programmers; Database Programmers; Game Engine Programmers, User Interface (UI)/Gameplay Coders* - Financial Services Sector *Software Analysts* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics, ICT/Global Business Services, Telco/Multimedia and Financial Services sectors.

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
29	Software and Application Developers and Analysts Not Elsewhere Classified (2519)	• Bottom-up evidence received includes the following **job titles** in this sector: - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector-(Information Technology Cluster) *Product Assurance Engineers; QA Analysts, QA Executives; Quality Engineers; Release Managers; Software Testers; Test Engineers; Technical Architects; Application Consultants*
30	Database Designers and Administrators (2521)	• Bottom-up evidence received includes the following **job titles** in this sector: - Telecommunications & Multimedia Sector– (Emerging Technologies Cluster) *Database Specialists; Data Architects; Data Scientists; Business Data Analysts* Further reference: *PwC|MCMC Talent Gap Study for the Communications Sector in Malaysia (pg. 94 – 116)*
31	System Administrators (2522)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Telecommunications & Multimedia Sector–(Infrastructure for Wireless Technology and Emerging Technologies Clusters) *Information Systems Maintenance Engineers; Value-Added Services (VAS) Engineers; Billing Specialists; IT Architects; Enterprise Applications Architects; Web and Mobility Developers; Cloud Computing Solution Architects* Further reference: *PwC|MCMC Talent Gap Study for the Communications Sector in Malaysia (pg. 94 – 116)* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector-(Information Technology Cluster) *Customer Support Engineers, Customer Support Officers, Product Support Engineers, Product Support Officers; System Administrators; Solution Architects*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
32	Computer Network Professionals (2523)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Telecommunications & Multimedia Sector– (Infrastructure for Wireless Technology Cluster) *Network Analysts; Radio Network Planning Consultants; Network Performance Consultants* - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector (Information Technology Cluster) *IT Network Systems Engineers, Network Analysts, Network Specialists, Network System Engineers; Network Performance Consultants* Further reference: *MSC Malaysia Skills Competency Matrix 2.0* • Common types of **qualifications**: Degree in Computer Science; Information Technology; MIS; Engineering or equivalent • Common types of **industry certification** in ICT/Global business services sector: Cisco Certified Network Professional CCNP Certification, CompTIA Network+
33	Database and Network Professionals Not Elsewhere Classified (2529)	• Bottom-up evidence received includes the following **job titles** in this sector: - Telecommunications & Multimedia Sector– (Information and Network Security Cluster) *Security Technology Specialists; Security Architects; Security Strategists; Network Penetration Testers; Application Security Specialists* Further reference: *PwC|MCMC Talent Gap Study for the Communications Sector in Malaysia (pg. 94 – 116)*
34	Lawyers (2611)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector *Legal Managers*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
35	Electronics Engineering Technicians (3114)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *Wafer Fabrication Technicians; Electronics Engineering Estimators* • Bottom-up evidence received indicates the occupation is hard-to-fill in the Electrical & Electronics sector.
36	Mechanical Engineering Technicians (3115)	• Bottom-up evidence received includes the following **job titles** in these sectors: - Electrical & Electronics Sector *Engineering/Mechanical Technician* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Electrical & Electronics sector.
37	Environmental and Occupational Health Inspectors and Associates (3257)	• Bottom-up evidence received includes the following **job titles** in this sector: - *Oil & Gas Sector (Tier 1: Production Sharing Employers)* *Health and Safety Inspectors; Industrial Safety Officers; Health, Safety and Environmental Coordinators* Further reference: *PwC|TalentCorp Study on Talent Demand and Supply in the Oil & Gas Sector (pg. 107 – 174)* • Bottom-up evidence received indicates the occupation is **hard-to-fill** in the Oil & Gas sector.
38	Securities and Finance Dealers and Brokers (3311)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector-(Investment Banking Cluster) *Forex Traders; Fixed Income Traders; Treasury Dealers; Treasury Analysts*

Table 8: Critical Occupations List – Full List (42 Occupations)		
No.	**Critical Occupation (MASCO Code)**	**Additional Information**
39	Credit and Loans Officers (3312)	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector-(Commercial/Islamic Banking Cluster) *Loan Officers; Credit Analysts; Credit Officers; Credit Risk Officers*
40	Accounting Associate Professionals (3313)	• Bottom-up evidence received includes the following **job titles** in this sector: - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector (Shared Services and Outsourcing Cluster) *Assistant Officer (Accounts); Financial Supervisors; Account Assistants* • Common types of **qualifications**: Diploma or degree in Accounting; Finance; Banking
41	Insurance Underwriters (3321)*	• Bottom-up evidence received includes the following **job titles** in this sector: - Financial Services Sector (Insurance/Takaful Cluster) *Non-motor Underwriters; General Insurance Underwriters; Claims Underwriters; Claims Managers; Claims Officers*
42	Information and Communications Technology (ICT) User Support Technicians (3512)	• Bottom-up evidence received includes the following **job titles** in this sector: - Information & Communications Technology (ICT) and Global Business Services (GBS) Sector (Information Technology Cluster) *Help Desk Technicians; Computer/User Services Assistants; Technical Helpdesk Analysts; Technical Support* • Common types of **qualifications**: Degree or higher in Computer Science; Information Technology; MIS; Engineering or equivalent • Common types of **industry certification**: Certified Technical Support Specialist; Certified Technical Support Associate

Note: The Critical Occupations List (COL) is constructed based on the Malaysia Standard Classification of Occupations (MASCO) 2008
*Based on MASCO Code 3321-03, under MASCO Code 3321 (Insurance Agents)

Critical Occupations in the Oil & Gas Sector

Oil & Gas Tiers: (1) Production Sharing Employers; (2) Oil & Gas Services and Equipment
**Disclaimer: The Pilot COL analysis was conducted using data spanning 2011 to 2014. Thus, any recent slowdown in the oil and gas job market due to the decline in oil prices is not reflected in the Pilot COL.*

Table 9: Critical Occupations List – Oil & Gas Sector			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
1	2114	Geologists and Geophysicists	Petroleum Geoscientists; Geoscientists; Geologists; Mudloggers; Oceanographers; Well Site Geologists; Operation Geologists; Reservoir Geologists; Sedimentologists; Structural Geologists; Subsurface Managers; Geomodellers; Geophysicists; Petrophysicists; Physical Oceanographers; Seismic Interpreters; Geological Specialists; Geophysical Specialists
2	2141	Industrial and Production Engineers	Automation Design – Electrical Engineers; Reliability Engineers; Process Development Engineers (Moulding)
3	2142	Civil Engineers	Structural Engineers; Civil/Structural/Structural Design Engineers; Drainage Design Engineers; Facilities Planning Specialists; Facilities (Equipment Design) Engineers; Facilities Project Managers; Foundation Engineers; Reliability and Safety Engineers; Construction Engineers
4	2144	Mechanical Engineers	Mechanical Design Engineers; Facilities Engineers; Mechanical Maintenance Engineers; Reliability and Safety Engineers; Rotating Equipment Engineers; Operations Managers; Operations Engineers; Platform Superintendents; Fabrication Engineers
5	2145	Chemical Engineers	Corrosion Engineers; Project Engineer/Managers; Product Quality Control/Assurances; Process Control Engineers; Terminal Managers

Table 9: Critical Occupations List – Oil & Gas Sector (continued)			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
6	2146	Mining Engineers, Metallurgists and Related Professions	Marine Section Leaders; Technical Section Leaders; Subsurface Engineers (Petroleum); Subsea Engineers; Integrity Management Engineers; Petroleum Engineers; Drilling Engineers; Well Engineers; Completions Engineers; Production Engineers; Enhanced Oil Recovery (EOR) Engineers; Reservoir Engineers; Wellsite (Planning) Engineers; Production Technologists; Petroleum Economists; Facilities (Equipment Design) Engineers; Loss Control Engineers; Pipeline Corrosion Engineers; Wellsite Corrosion Engineers; Material (and Non-destructive Testing) Engineers; Welding Engineers; Instrumentation Engineers; Energy Engineers; Renewable Energy Engineers; Environment Engineers; Plan and Audit Engineering Design; Materials and Metallurgical Engineers; Pipeline/ Piping Engineers; Gas Processing Engineers; Hydraulics Engineers; Water Management Engineers; Marine Supervisors; Inspection Engineers; Product Design R&D Engineers; Operation Readiness and Assurance (OR&A) Leads; Pipeline Mechanical Engineers; Pipeline Project Engineers; Pipeline SCADA and Simulations Engineers; Pipe Stress Engineers
7	2149	Engineering Professionals Not Elsewhere Classified	Procurement Engineers; Commissioning Engineers; Research Engineers; Project Engineers; Inspection (QA/QC) Engineers
8	2411	Accountants	Operations Accountants; Production Accountants; Chief Accountants; Project Accountants; Drilling Accountants; Management Accountants
9	1214	Business Services Managers	Technical Sales Engineers; Wireline Sales Engineers
10	3257	Environmental and Occupational Health Inspectors and Associates	Health and Safety Inspectors; Industrial Safety Officers; Health, Safety and Environmental Coordinators

Critical Occupations in the Electrical & Electronics Sector

Electrical & Electronics Clusters: (1) Automation; (2) Electronic Components; (3) Industrial Electronics; (4) Semiconductor; (5) LED; (6) Solar

Table 10: Critical Occupations List – Electrical & Electronics Sector			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
1	2151	Electrical Engineers	Electrical Engineers; Electrical Illumination Engineers; Electromechanical Equipment Engineers; Process Engineers; Maintenance Engineers; Product Engineers; IC Design Engineers; Embedded System/Firmware Engineers; RF Engineers; Media Process Engineers; Wafer Fabrication Process Engineers; Test/Measurement Engineers; R&D Engineers (includes Product Design); Electrical Consultants; Protection Engineers
2	2152	Electronic Engineers	Electronics Engineers; Computer Engineers; Audio And Video Equipment Engineers; Electronics/ Semiconductors Engineers; Electronics/ Instrumentation Engineers; RF engineers; Embedded System/Firmware Engineers; Wafer Fabrication Engineers; Process Engineers; Maintenance Engineers; Design Engineers; Product Engineers; Test Engineers; IC Design Engineers; Media Process Engineers; Wafer Fabrication Process Engineers; Test/Measurement Engineers; R&D Engineers (includes Product Design); Hardware Design Engineers; User Experience Engineers; Semiconductor Packaging Engineers; IC Circuit Designers; IC Package Assembly Process Engineers; Component Design Engineers; IP logic Design Engineers; Optoelectronics Engineers
3	2182	Manufacturing Professionals	Manufacturing Specialists; Manufacturing Executives; Quality Assurance Executives; Production Executives; Warehouse Executives; Boiler Superintendents; Health and Safety Executive and Managers
4	1213	Policy and Planning Managers	Project Managers; Project Leaders; Program Managers
5	1330	Information and Communications Technology (ICT) Services Managers	Strategic Program Managers
6	2120	Mathematicians, Actuaries and Statisticians	Data Scientists; Data Analysts

Table 10: Critical Occupations List – Electrical & Electronics Sector (continued)			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
7	2141	Industrial and Production Engineers	Process Engineers; Preventive Maintenance (Facility); Packaging Engineers; Facilities Competent Engineers; Industrial Engineers; Automation Engineers; SCADA Engineers
8	2144	Mechanical Engineers	Mechanical Engineers; Engineering Technologists; Mechanical Technologists; Industrial Machinery and Tools Engineers; Heating, Ventilation, Air-conditioning and Refrigeration Engineers; Maintenance Engineers; Product Engineers; Media Process Engineers; Industrial Machinery and Tools Engineers; Process Engineers; Metrology Equipment Engineers; R&D Engineers
9	2149	Engineering Professionals Not Elsewhere Classified	Photonic Engineers; Material Engineers; Unit Process Design (UPD) Engineers; Plasma Enhance Chemical Vapour Deposition Engineers; Sputter Process Engineers; Module Characterisation Engineers; Aerospace Engineers; Sputter Equipment Engineers
10	2511	System Analysts	Computer Analysts; Business (Information Technology) Analysts
11	2512	Software Developers	Computer Programmers; Systems Programmers; Programmers (Analyst); Multimedia Programmers; Information Technology Researchers; Software Engineers; Software Design Engineers; Root Cause Failure Analysis (RCFA) Engineers; SAP IT and Finance Applications Developers; Product Development Engineers
12	2514	Applications Programmers	CAD Engineers
13	3114	Electronics Engineering Technicians	Electronics Engineering Technicians; Electronics Engineering Estimators; Wafer Fabrication Technicians
14	3115	Mechanical Engineering Technicians	Engineering/ Mechanical Technicians; Hydraulic Hose Technicians; Wafer Fabrication Technicians
15	1214	Business Services Managers	Sales Engineers; Marketing Engineers

Critical Occupations in the Telco & Multimedia Sector

Telco Clusters: (1) Infrastructure for wireless technology; (2) Infrastructure for fixed line technology; (3) Information & network security; (4) Emerging technologies (cloud computing & big data analytics)

Table 11: Critical Occupations List – Telco & Multimedia Sector			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
1	1330	Information and Communications Technology (ICT) Services Managers	Network Strategists; Technology Strategists; Enterprise Convergence Strategists; IT Project Managers; Infrastructure Specialists; Database Specialists; Software Developers; Network Performance Managers; Network Operations Managers; Network Deployment Managers; Chief Information Security Officers; Network Security; Information Systems Maintenance Engineers; Access Control Specialists; Network Security Software Developers; Data Architects; Business Data Analysts; Production And Operation/ Communications Managers; Information Systems Managers; Information Technology Managers; Computer Services Managers; Data Processing Managers
2	2529	Database and Network Professionals Not Elsewhere Classified	Security Technology Specialists; Security Architects; Security Strategists; Network Penetration Testers; Application Security Specialists
3	2521	Database Designers and Administrators	Database Specialists; Data Architects; Data Scientists; Business Data Analysts
4	1214	Business Services Managers	Production and Operation Managers; Business Services/Development Managers
5	2120	Mathematicians, Actuaries and Statisticians	Data Scientists; Predictive Analysts; Data Mining Analysts
6	2413	Financial Analysts	Pricing Analysts
7	2421	Management and Organisation Analysts	Market Research/ Business Analysts; Strategy Analysts
8	2511	Systems Analysts	Systems/Computer Analysts; Business (Information Technology) Analysts

Table 11: Critical Occupations List – Telco & Multimedia Sector (continued)			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
9	2514	Applications Programmers	Software Developers; Systems Programmers
10	2522	System Administrators	Systems Administrators; Information Systems Maintenance Engineers; Value-added Services (VAS) Engineers; Billing Specialists; IT Architects; Enterprise Applications Architects; Web and Mobility Developers; Cloud Computing Solution Architects; Cloud Technology Specialists; Cloud Planners
11	2523	Computer Network Professionals	Network Analysts; Radio Network Planning Consultants; Network Performance Consultants
12	2153	Telecommunications Engineers	Network Architects/ Designers/ Planners/ Testers; Wireless Network Engineers; Radio Optimisation and Capacity Engineers; Core Network Service Assurance Engineers; Data Network Engineers; Network Deployment Managers; Site and Construction Engineers; Network Implementation and Construction Engineers; Network Performance Managers; Network Quality Engineers; Value-added Services (VAS) Engineers; Transmission Networks; IP Engineers; Network and System Engineers; Telecommunications Consultants

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

ICT & GBS Clusters: (1) Creative multimedia; (2) System design & development; (3) Information technology; (4) Shared services & outsourcing

Table 12: Critical Occupations List – ICT & GBS Sector			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
1	2512	Software Developers	SAP Application Developers
2	2514	Applications Programmers	Computer Programmers; Communications Programmers; Systems Programmers; Software QA Engineers; Multimedia Programmers; Database Programmers; Programmers (Analyst); Information Technology Researchers; .NET Programmers; Java Programmer; PHP Programmer; C/C++ Programmer; Application Developers; Application Engineers; Software Engineers; Software Programmers; Game Engine Programmers; User Interface (UI)/ Gameplay Coders
3	3313	Accounting Associate Professionals	Assistant Officers (Account); Financial Supervisors; Account Assistants
4	3512	Information and Communications Technology (ICT) User Support Technicians	Help Desk Technicians; Computer/User Services Assistants; Technical Helpdesk Analysts; Technical Support
5	2166	Graphic and Multimedia Designers	Web Designers; Graphics and Sound Specialists; Computer Specialists; Systems/Computer Designers; Graphic Designers; Digital Artists; Animators; 3D Modellers; Visual Effects Artists; 2D Animators; 3D Artists; Animation Directors; Animation Producers; Animation Supervisors; Creative Artists; Layout Artists; Lighting Artists
6	2152	Electronic Engineers	Computer Engineers; Audio and Video Equipment Engineers; Electronics/ Semiconductors Engineers; Electronics/ Instrumentation Engineers; System Architects; Structural Designers; Pre-Silicon Validation Engineers; Physical Design Engineers; Physical Design Verification Engineers; Signal Integrity Engineers; Register-transfer Level (RTL) Designers
7	2423	Personnel and Career Professionals	Human Resource (HR) Analysts; HR Assistants; HR Consultants; Talent Acquisition Consultants
8	2523	Computer Network Professionals	IT Network Systems Engineers; Network Analysts; Network Specialists; Network System Engineers; Network Performance Consultants

Table 12: Critical Occupations List – ICT & GBS Sector (continued)			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
9	2519	Software and Application Developers and Analysts Not Elsewhere Classified	Product Assurance Engineers; QA Analysts; QA Executives; Quality Engineers; Release Managers; Software Testers; Test Engineers; Technical Architects; Application Consultants
10	2522	System Administrators	Customer Support Engineers; Customer Support Officers; Product Support Engineers; Product Support Officers; System Administrators; Solution Architects
11	1330	Information and Communications Technology Services Managers	Production and Operation/ Communications Managers; Information Systems Managers; Information Technology (IT) Managers; Computer Services Managers; Data Processing Managers
12	2120	Mathematicians, Actuaries and Statisticians	Data Scientists; Data Modellers; Data Analysts; Data Miners; Big Data and Analytics; Analytical Consultants
13	2182	Manufacturing Professionals	Supply Chain/ Procurement Specialists; Presales Storage Consultants; Product Planners
14	2411	Accountants	Accountants; Auditors; Tax Consultants; Liquidators; Chartered Accountants; Transaction Monitoring Managers; Account Receivable (AR) Executives; Account Payable (AP) Executives; E-payment Account Managers
15	2413	Financial Analysts	Operational Risk Analysts; Financial Services Leaders; Solutions Consultants
16	2511	Systems Analysts	Computer Analysts; Business (Information Technology) Analysts; JD-Edwards (JDE) Consultants; RPG Programmers; SAP Consultants
17	1215	Administrative Managers	Contact Centre Managers

Critical Occupations in the Financial Services Sector

Financial Services Clusters: (1) Commercial/Islamic Banking; (2) Investment Banking; (3) Insurance/Takaful

Table 13: Critical Occupations List –Financial Services Sector			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
1	1211	Finance Managers	Financial Reporting Analysts; Tax Managers; Credit Risk Managements; Financial Controllers
2	1214	Business Services Managers[1] *(Includes Compliance Managers)*	Production and Operation/Business Managers; Business Services/Development Managers; Anti-Money Laundering Specialists; Compliance Officers; Shariah Compliance Officers; Compliance Analysts
3	2411	Accountants	Accountants/ Chartered Accountants; Auditors; Tax Consultants; Tax Managers; Adjusters
4	2412	Financial and Investment Advisers	Sales Managers; Sales Analysts; Client Relationship Managers; Wealth Managers; Financial Planners; Corporate Finance Advisors; High-net-worth Client Advisors
5	2413	Financial Analysts[2]	Research Analysts; Debt Analysts; Equity Analysts; Investment Analysts; Financial Officers; Risk Management Officers; Market Risk Officers; Credit Risk Officers; Operational Risk Officers; Risk Manager; Risk Analysts; Risk Modellers
6	2423	Personnel and Career Professionals	Human Resource Professionals
7	2511	Systems Analysts	Computer and System Administrators; System Analysis Engineers
8	2514	Applications Programmers	Software Analysts
9	3312	Credit and Loans Officers	Loan Officers; Credit Analysts; Credit Officers; Credit Risk Officers

Table 13: Critical Occupations List –Financial Services Sector (continued)			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
10	2611	Lawyers	Legal Managers
11	1330	Information and Communications Technology (ICT) Services Managers	Software Analysts; Data Warehouse Specialists/ Modellers/ Scientists; Digital Banking/ Internet Technology Specialists; Integration Technology Specialists; IT Security Specialists; Big Data/ Hadoop Engineers; Cloud Specialists; PMO Managers; MIS Specialists
12	2120	Mathematicians, Actuaries and Statisticians	Appointed Actuaries; Pricing Actuaries; Valuation Actuaries
13	3311	Securities and Finance Dealer and Brokers	Forex Traders; Fixed Income Traders; Treasury Dealers; Treasury Analysts
14	3321-03	Insurance Underwriters[3]	Non-motor Underwriters; General Insurance Underwriters; Claims Underwriters; Claims Managers; Claims Officers;
15	2431	Advertising and Marketing Professionals[4]	Marketing Communications Specialists
16	1223	Research and Development Managers[5]	Trade Product Specialists; Product Managers; Islamic Product Managers; Credit and Lending Product Developers

[1] Also includes Compliance Managers, 1214-07 (MASCO 2013)
[2] Also includes Risk Operation Analysts, 2413-04 (MASCO 2013)
[3] Based on MASCO 2013 (MASCO Code 3321: Insurance Agents)
[4] Also includes Marketing Officers
[5] Refers specifically to Product Development Managers, 1223-02 (MASCO 2013)

Critical Occupations in the Accounting Sector

Table 14: Critical Occupations List – Accounting Sector			
No.	**MASCO**	**Critical Occupation**	**Job Titles** *(Based on bottom-up feedback, input from sector regulators and administrative data)*
1	1211	Finance Managers	Finance Directors; Financial Controllers
2	2411	Accountants	Auditors; Accountants; Tax Consultants; Tax Managers; Technical Managers (Accounting)
3	2413	Financial Analysts	Fraud Specialists; Transfer Pricing; Fraud and Investigation Consultants

CHAPTER 7: MOVING FORWARD

7.1 The Value of the Critical Occupations List to Policy Application

The COL is developed to 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.

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, 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.

In the near term, the CSC will roll out the application of the COL for several of TalentCorp's initiatives, such as the Graduate Employability Management Scheme (GEMS), Returning Experts Programmes (REP) and Residence Pass-Talent (RP-T). At the same time, the CSC will engage with the relevant agencies to discuss and lay out the use of the COL in their policy implementation. These agencies include the Ministry of Higher Education, Ministry of Education, Immigration Department and the Human Resource Development Fund. The following reflects the potential use of the COL in selected human capital policy interventions.

i. Upskilling

With a dynamic and ever-changing global work environment, the COL provides up-to-date information on the type of specialisations and competencies that they demand 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 be designed with reference to the COL, to ensure updated and relevant provision of training to workers.

ii. TVET

The field of Technical and Vocational Education and Training (TVET) plays an increasingly important role in many countries in addressing issues such as youth unemployment and other social inequalities. While the Pilot COL does not include analysis of semi-skilled occupations, the CSC aims

to analyse this category in the upcoming COL. The future COL will therefore provide information on the types of TVET occupations that are sought-after by firms and the type of qualifications and specialisations they require. This will facilitate the government and other related TVET agencies in improving curriculum design and graduate employability in TVET occupations.

iii. Graduate Employability

On top of listing the critical occupations demanded by the industry, the COL also provides insights into the type of job specialisations or qualifications that are required within each occupation. Graduate employability programmes or bridging programmes can utilise the COL as a tool to help graduates gain the relevant training and knowledge needed to smoothen their transition from graduation to employment.

iv. Higher Education and Scholarship Management

The COL, which incorporates industry evidence, can serve as a primary guide in shaping higher education curriculum and the allocation of scholarships. The COL can not only inform on the types of occupations that are sought-after by major firms, but can also provide insights into the type of qualifications and specialisations that firms demand within each occupation. 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.

7.2 Refining, Updating and Reviewing the List

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. The CSC will continue to engage data-providing agencies, firms, sector bodies and regulators to ensure ongoing and fruitful collaboration in this important exercise.

If you or your organisation have any feedback or suggestions on the COL (on its methodology, usage of labour market indicators, engagement with industry or possible application of the COL), please feel free to contact Daryl Yong (daryl.yong@talentcorp.com.my / 603-7839 7123). We welcome constructive comments and continue to work towards improving the COL for better coordination of Malaysia's human capital development strategy.

APPENDIX I

Description of Critical Occupations in Table 6

1. 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.

2. Policy and Planning Managers (1213)

MASCO Description

Policy and planning managers plan, direct and coordinate policy advice and strategic planning within a government agency, corporate business, or organisation.

3. Business Services Managers (1214)

MASCO Description

Business services managers plan, direct and coordinate the business services activities within a government agency, corporate business, or organisation.

4. Administrative Managers (1215)

MASCO Description

Administrative managers plan, direct and coordinate supportive services such as record-keeping, mail distribution, telephone operator/receptionist and other office support services within a government agency, corporate business, or organisation.

5. Research and Development Managers (1223) – Includes Product Development Managers

MASCO Description

Research and development managers plan, direct and coordinate the research and development activities within a government agency, corporate business, or organisation.

6. ICT Services Managers (1330)

MASCO Description

ICT Services Managers plan, direct and coordinate the acquisition, development, maintenance and use of computer and telecommunications systems within government agency, corporate business, or organisation under the broad guidance of directors and chief executive.

7. 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.

8. Mathematicians, Actuaries and Statisticians (2120)

MASCO Description

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

9. Industrial and Production Engineers (2141)

MASCO Description

Industrial and production engineers plan, design, organise and supervise the operation of industrial production.

10. Civil Engineers (2142)

MASCO Description

Civil engineers plan, design, organise and supervise the construction and operation of civil engineering works.

11. Mechanical Engineers (2144)

MASCO Description

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

12. Chemical Engineers (2145)

***MASCO Description**: Chemical engineers conduct research and develop, design and advise on and direct commercial-scale chemical processes and production of various substances and items such as crude oil, petroleum derivatives, food and drink products, medicaments, or synthetic materials, and direct maintenance and repair of industrial plant, or study and advise on technological aspects of particular materials, products or processes.*

13. Mining Engineer, Metallurgists, Related Professions (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, 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.*

14. Engineering Professionals Not Elsewhere Classified (2149)

MASCO Description

This unit group covers Engineering Professional (Excluding Electrotechnology) not classified elsewhere in Minor Group 214: Engineering Professional (Excluding Electrotechnology). For instance, here should be classified those who engaged in conducting research, advising on or developing industrial efficiency of production, quality control, and those who study and advise on technological aspects of particular materials, products and manufacturing processes.

15. Electrical Engineers (2151)

MASCO Description

Electrical engineers conduct research and advise on, design, develop and supervise the manufacture, installation, operation and maintenance of equipment, machines and systems for the generation, distribution, utilisation and control of electric power.

16. Electronic Engineers (2152)

MASCO Description

Electronics engineers design, develop, adapt, test and maintain electronic components, circuits and systems used for computer systems, communications systems and industrial applications.

17. Telecommunications Engineers (2153)

MASCO Description

Telecommunications engineers design, develop, adapt, test and maintain electronic components, circuits and systems used for communications systems and industrial applications.

18. Graphic and Multimedia Designers (2166)

MASCO Description

Graphic and multimedia designers conduct research, improve or develop graphic computing concepts and operational methods, and advise on or engage in their practical application.

19. 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.

20. Accountants (2411)

MASCO Description

Accountant plan, organise and administer accounting systems for individuals establishment. Some occupations classified here examine and analyse the accounting and financial records of individuals establishments to ensure accuracy and compliance with established accounting standards and procedures.

21. Financial and Investment Advisers (2412)

***MASCO Description**: Financial and investment advisers develop financial plans for individual organisations and invest and manage funds on their behalf.*

22. Financial Analysts (2413)

***MASCO Description**: Financial analysts conduct quantitative analyses of information affecting investment programs of public or private institutions.*

23. Management and Organisation 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.

24. Personnel and Career Professionals (2423)

MASCO Description

Personnel and careers professionals provide professional business services related to personnel policies such as employee recruitment or development, occupational analyses and vocational guidance.

25. Advertising and Marketing Professionals (2431)

MASCO Description

Advertising and marketing professionals improve, advice or apply operational methods relating to marketing strategy, sales, advertising, promotion and pricing activities.

26. Systems Analyst (2511)

***MASCO Description**: Systems analysts conduct research, analyse and evaluate client information technology requirements, procedures or problems, and develop and implement proposals, recommendations, and plans to improve current or future information systems.*

27. Software Developers (2512)

***MASCO Description**: Software developers research, 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.*

28. Applications Programmers (2514)

MASCO Description

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

29. Software and App. Developers & Analysts Not Elsewhere Classified (2519)

MASCO Description

This unit group covers professionals not classified elsewhere in minor group 251, Software and Applications Developers and Analysts. For instance, here should be classified those professionals specialising in quality assurance including software testing.

30. Database Designers and Administrators (2521)

MASCO Description

Database designers and administrators design, develop, control, maintain and support the optimal performance and security of databases.

31. System Administrators (2522)

MASCO Description

Systems administrators develop, control, maintain and support the optimal performance and security of information technology systems.

32. Computer Network Professionals (2523)

***MASCO Description**: Computer network professionals research, analyse and recommend strategies for network architecture and development, Implement, manage, maintain and configure network hardware and software, and monitor, troubleshoot and optimise performance.*

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

***MASCO Description**: This unit group covers database and networking professionals not elsewhere classified in Minor Group 252: Database and Network Professionals.*

34. Lawyers (2611)

MASCO Description

Lawyers give clients legal advice on a wide variety of subjects and plead cases or conduct prosecutions in courts of justice, or instruct barristers or advocates to plead in higher courts of justice.

35. Electronics Engineering Technicians (3114)

MASCO Description

Electronics engineering technicians, normally under the direction and supervision of electronics engineers, perform technical tasks connected with electronic engineering research, as well as with the design, manufacture, assembly, construction, operation, maintenance and repair of electronic equipment and electromechanical systems.

36. Mechanical Engineering Technicians (3115)

MASCO Description

Mechanical engineering technicians perform technical tasks, normally under the direction and supervision of mechanical engineers, contributory to design, development, manufacture, construction, installation, maintenance and repair of mechanically functioning plant and equipment.

37. Environmental and Occupational Health Inspectors and Associates (3257)

MASCO Description

Environmental and Occupational health inspectors and associates on behalf of the government or industrial and other enterprises, inspect places of works on the grounds of occupational safety, and safety of production processes, or of goods produced, used or sold, and to ensure compliance with health and environment protection rules and regulations as well as with the quality standards and specifications of manufacturers.

38. Securities and Finance Dealers and Brokers (3311)

MASCO Description*: Securities and finance dealers and brokers buy and sell securities, stocks, bonds and other financial instruments, and deal on the foreign exchange on spot or on futures markets, on behalf of their own company or for customers on a commission basis and recommend transactions to clients or senior management.*

39. Credit and Loans Officers (3312)

MASCO Description*: Credit and loan officers analyse and evaluate financial information on applications for credit and loans and determine approval or disapproval of the client for the credit or loan or recommend to management approval or disapproval.*

40. Accounting Associate Professionals (3313)

***MASCO Description**: Accounting associate professionals maintain complete records of financial transactions of an undertaking and verify accuracy of documents and records relating to such transactions.*

41. Insurance Underwriters (3321-03)

***MASCO Description**: Insurance representatives 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)

42. ICT User Support Technicians (3512)

***MASCO Description**: Information and communications technology user support technicians provide technical assistance to users, either directly or by telephone, e-mail or other electronic means, including diagnosing and resolving issues and problems with software, hardware, computer peripheral equipment, networks, databases and the Internet, and providing guidance and support in the deployment, installation and maintenance of systems.*