



Ipsos Business Consulting

Supporting Your Path To Growth

Project Kolman:

E&E Sector Study on the Supply-Demand of Talent in Malaysia

Final Report



6 April 2012

© 2012 Ipsos. All rights reserved. Contains Ipsos' Confidential and Proprietary information and may not be disclosed or reproduced without the prior written consent of Ipsos.

Executive Summary

1. Project Background

2. Malaysia's Electrical and Electronics Sector

- ⇒ Defining the E&E Sector and its Value Chain
- ⇒ Overview Malaysian's E&E Sector
- ⇒ Baseline and New Investments Analysis for the E&E Sector 2007 - 2011

3. Issues and Challenges of the E&E Sector

4. Global Trends and its Talent Implications for the E&E Sector

5. Talent Issues within the Electrical and Electronics Sector

- ⇒ Key Talent Issues Facing the E&E Sector
- ⇒ Analyzing the Drivers of Key Talent Issues
- ⇒ Analyzing Talent Shortages within the Core Technical Functions of the E&E Value Chain

6. Overview of Current Training and Up-skilling Programs

7. Talent Supply-Demand Analysis

- ⇒ Analysis of Potential and Addressable Talent Supply Pool
- ⇒ Analysis of Potential Incremental Demand for Talent
- ⇒ Talent Supply-Demand Analysis

8. Main Talent Shortage Areas

- ⇒ Profile of the Talent Shortage Areas
- ⇒ Current Situation and Outlook of Main Talent Shortage Areas
- ⇒ Current Training and Up-skilling Programs for the Talent Shortage Areas

9. Conclusion

10. Recommendations

- ⇒ Recommendations to Address Talent Issue 1: Addressable Talent Supply Not Able to Meet Incremental Talent Demand
- ⇒ Recommendations to Address Talent Issue 2a: Skills Gaps - Entry-level Talent Not Industry-Ready (lacks required skill-sets)
- ⇒ Recommendations to Address Talent Issue 2b: Skills Gaps - Skills gaps in existing Talent Pool
- ⇒ Recommendations to Address Talent Issue 3: Attrition
- ⇒ Summary of Recommendations: Talent Attraction; Talent Development; and Talent Retention

Appendices

List of Appendices

- Appendix 1: Ipsos Survey Results
- Appendix 2: Proposed Framework for the Maintenance of Sectoral Talent Demand-Supply Study Talent Supply-Demand Analysis
- Appendix 3: General E&E Value Chain and the Solar and LED Value Chain
- Appendix 4: Identification of Talent Shortage Areas Across Micro Sub-Sectors
- Appendix 5: Talent Supply Pool Analysis
- Appendix 6: Incremental Demand Analysis
- Appendix 7: Demand-Supply Gap Analysis
- Appendix 8: Case studies: Singapore, Korea and Taiwan
- Appendix 9: Selected Talent Enhancement and Up-Skilling Programs in Malaysia for the E&E sector
- Appendix 10: Survey Findings from MEF, FMM and PICs
- Appendix 11: References and Selected Stakeholders Engaged



Executive Summary

Analysis Timeframe

- 2012 to 2014

Objectives

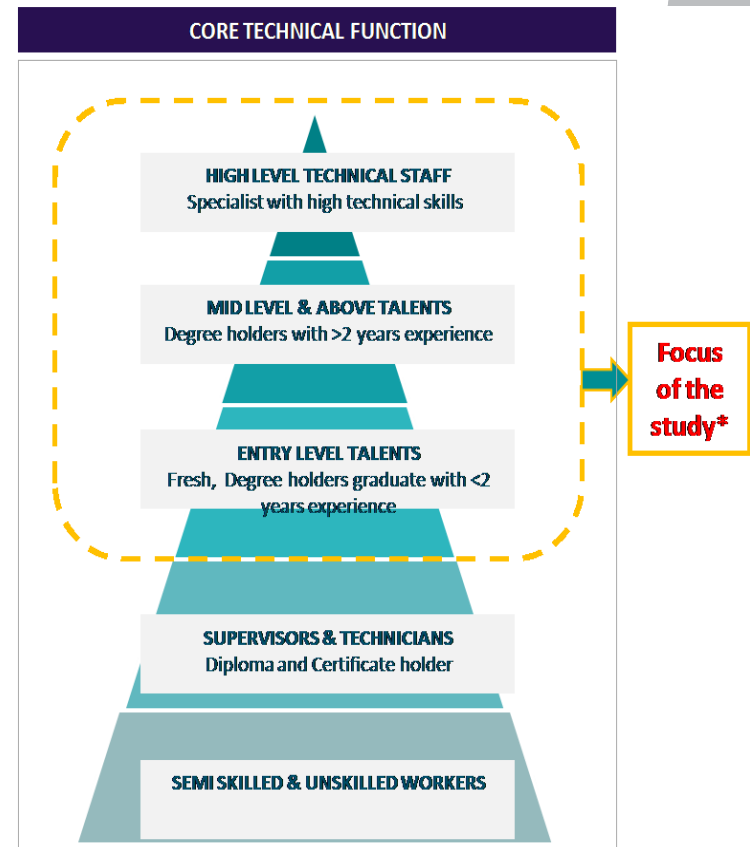
- Ascertain current demand-supply situation
- Identification on key talent shortage areas
- Benchmark human capital development in other countries
- Recommend talent development strategies

Methodology



Talent Area of Focus

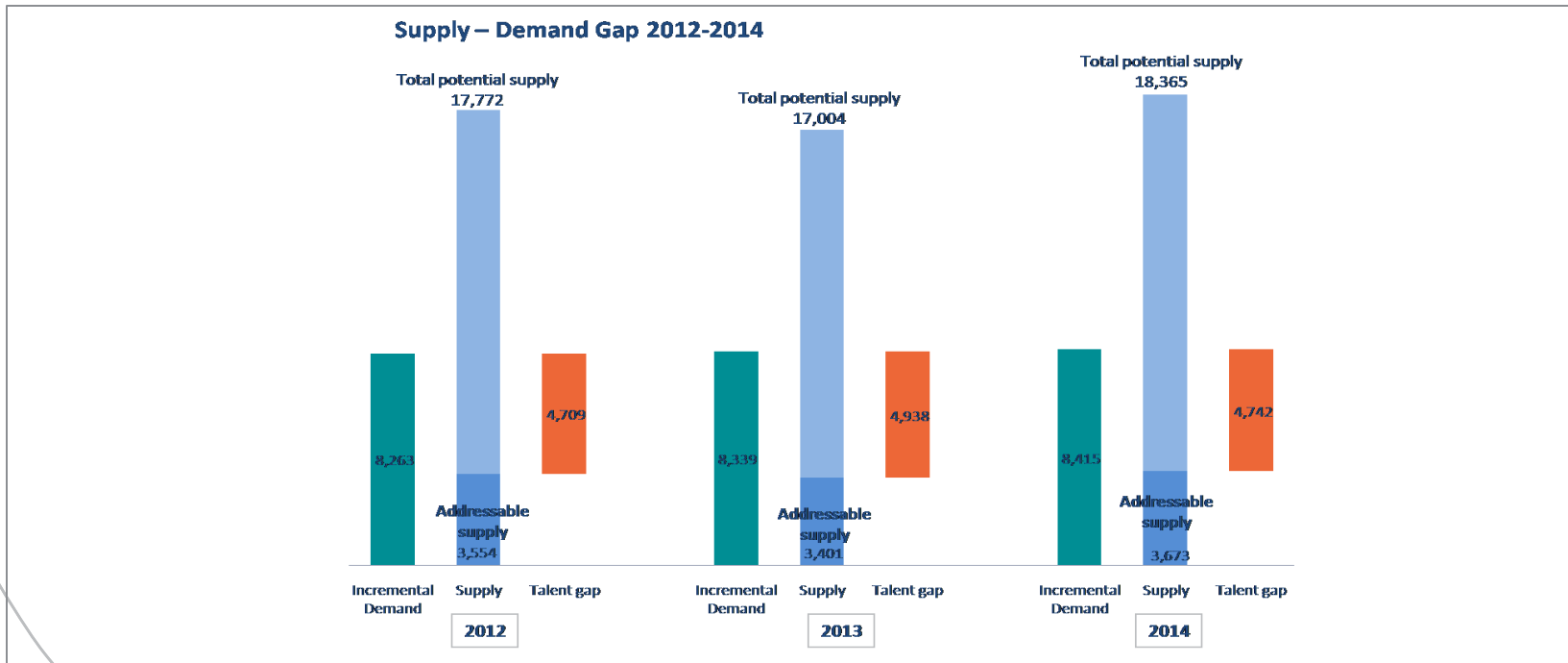
- The focus area of the talent analysis is on degree-holders and above within the core technical functions



- The E&E sector is an important contributor to Malaysia's economy as it is one of the 12 National Key Economic Areas (NKEA) in the country's Economic Transformation Programme (ETP). There are ~1,900 active E&E companies which provide employment to over 350,000 people.
- In line with ETP projections, Malaysia's E&E sector growth is expected to be robust in the coming years. This growth will require a steady supply of skilled talent, both in numbers and in the appropriate skills-sets, to meet the present and future needs of the sector
- However, the findings of this study points to several talent issues that will have an impact on the talent pool's ability to support the E&E sector

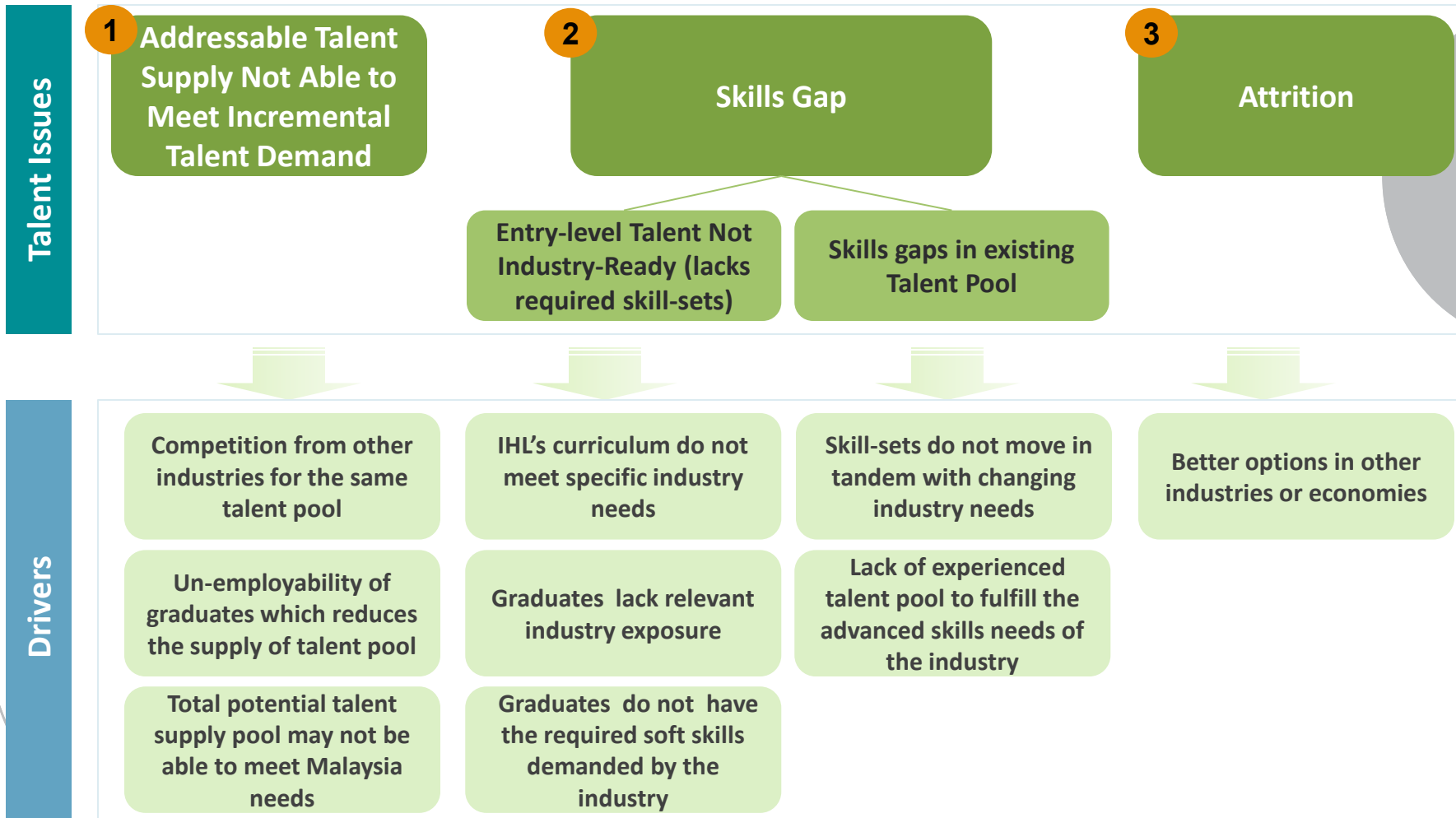
New Addressable Supply is not able to Meet the Incremental Talent Demand

- The analysis of this study indicates that new addressable supply is not able to meet the incremental talent demanded by the E&E sector for its core technical talent. There is a significant gap in the talent supply-demand projections
- While the potential talent pool is twice the amount of the projected incremental demand, the addressable talent pool will only be able to meet ~57% of projected incremental demand. A gap of ~4,700 is projected based on the baseline scenario



- This gap is due to several factors that includes competition from other sectors and economies for the same talent pool, as well as the un-employability of graduates that reduces the pool of addressable talent
- The sector also faces a situation of skills gaps, where adequately trained and skilled talent, both at entry and experienced levels are lacking. These are mainly in the areas of R&D and to some extent Engineering Support
- The gap in talent demand-supply numbers and skill-sets is further exacerbated by issues of talent attrition, whereby the E&E sector is losing its experienced talent to competing sectors and countries. The loss of these experienced talent has an adverse impact on the quality and level of skill-sets within the E&E sector since these talent would typically have good skill sets to be considered for international opportunities
- Collectively, these gaps or talent issues that the E&E sector is facing can be summarized into 3 broad areas:
 1. Addressable Talent Supply Not Able to Meet Incremental Talent Demand
 2. Skills Gaps in entry level and existing (experienced) talent pool
 3. Attrition









The talent issues and its drivers can be broadly categorized under the following headers



Key Talent Shortage Areas are mainly in the R&D and Engineering Support Functions

- The study also identified several areas where the talent shortage is prevalent i.e., areas in which industry players are unable, or find it difficult, to recruit entry and experienced level talent with the required skill-sets needed for the specific roles.
- The identification of the talent shortage areas also took into account the key talent areas that can support the growth of the sector towards higher value added activities (e.g. R&D) as well as key subsectors identified by the ETP
- The talent shortage areas are mainly in the areas of R&D and Engineering Support functions

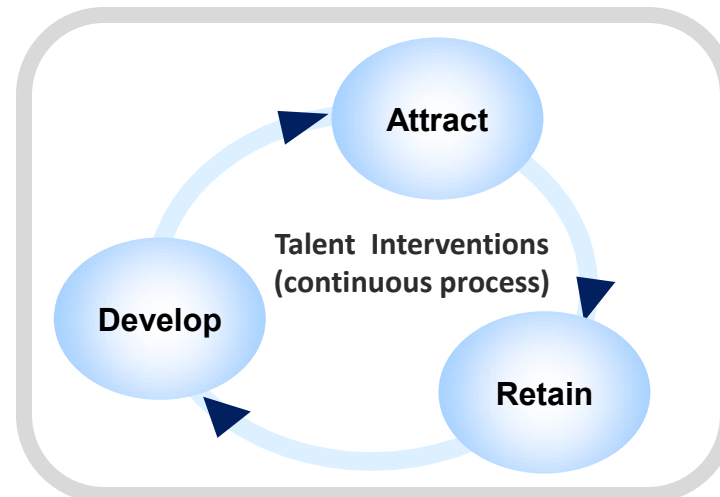
Key Talent Shortage Areas at Different Talent Levels and the Educational Requirements

Talent Shortage Areas		Level			Educational Requirement*
		Entry	Mid-Level	Experienced	
	IC Design Engineers	●	●	●	Degree in Electrical & Electronic with emphasis in IC Design / Microelectronics
	Embedded System / Firmware Engineer	●	●	●	Computer Engineering, Electrical & Electronics
	Software Engineer	●	●	●	Degree in Software Engineering, Electrical & Electronic
	RF Engineers	●	●	●	Degree in Electrical & Electronic , Tele-communications
	Media Process Engineers		●	●	Mechanical Engineering , Material Engineering, Electrical & Electronics
	Wafer Fabrication Process Engineers		●	●	Chemical Engineering, Mechanical Engineering, Material Engineering
	Test / Measurement Engineer		●	●	Mechanical Engineering , Electrical & Electronics, Statistical
	Product Design R&D Engineer	●	●	●	Mechanical Engineering, Electrical & Electronics

The list is not exhaustive but shows some of the more common educational requirements of the industry

The Talent Issues Demands Immediate Action from All Stakeholders

- There is a need for active participation by all stakeholders based on their respective roles within the E&E sector
- There has to be a cohesive and a comprehensive approach to enhance present initiatives and to formulate new initiatives to address the talent issues. It should cover programs in talent attraction to ensure the E&E sector has the adequate number of talent; talent development in ensuring the talent pool has the required skill-sets; and talent retention to ensure the E&E sector does not lose its experienced skilled talent





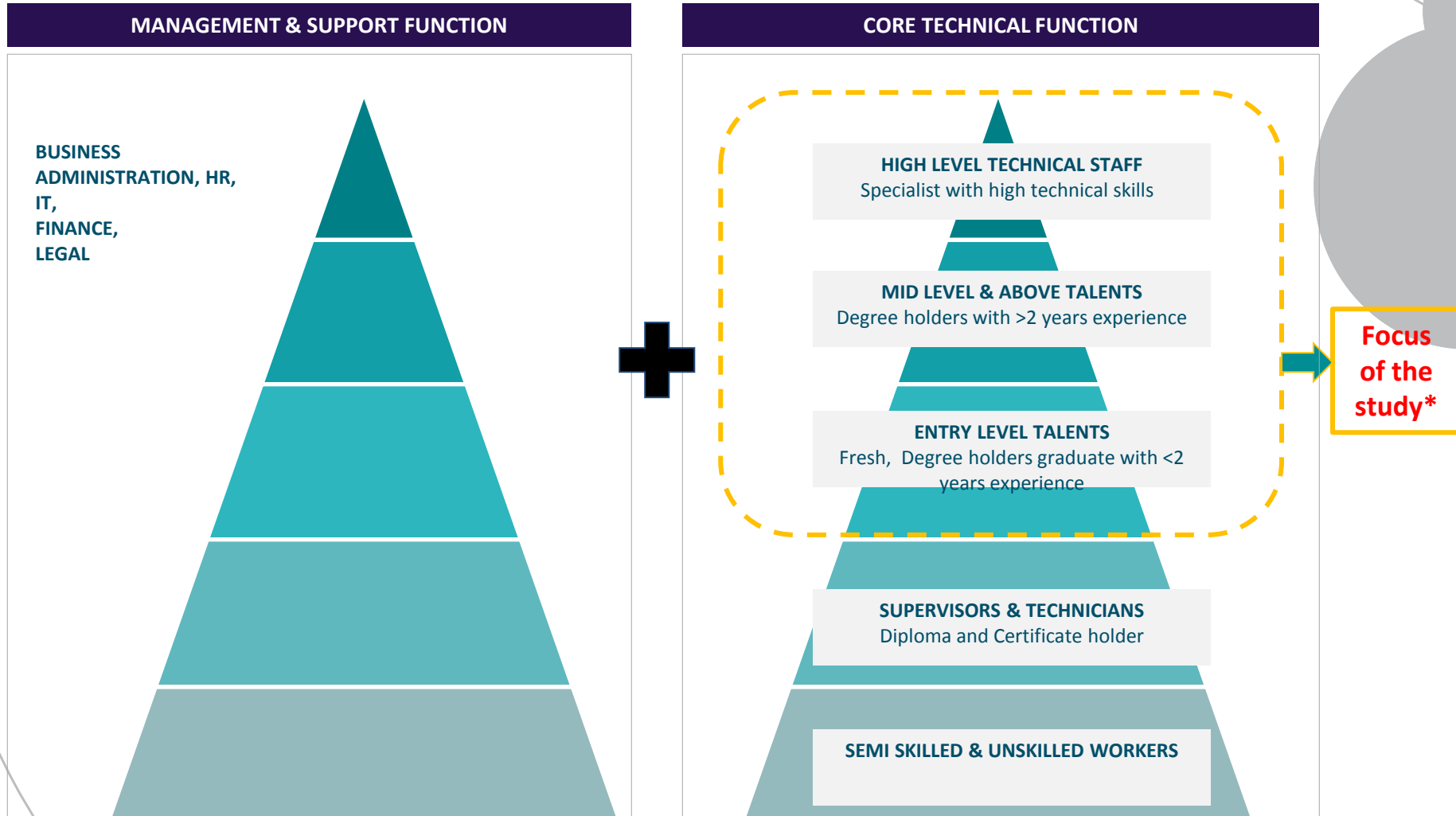
Project Background

Project Objectives

- 1 **Mapping and forecasting of talent demand-supply** with emphasis on the sector's value chain and geographic concentration;
- 2 **Identification of critical jobs, skills and competencies** required in various sub-sector by level of occupational requirement under the sector;
- 3 Analysis of **skills shortages and skills gaps** in the sector;
- 4 Identification of **future skills requirement** needed in the sector **to support the economic transformation** agenda;
- 5 **Potential roles of the government, industry and institutions** of higher learning in addressing the sectoral talent issues.

The focus area of the talent analysis is on degree-holders and above within the core technical functions in the E&E sector

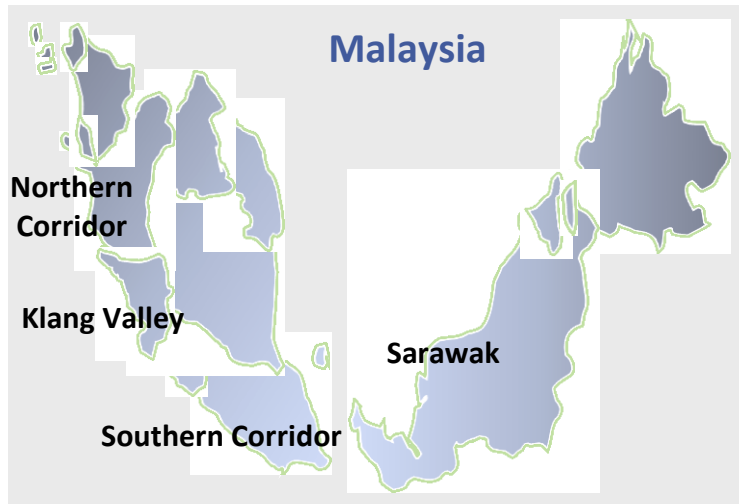
Organisation Pyramid of a Typical E&E Manufacturing Organisation



* The focus of the study will be on core technical talent which for the purpose of this study, is defined as degree-holders and above

Analysis timeframe: 2012 to 2014

Geographical Coverage



Scope of Study

- 1 *Review existing materials*
- 2 *Ascertain current demand-supply situation*
- 3 *Skills and competencies mapping and needs matching*
- 4 *Gaps identification*
- 5 *Future demand-supply forecast*
- 6 *Benchmark human capital development in other countries*
- 7 *Recommend talent development strategies*

Our methodology for this study: Gathering insights from primary and secondary sources

Compiling and Reviewing
Secondary Sources



In-depth Discussions
(face-to-face and phone)



Surveys



Analysis

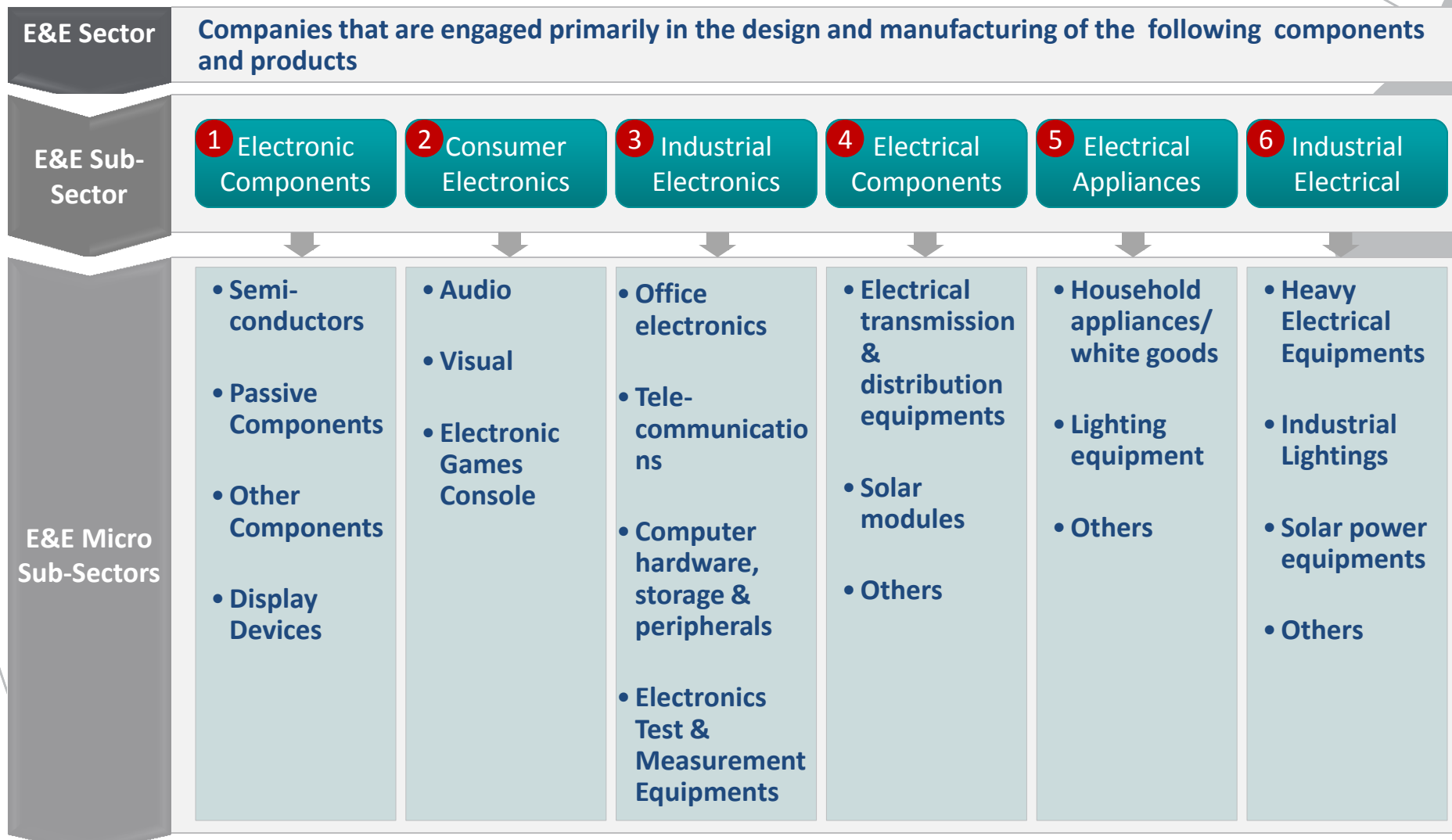




Malaysian's E&E Sector

Defining the E&E Sector and its Value Chain

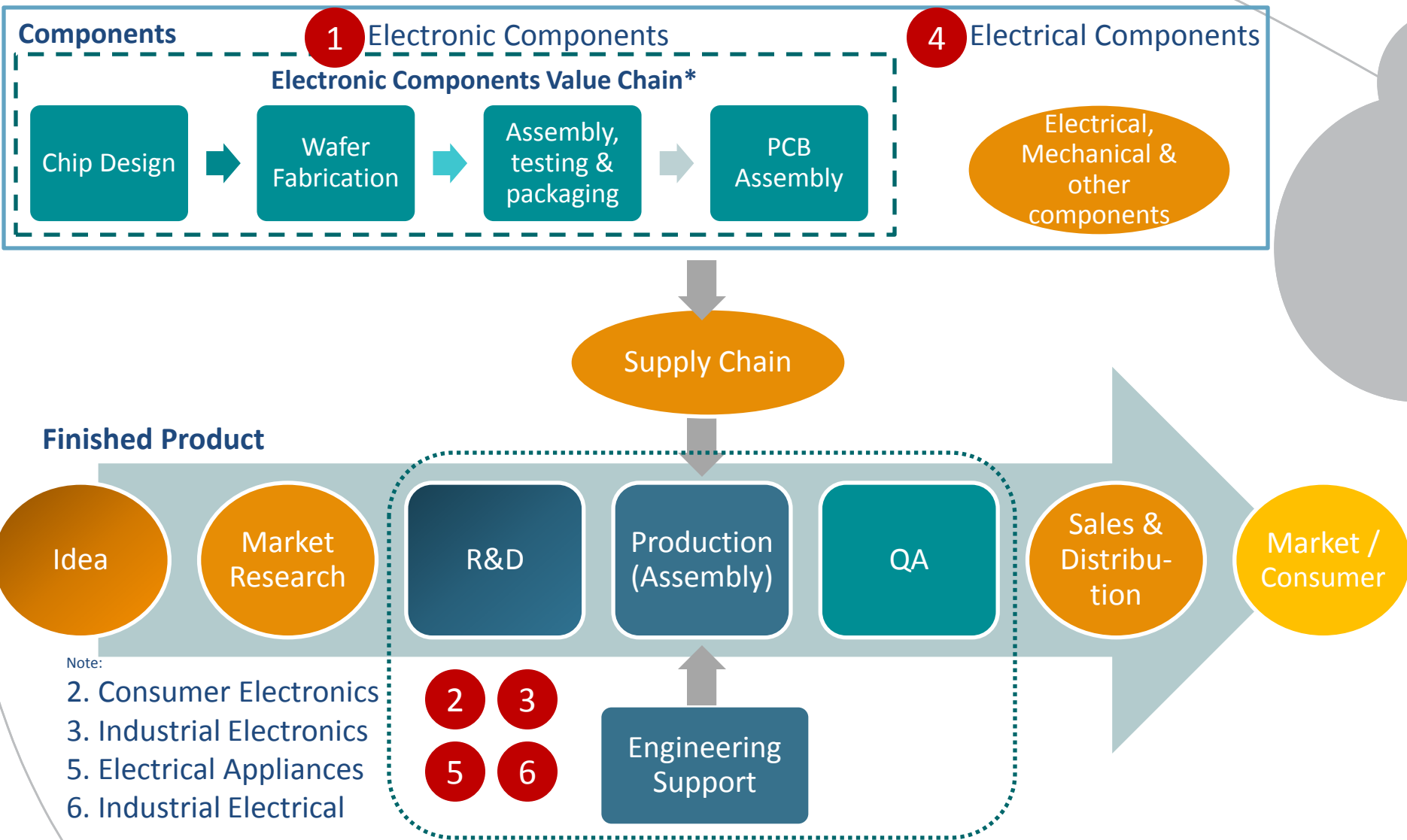
The E&E sector can be broken down to six sub-sectors; and the six sub-sectors can be further broken down to various micro sub-sectors



The description of products within each sub-sector and micro-subsectors are elaborated below

Sub-sectors	Examples of Products within the Micro Sub-sectors
1 Electronic Components	<ul style="list-style-type: none"> • Semiconductors – Integrated Circuit (IC), LEDs, Memory, etc. • Passive – Capacitors, Inductors/Coil, Resistors, Quartz, Oscillators, Magnets, etc. • Other Components – PCBs, etc. • Display Devices – LCD, LED/Display board
2 Consumer Electronics	<ul style="list-style-type: none"> • Audio – Hifi, music players (CD, MP3), etc. • Visual – CD/VCD/DVD players, TVs, camcorder, digital camera, etc. • Electronic Games Console
3 Industrial Electronics	<ul style="list-style-type: none"> • Office electronics – Copiers, fax, etc. • Telecommunications – Telephones, mobile phones, etc. • Computer hardware, storage & peripherals – Personal computers, servers, mainframes, workstation, data storage devices, motherboard, audio & video card, etc. • Electronics Test & Measurement Equipments– Bio-analytics equipments, etc.
4 Electrical Components	<ul style="list-style-type: none"> • Electrical transmission & distribution equipments • Solar modules, etc. • Others
5 Electrical Appliances	<ul style="list-style-type: none"> • Household appliances/white goods – Washing machine, ovens, refrigerators, etc. • Lighting equipment – Solid State Lighting (SSL) system, etc. • Others
6 Industrial Electrical	<ul style="list-style-type: none"> • Heavy Electrical Equipments – Generators, etc. • Industrial Lightings • Solar power equipments • Others

A simplified Process Value Chain for the various E&E sub-sectors can be defined as follows



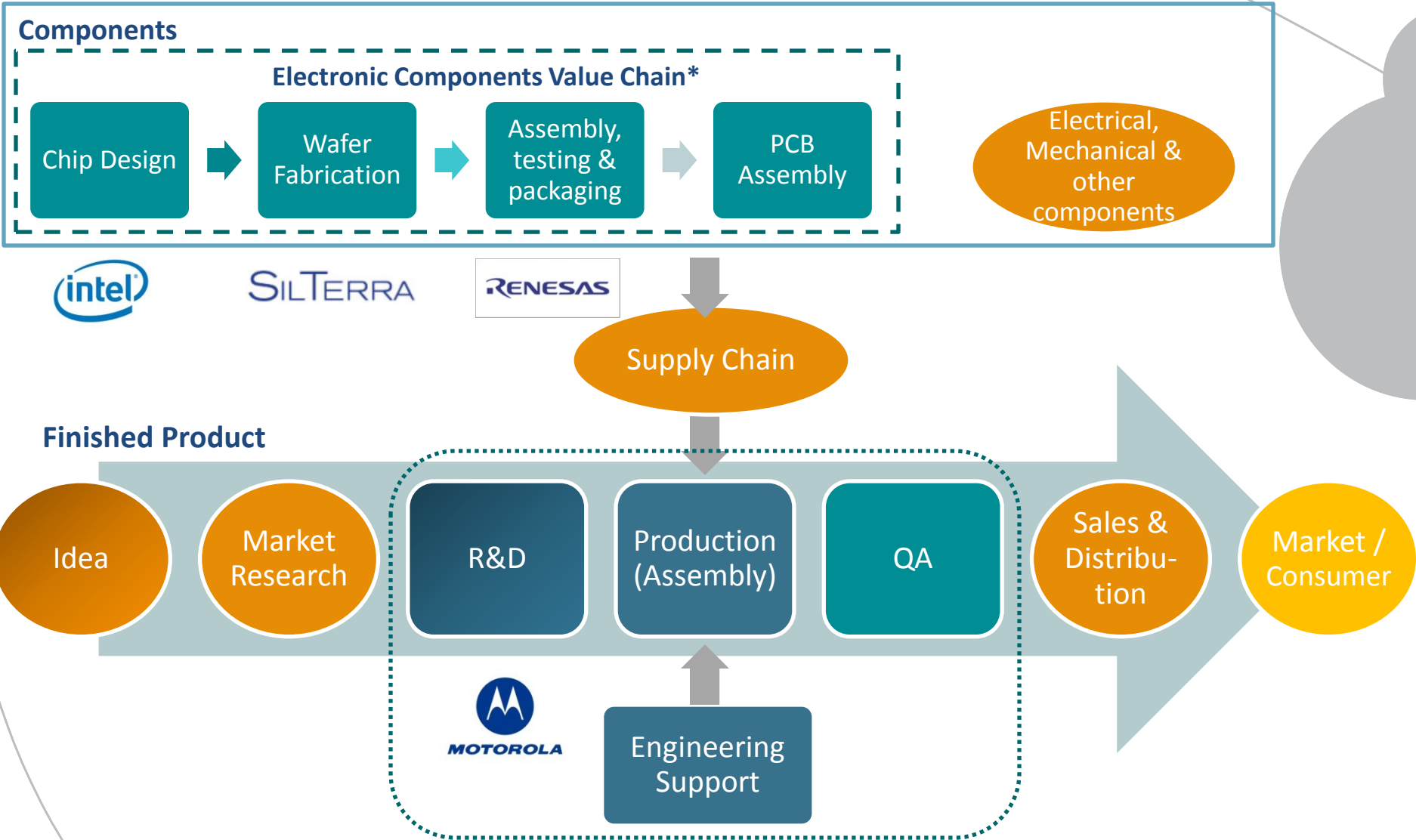
Note:

- 2. Consumer Electronics
- 3. Industrial Electronics
- 5. Electrical Appliances
- 6. Industrial Electrical

* Within the Electronic Components Value Chain, each cluster / sub-function will have their own elements of R&D, QA, Production (Assembly) and Engineering Support

Legend:
 Generally regarded as technical based functions
 Generally regarded as non-technical based functions

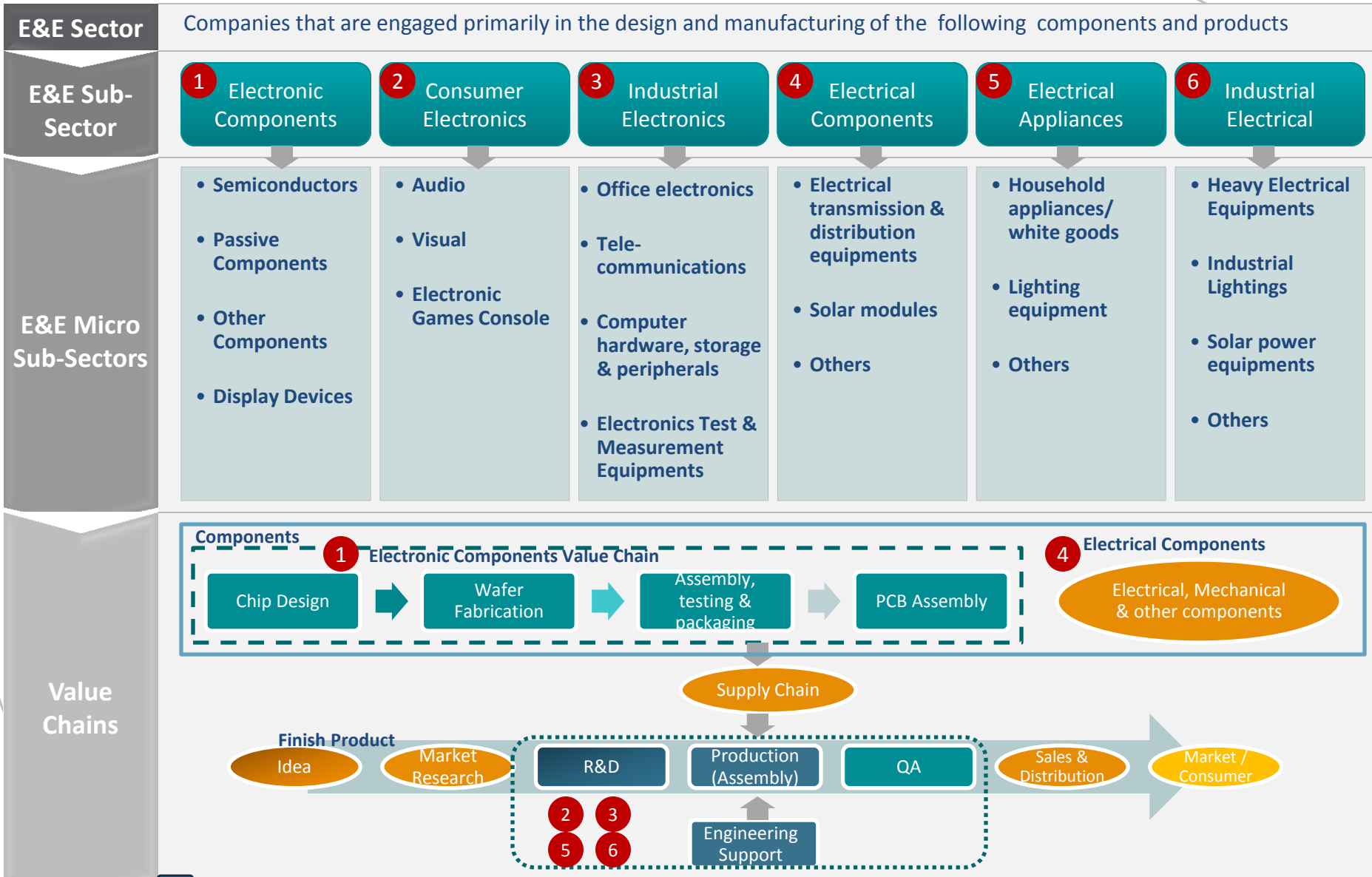
An illustration of where some companies sit within the value chain is shown below



* Within the Electronic Components Value Chain, each cluster / sub-function will have their own elements of R&D, QA, Production (Assembly) and Engineering Support

- Generally regarded as technical based functions
- Generally regarded as non-technical based functions

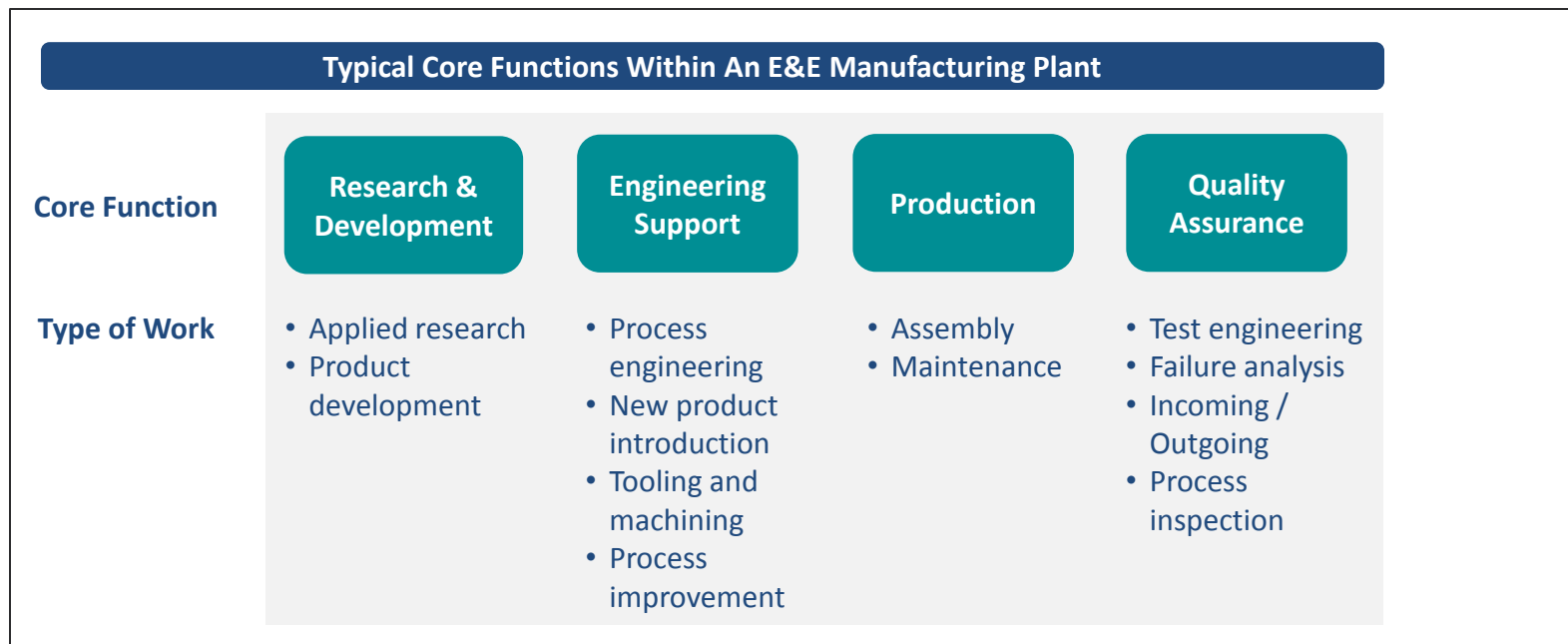
Put together, the E&E sub-sectors and its relationship with the value chain can be outlined as follows



Generally regarded as technical based functions
 Generally regarded as non- technical based functions

The major technical functions within the value chain can generally be divided into four core technical functions

- The major technical core functions within a typical E&E manufacturing plant can be divided into four main areas of work i.e. Research and Development (R&D), Engineering Support, Production, and Quality Assurance (QA)

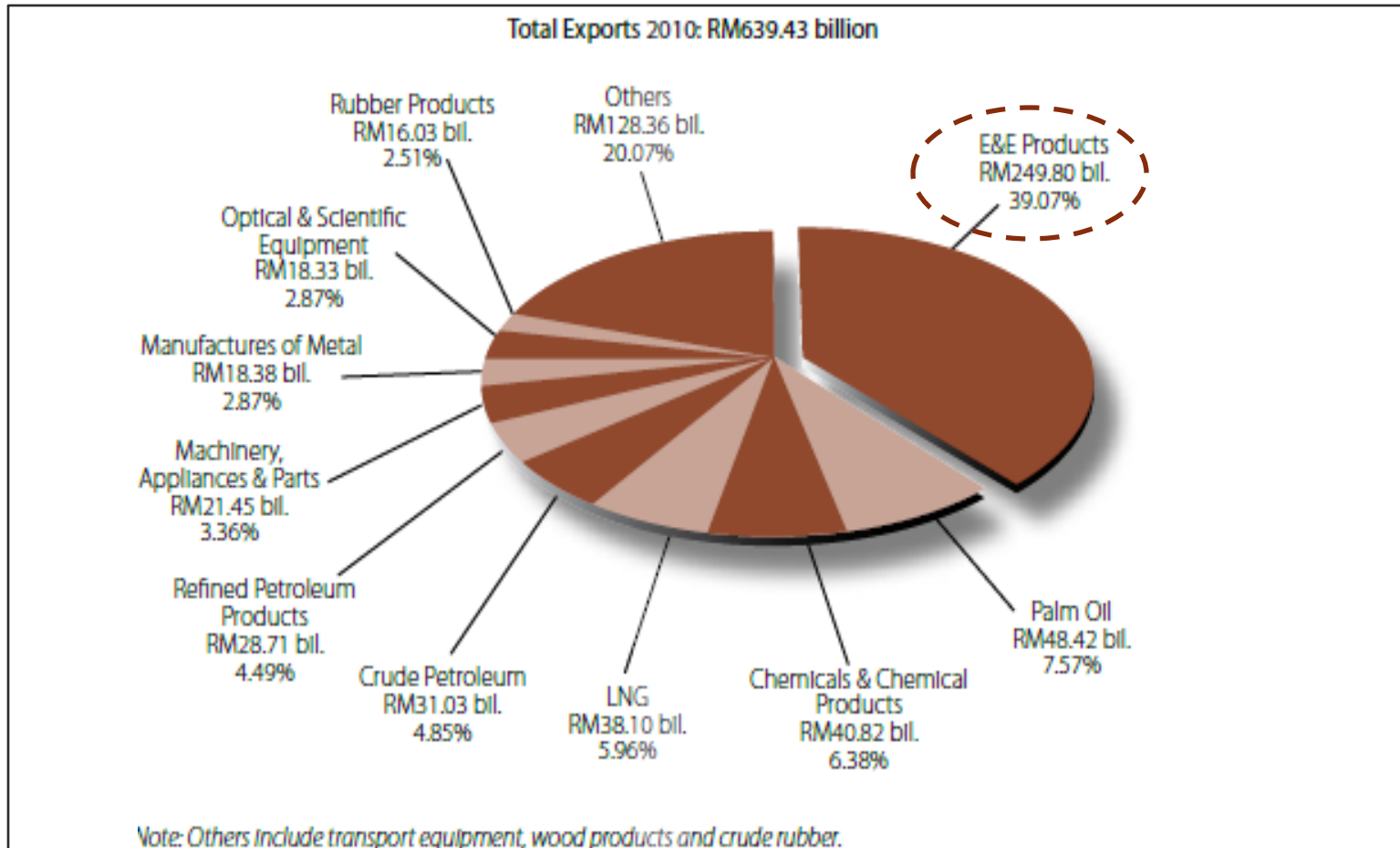


- Not all E&E manufacturing plants would necessarily have these four major functions

Overview Malaysian's E&E Sector

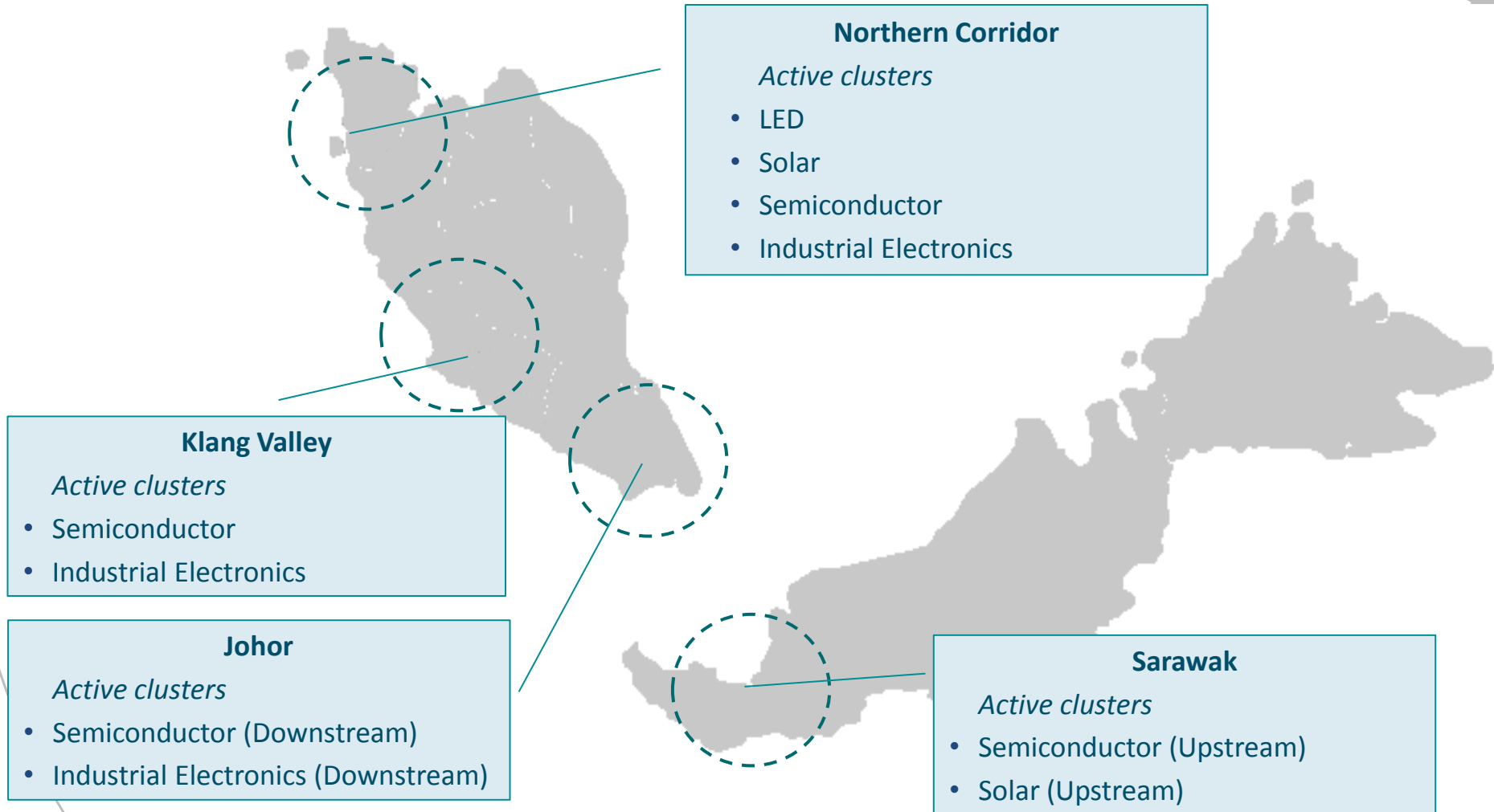
The E&E Sector is an important contributor to Malaysia's economy, accounting for ~40% of Malaysia's total exports in 2010

Top 10 Exports by Product Sector in 2010



Source: Extracted from MITI, 'Malaysia International Trade and Industry Report' (2010)

There are ~1900 active E&E companies mainly concentrated in four industrial regions. It employs over ~350,000 people...

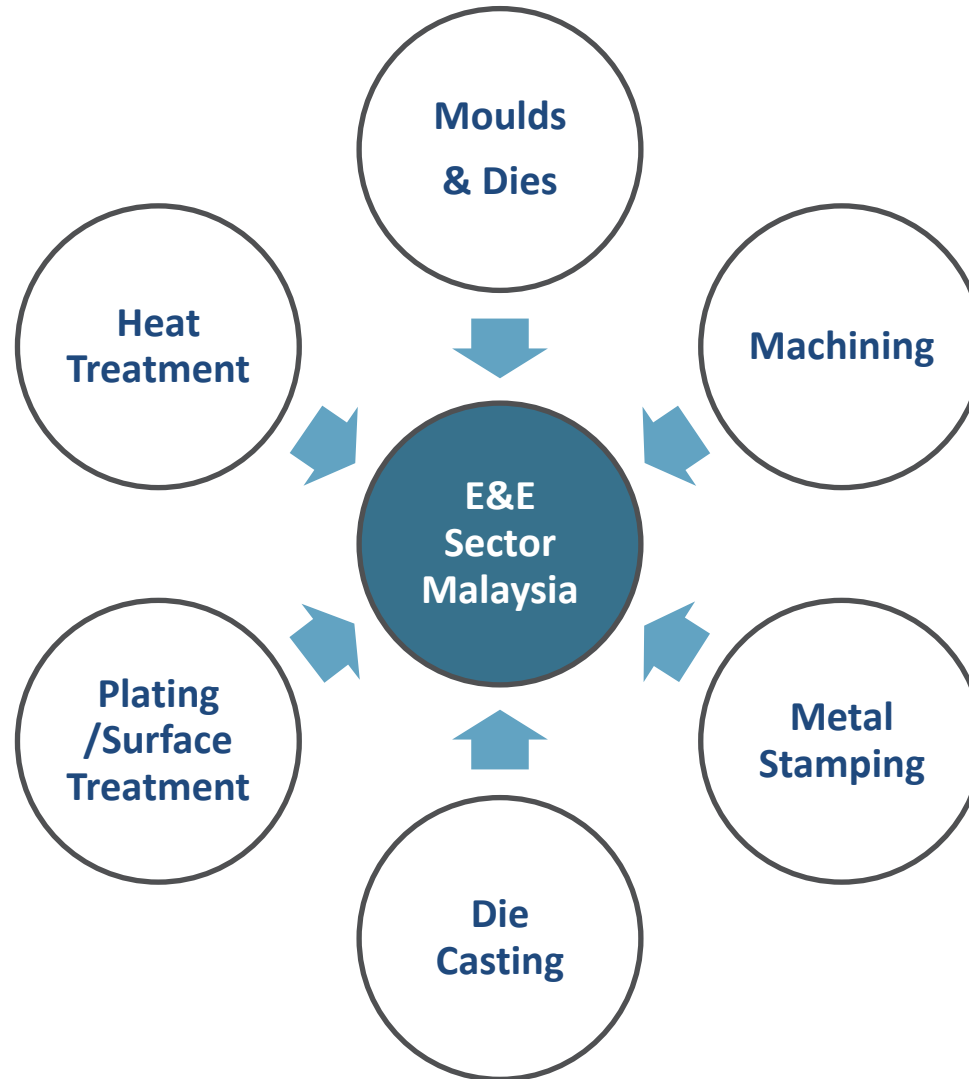


X

Note: Relevant EPP

Note: Downstream activities: Assembly, packaging, testing, sales, and service; Upstream activities: R&D, Manufacturing, etc.

Source: Pemandu, Federation of Malaysian Manufacturers, Ipsos Analysis

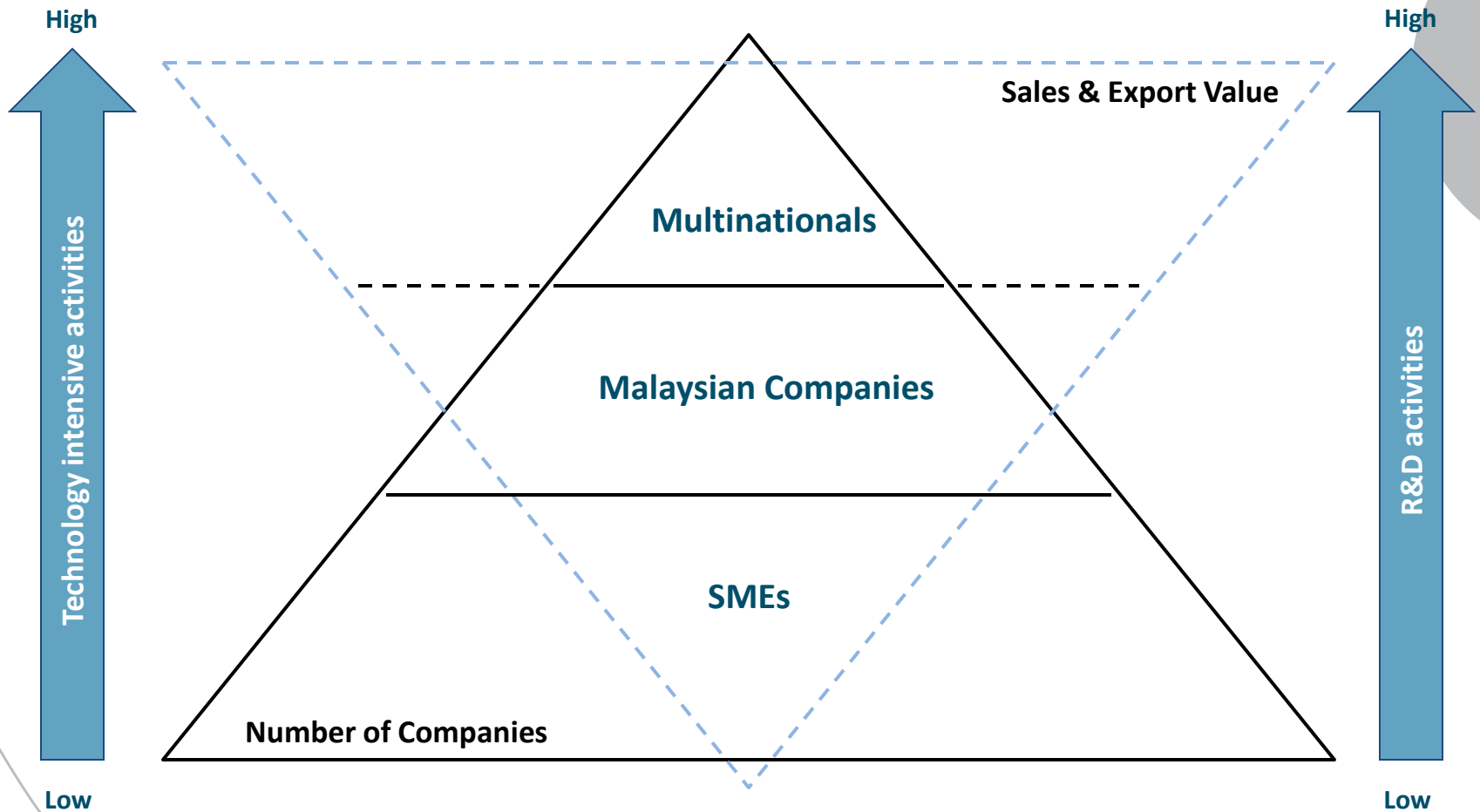


* Note: As these supporting industries are supporting various industries besides E&E, the scope of this study therefore does not include these supporting industries

Source: MIDA

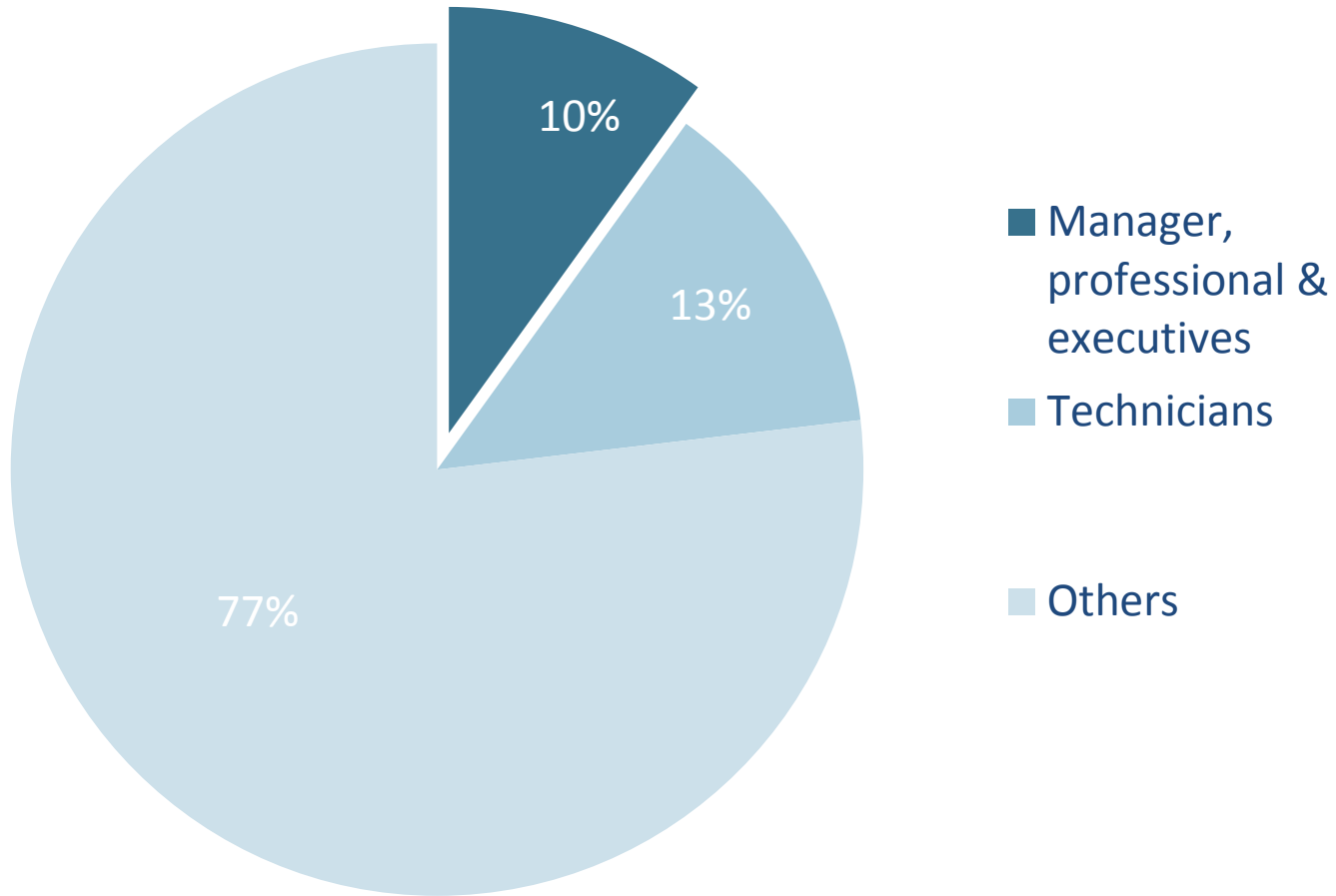
The sector is mainly led by multinational companies (MNCs) in terms of employment, export value and technology intensive activities

The Structure of Malaysian Electrical & Electronic Industry





Based on available data of 2009, the core technical talent pool make up less than 10% of the total employment in the sector



Source: DOSM

Baseline and New Investments Analysis for the E&E Sector 2007 - 2011



Baseline Analysis of E&E Sector 2007 - 2011

The sector employs ~350K people, with sales ex factory, total employment, and sub-sector annual sales per employee showing an overall declining trend

Overview of E&E Sector in 2011: Size, Employment, Average Annual Salary and Annual Sales per employee (these items are discussed separately in the following pages)

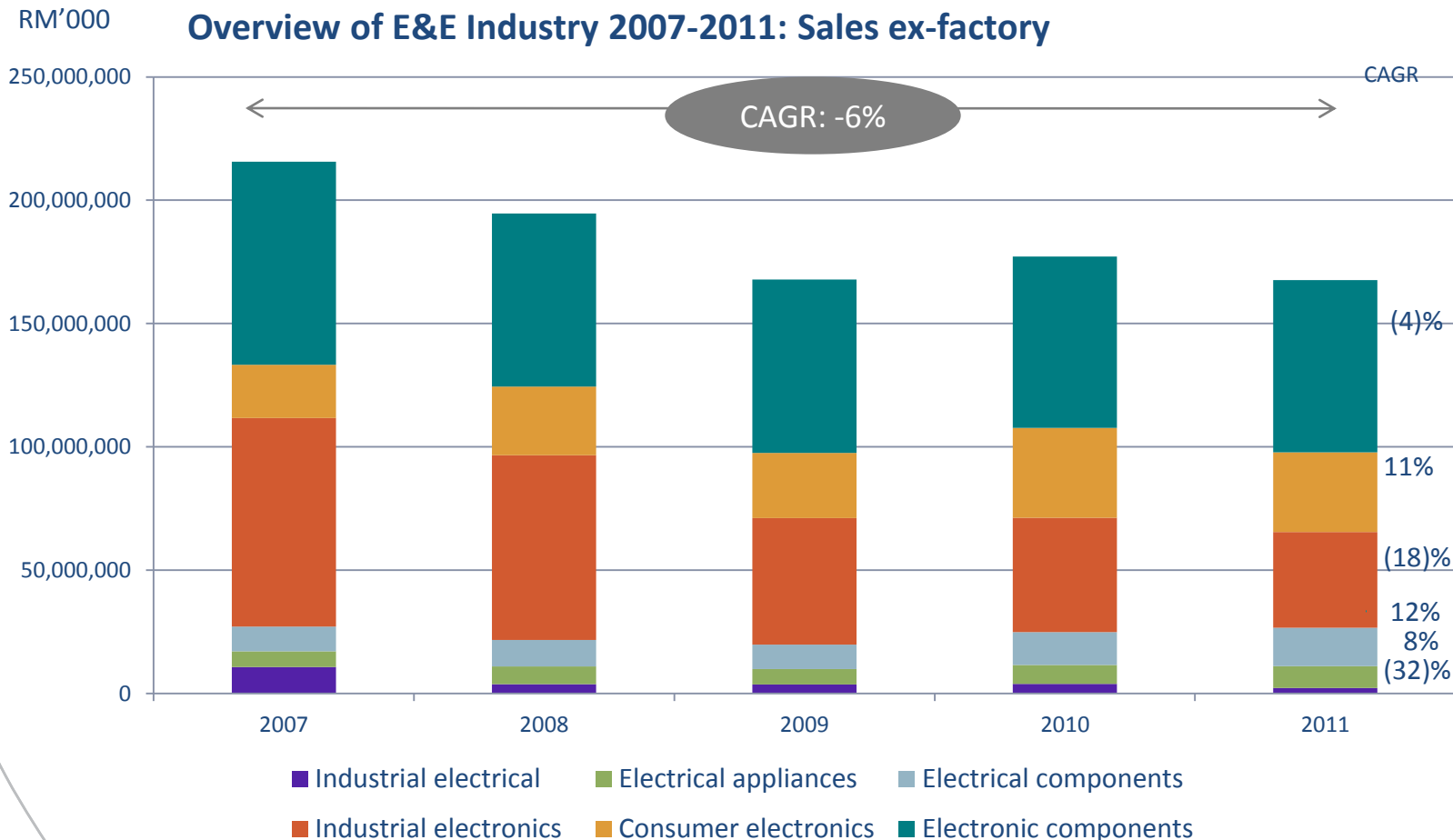
E&E Sub-Sector	Size		Employment		Average Annual Salary		Annual Sales per employee*	
	Sales ex-factory RM '000	CAGR 2007-2011 %	No	CAGR 2007-2011 %	RM	CAGR 2007-2011 %	RM	CAGR 2007-2011 %
Electronic Components	69,748,156	-4	149,170	-2	33,473	4	467,575	-2
Consumer Electronics	32,317,675	11	50,282	-2	24,608	-3	642,729	13
Industrial Electronics	38,853,117	-18	91,430	3	28,998	-2	424,949	-20
Electrical Components	15,529,262	12	24,784	8	26,355	6	626,584	4
Electrical Appliances	8,814,961	8	17,929	9	29,850	3	491,659	-1
Industrial Electrical	2,301,326	-32	15,283	-18	22,479	2	150,581	-17
Total E&E	167,564,497	-6	348,878	-1	29,849	2	480,295	-5

* Sales divided by employment

Note: Only larger establishments with above certain employment cut-offs were covered. The industries covered accounted for 90% of the manufacturing sector in 2005.

Electronic Components recorded the highest Sales (ex-factory) in 2011, however, at a declining growth rate of 4% between 2007 and 2011

- Industrial Electronics which is the sub-sector with the next highest sales ex-factory figures, recorded an even greater decline of growth at 18% in recent years .
- Whereas, Consumer Electronics and Electrical Components recoded a average growth of ~ 12 %



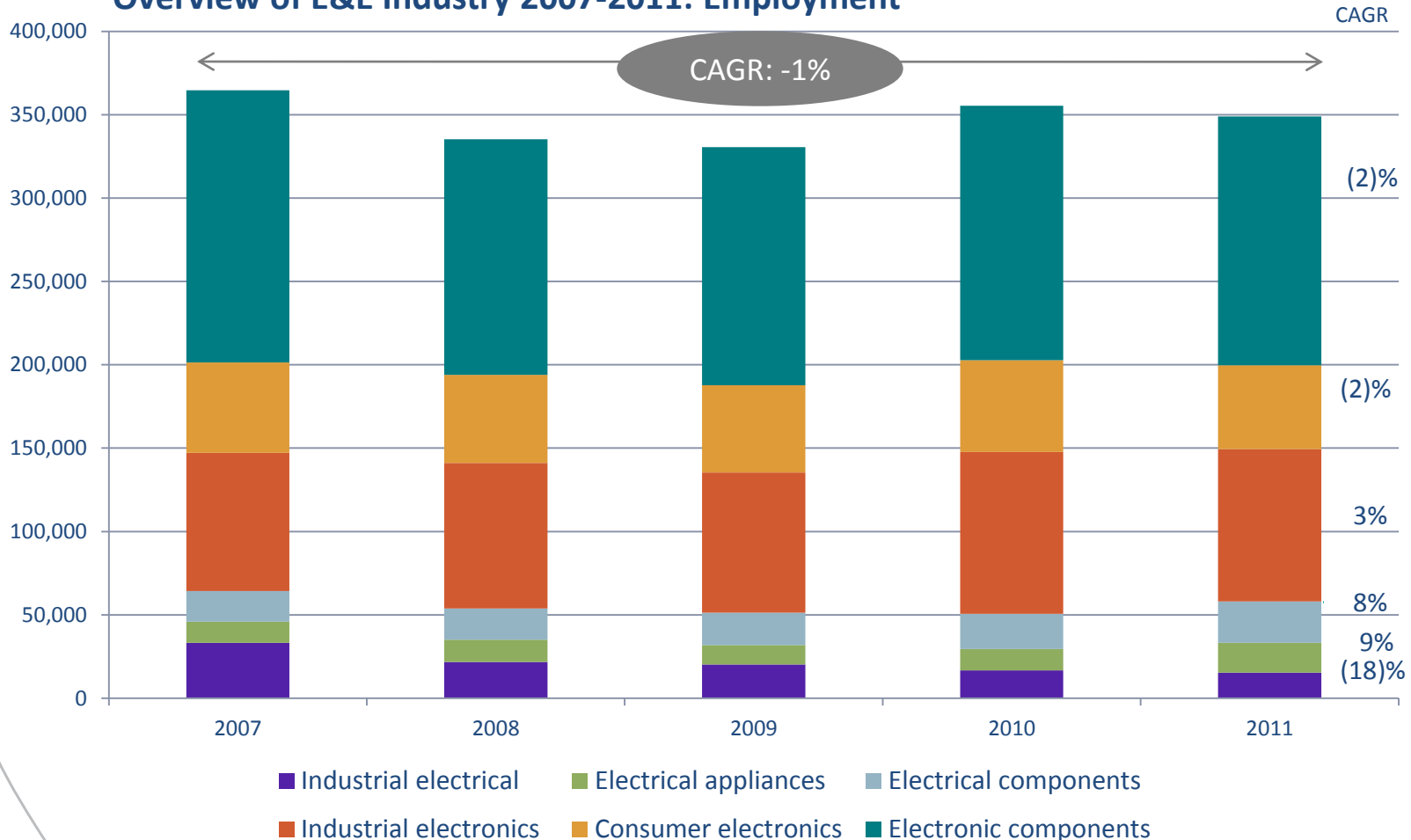
Source: Manufacturing Statistics, Department of Statistics Malaysia, Ipsos Analysis

Note: Only larger establishments with above certain employment cut-offs were covered. The Industries covered accounted for 90% of the manufacturing sector in 2005.

Overall employment within E&E has declined in recent years

- However, employment in Industrial Electronics, Electrical Components, and Electrical Appliances showed a positive growth

Overview of E&E Industry 2007-2011: Employment

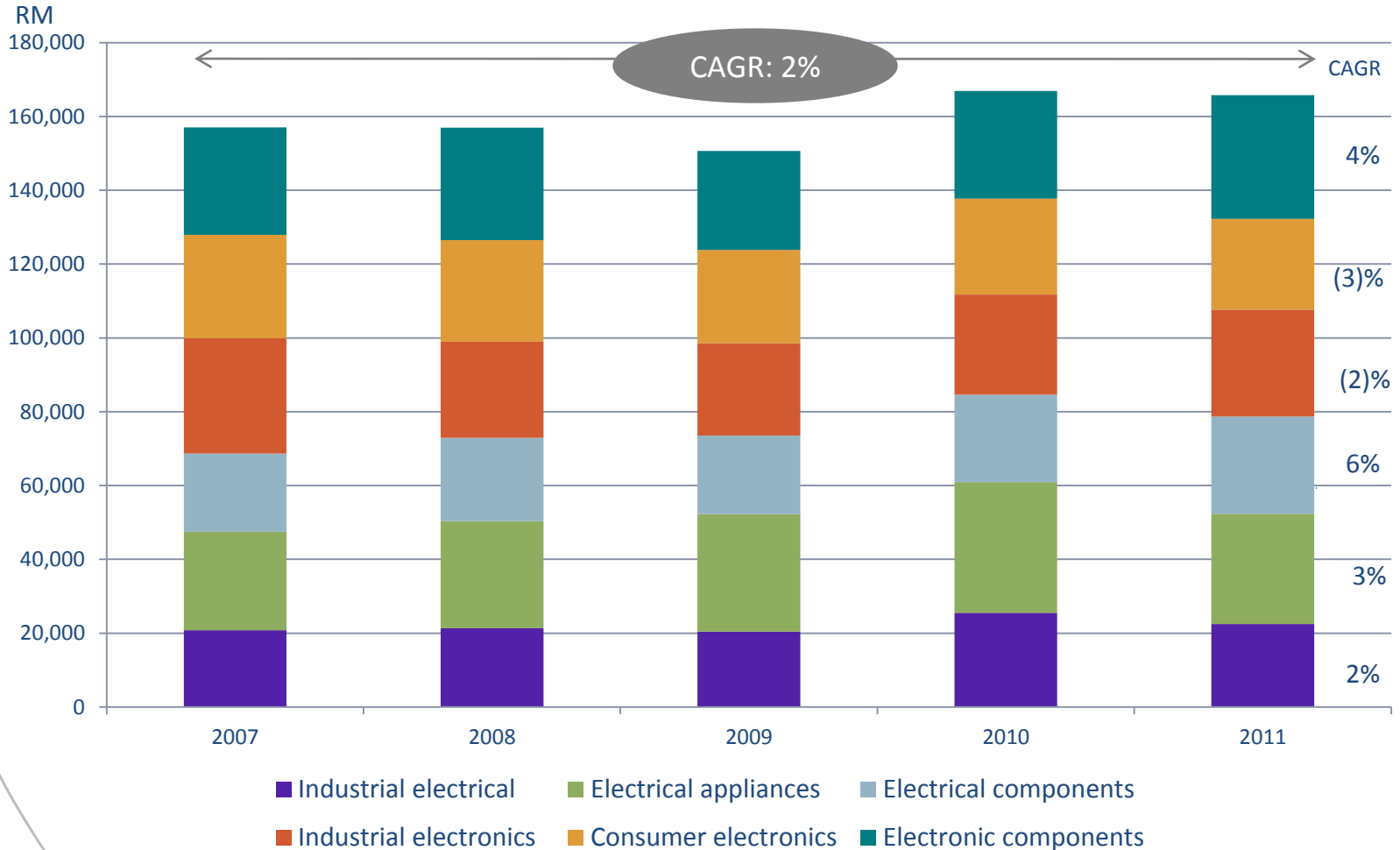


Source: Manufacturing Statistics, Department of Statistics Malaysia, Ipsos Analysis

Note: Only larger establishments with above certain employment cut-offs were covered. The industries covered accounted for 90% of the manufacturing sector in 2005.

The average annual salary growth per employee is ~ 2 %

Overview of E&E Industry 2007-2011: Average Annual Salary

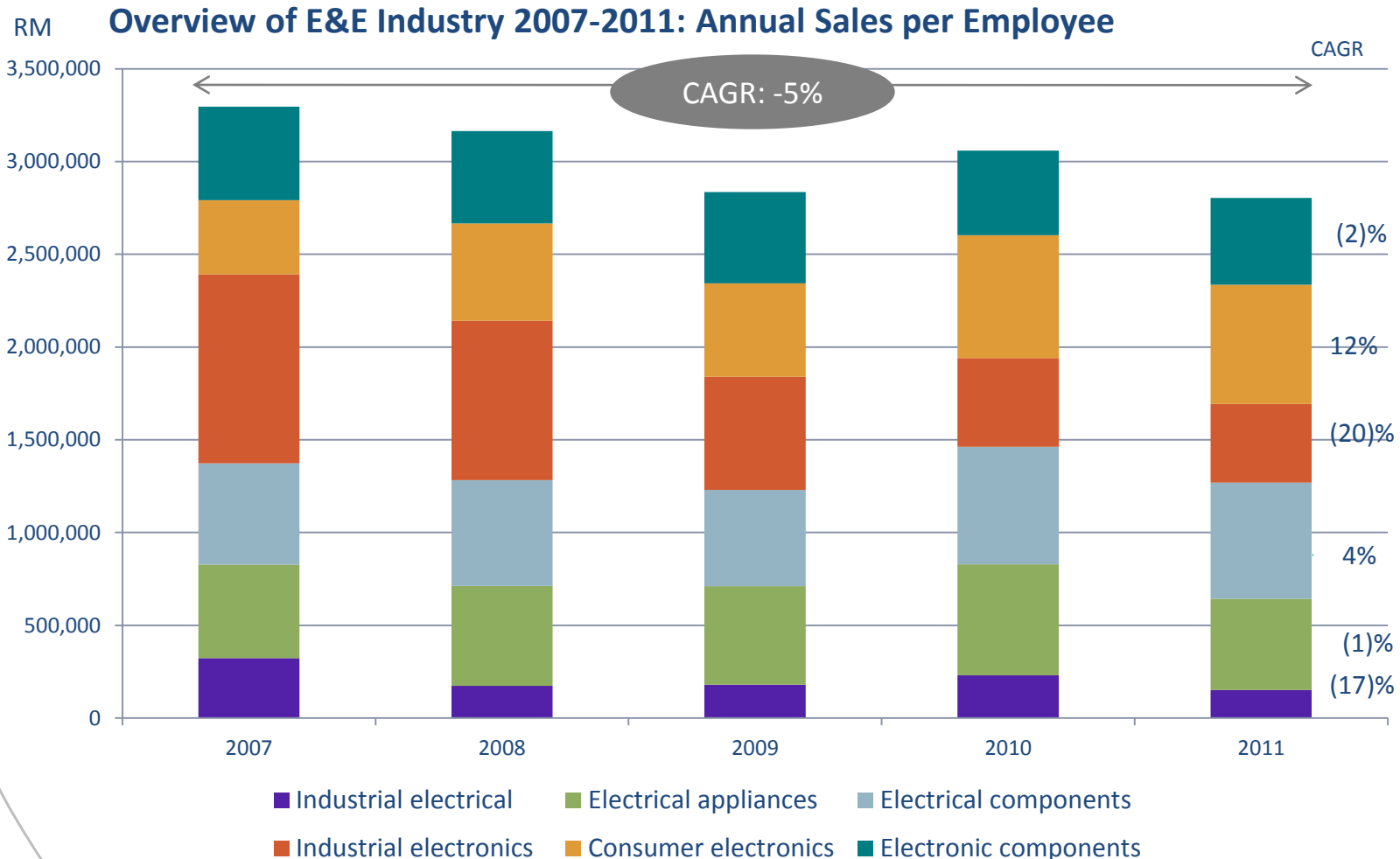


Source: Manufacturing Statistics, Department of Statistics Malaysia, Ipsos Analysis

Note: Only larger establishments with above certain employment cut-offs were covered. The Industries covered accounted for 90% of the manufacturing sector in 2005.

The average annual sales- per-employee has declined by ~5%

- The overall decline in sales per employee (as a gauge of personnel productivity) indicates that the industry is still slow in moving towards higher value-added activities



Source: Manufacturing Statistics, Department of Statistics Malaysia, Ipsos Analysis

Note: Only larger establishments with above certain employment cut-offs were covered. The industries covered accounted for 90% of the manufacturing sector in 2005.

New Investments in E&E sector 2008 - 2011

The average overall talent required by new investments is ~ 30K / annum

Potential Employment in E&E Industry based on Capital Investments (FDI and DDI) Approved by MIDA, 2008-2011*

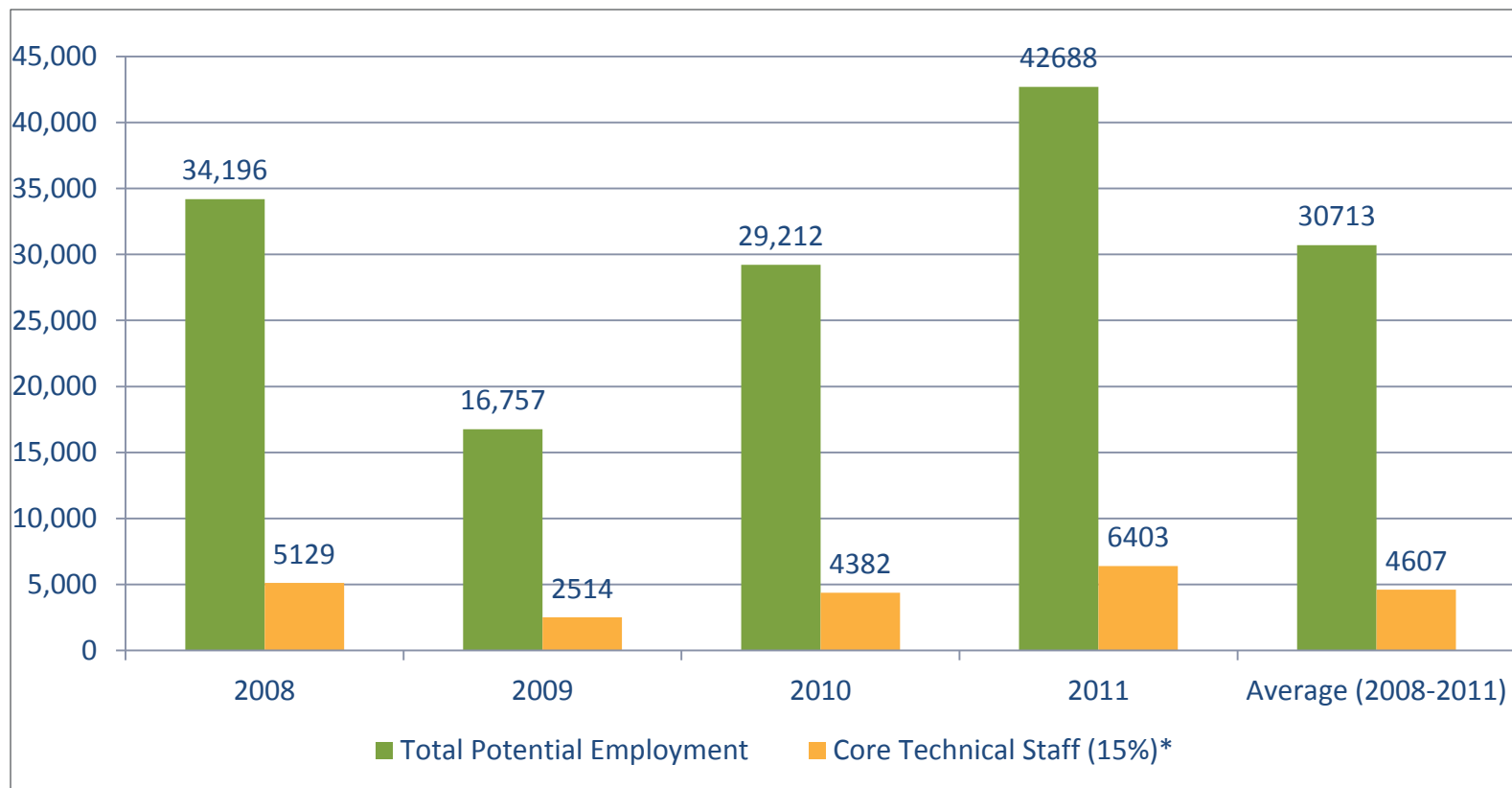
E&E Sub-Sector	2008	2009	2010	2011*	Total 2008-2011*	CAGR (%) 2008-2011*	Average 2008-2011*
Electronic Components	11,188	10,637	9,917	11,378	43,120	1	10,780
Consumer Electronics	629	223	1,116	2,767	4,735	64	1,184
Industrial Electronics	11,575	2,475	13,025	11,952	39,027	1	9,757
Electrical Components	8,597	1,511	3,745	7,464	21,317	-5	5,329
Electrical Appliances	18	799	137	1,506	2,460	337	615
Industrial Electrical	2,189	1,112	1,272	202	4,775	-55	1,194
Total E&E	34,196	16,757	29,212	35,269	115,434	1	28,859

Note: * Estimates based on January-October 2011 data

Source: MIDA 2011, Ipsos Analysis

However, it is estimated that the average core technical talent requirement is ~ 4600 / annum (based on 15%* of total employment)

Potential Employment Based On Approved FDI & DDI



Note:

* A ratio of 15% for core technical staff of the total potential employment is based on a benchmarking analysis on a selection on E&E companies

Source: MIDA

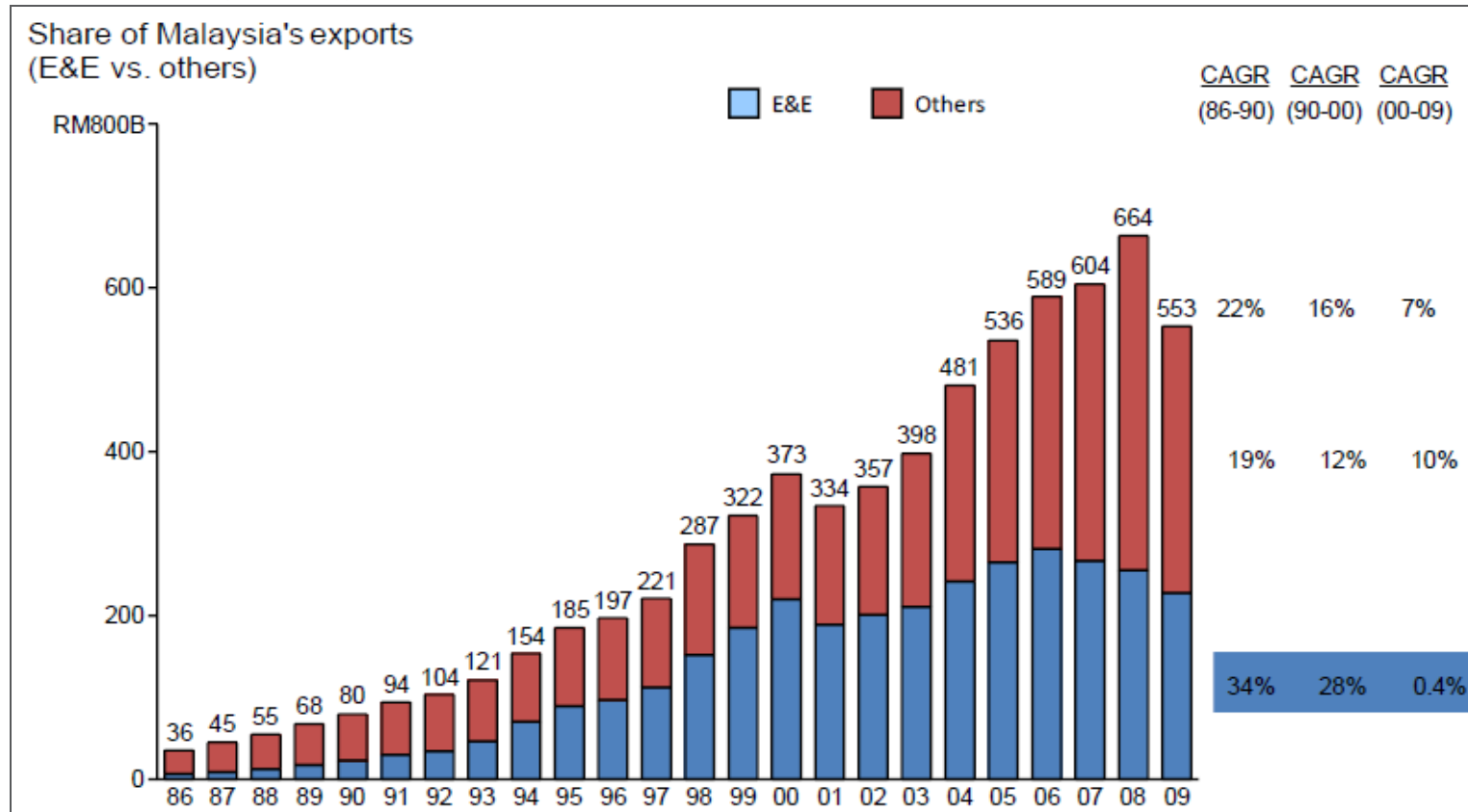


Issues and Challenges of the E&E Sector

Malaysia's E&E sector faces significant challenges in maintaining growth in the face of competition from other regional countries

- Over the last 10 years, E&E's share of Malaysian exports has declined

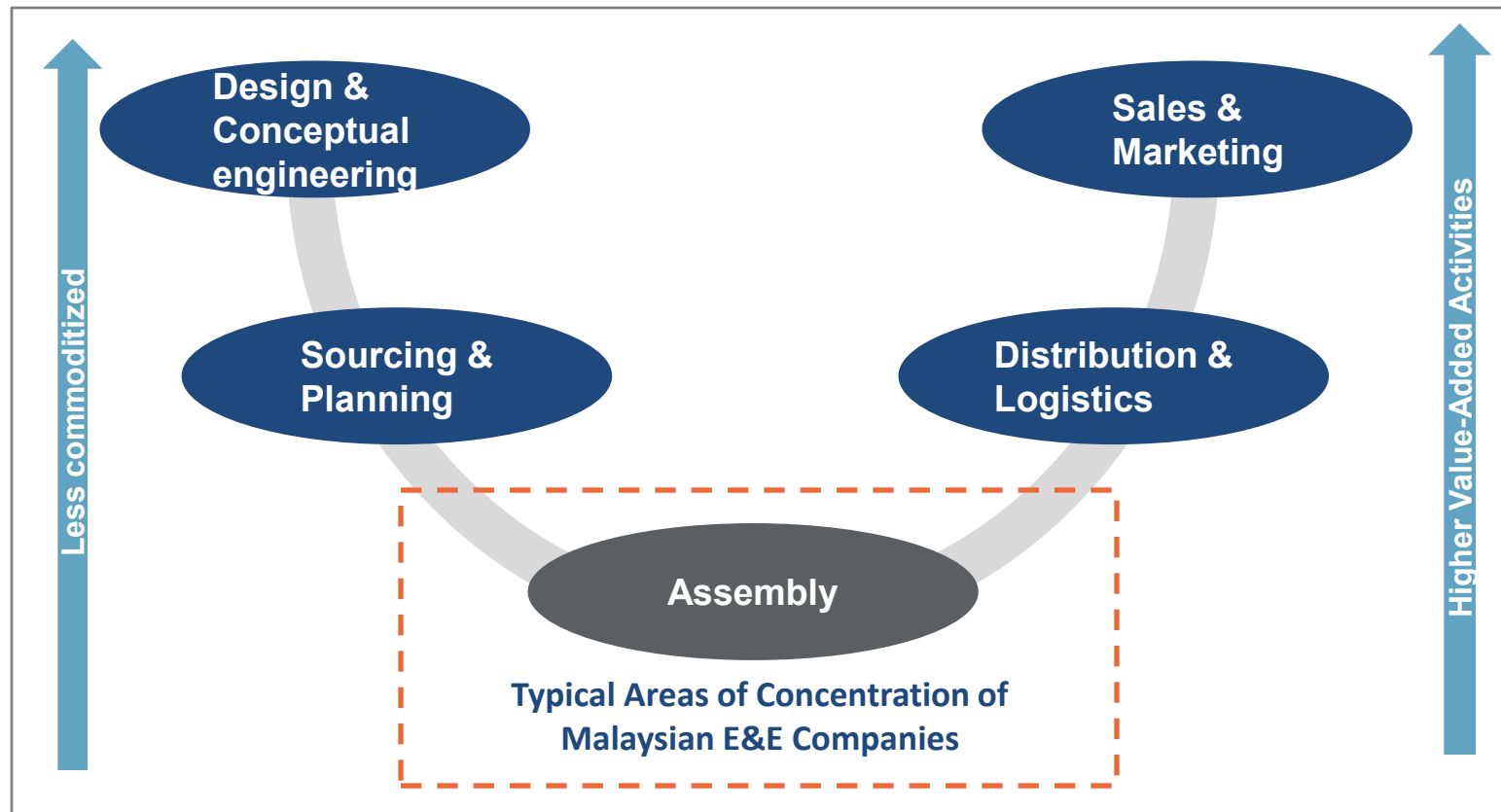
Share of Malaysia's Export (E&E vs. Others)



Source: Pemandu, DOSM, Ipsos Analysis, News articles

One of the primary reasons is that the E&E sector has mainly remained on the lower value-added part of the industry (i.e. assembly) ...

... while competing countries like Singapore have moved towards the higher value-added activities (e.g. R&D)



The industry is still, by and large, predominantly focused on low value-added activities ...

Subsector			% Establishments involved in R&D in 2009
Electronic Components	Consumer Electronic	Industrial Electronics	~7% (based on MSIC Code 26)
Electrical Components	Electrical Appliances	Industrial Electrical	~5% (based on MSIC Code 27)

... However, there have been some indications that some E&E companies are placing more emphasis on R&D activities

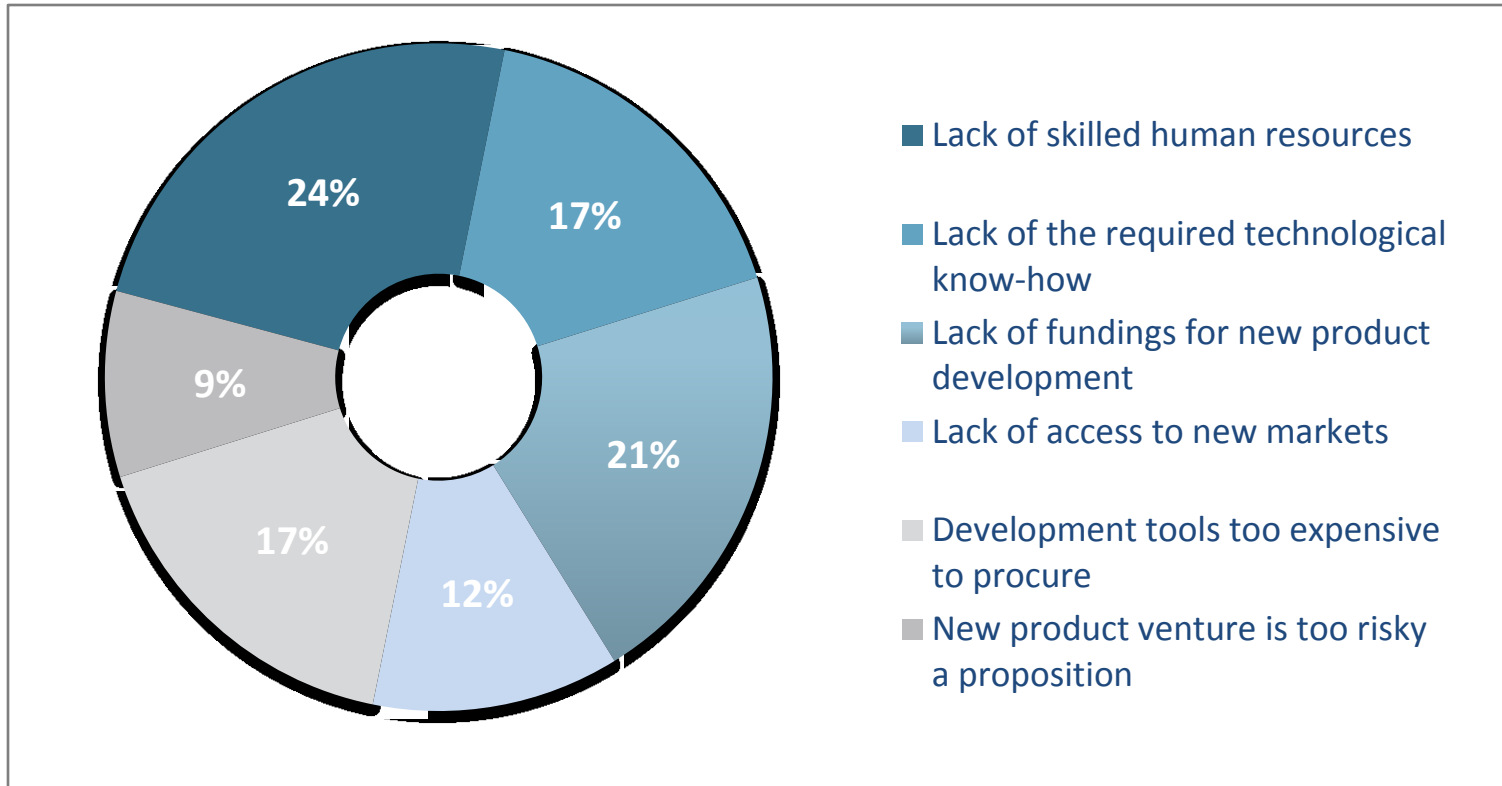
	2002	2007
Percentage of firms in Penang that employs staff exclusively for design / doing innovation / R&D	14%	19%

Source: World Bank 'Cities, People & the Economy: A study on Positioning Penang'

Note: MSIC codes refer to the Malaysia Standard Industrial Classification. Please refer to the Appendix for details of MSIC Code 26 and 27
 Source: Department of Statistics, 'Annual Survey of Manufacturing Industries conducted in 2010 for reference year 2009', Ipsos analysis

In moving towards higher value-added activities, one of the prerequisites is a ready supply pool of skilled talent

Key issues Inhibiting Progress in IC Design Products/IPs and Transfer of Design to Malaysia



Source: Penang Economic Monthly, May 2011, Ariffin, Norlela (2010) "Internationalisation of technological innovative capabilities: levels, types and speed (learning rates) in the electronics industry in Malaysia"

“Industry feedback indicates that the lack of the right E&E talent in Malaysia has impeded the growth of the sector”¹

- “In the past few years, the supply of skills has improved, but challenges remain.”²
- “The government has taken bold measures to expand education to address the constraints on skilled labor.”³
- “Although the quantity of high-school and college graduates has increased, it has been insufficient in addressing the skills constraints”⁴
- “Over 60 per cent of the 167 E&E firms surveyed in Penang and Johor reported in 2005 that university curricula in Malaysia lack interface with their firms’ activities, thereby forcing them to invest in longer training periods for new recruits” (Rasiah, Hamdan and Gopalan, 2009).”⁵

¹ Pemandu ETP : Roadmap for Malaysia

² Malaysia Productivity and Investment Climate Assessment Update, August 2009, World Bank, p. 107

³ Ibid., p. 109

⁴ Ibid., p. 107

⁵ Cities, people, & the economy: A study on positioning Penang, Homi Kharas, Albert Zeufack & Hamdan Majid, p.42



Global Trends and its Talent Implications for the E&E Sector

Global Trends and its Talent Implications for Malaysia's E&E Industry will require a talent pool which is highly skilled, competitive

1 Increasing Options for Global E&E players to outsource low value-added activities

⇒ Developing countries with moderate labor costs like Malaysia will lose out if they do not move to higher value-added activities as they can't compete with regional competitors (e.g. China, Vietnam etc.) solely based on cost factors including cost of labor

Talent Implications:

- To grow the E&E industry and specifically to attract foreign investment, Malaysia will need amongst other factors, a pool of industry ready skilled talent to compete against low cost manufacturing centers

... continuously up-skilled with new skill-sets ...

2 Market pressure for Shorter Product Lifecycles

⇒ Quick shifting of consumers preferences is making the need for shorter product cycles even more important

Talent Implications:

- The demand for shorter design and manufacturing cycles requires an increasingly trainable, adaptive talent pool, with a passion for life-long learning. Up-skilling among current talent pool must be a continuous effort

3 Market pressure for lower manufacturing cost

⇒ The emergence and strengthening of new global players from Asia has added to the market competition for lower manufacturing cost

Talent Implications:

- The demand in ensuring the lowest possible manufacturing cost is giving rise to a new set of skills from E&E talent pool. This set of skills will need to include an understanding of manufacturing process improvements and business improvements to increase efficiency, in terms of time and costs at the workplace

... multi-disciplinary with excellent soft skills...

4 Increasing product convergence

⇒ The rise of smart products - e.g. a refrigerator with an LCD screen, linked by WiFi to the internet, that can check the weather, browse the web for recipes and keep tab on the groceries - requires increasingly greater breadth of skills for scientists, engineers and designers that enter the industry.

Talent Implications:

- The design and manufacturing of new products will require a talent pool with a multi-disciplinary understanding of both mechanical and electronic systems, and an appreciation of both hardware and software technologies

5 Globalization of the Industry

⇒ Because of the improvements in communication (e.g. internet) and travel, companies are increasingly requiring talent from different markets to work as a team on a daily basis on product design, supply chain, manufacturing etc. to leverage on the different strengths of the team

Talent Implications:

- Talent with effective communication skills including a good command of English is an important criteria for companies in the hiring process.

6 Renewed Focus in the Manufacturing Sector in the Developed Economies

- ⇒ Developed economies (e.g. USA) are beginning to roll-out programs to encourage the return of manufacturing jobs, i.e. to discourage outsourcing and to encourage in-sourcing especially in the areas of high value added jobs.
- ⇒ This may lead to a lower trend in the outsourcing of higher value added jobs to MNC's overseas subsidiaries where the domestic market is small (e.g. Malaysia) ¹

Talent Implications:

- To ensure Malaysia remains high on the list for high value-added outsourcing jobs, Malaysia's E&E talent will need to be comparatively higher skilled than competing countries.
- In addition, local E&E talent will need to be innovative and creative in designing and developing their own products to grow the Malaysian based E&E companies.

¹ In countries where the domestic market is big like China, there will still be activities to localize their design and to improve on their facilities and services to better serve the market



These global trends will require an above average E&E talent pool to grow the industry in meeting the new competitive landscape

- In the past , talent with average skills may be sufficient, but with the new landscape, employers are demanding successful talent bring more to the table
- Changing markets and new technologies are creating a demand for talent that can adapt quickly—and repeatedly—to new processes or environments
- Malaysia’s E&E talent must be ready to meet the challenge of the industry that needs to move from “Made in Malaysia” to “**Imagined , Designed ,and Made in Malaysia**”.



Talent Issues within the Electrical and Electronics Sector

Key Talent Issues Facing the E&E Sector

Key talent issues facing the E&E sector in Malaysia are in many ways similar to talent issues faced by other industries in Malaysia, as well as regional and global E&E industries, however with varying degrees of severity

1

Talent supply from Institutions of Higher Learning are not industry-ready

- ⇒ The current university education does not provide workplace ready and able talent. Six months to one year of additional on-the-job experience is typically required until graduates are considered viable.
- ⇒ This implies higher training costs and a considerably a longer training period before an fresh graduate is productive.

2 Skills gaps in existing Talent pool

- ⇒ As the E&E industry and its manufacturers are transitioning from low value-added activities to more complex high value-added activities, they need advanced skills that their current talent often lack.
- ⇒ The existing talent is often said to lack the required qualifications, experience and/or specialized skills to meet the industry's skills needs.
- ⇒ In particular, companies have cited instances of lack of experienced R&D talent in terms of breadth and depth of experience¹.

¹ Breadth indicates knowledge of all the aspects of design flow whereas depth refers to the extensive knowledge of a particular aspect of the design flow

3 Lack of employability skills¹ among entry level talent

- ⇒ It is reported that one of the most critical talent issues is the emphasis on the need for employability skills (i.e. soft skills and personal attributes) among new graduates
- ⇒ In some cases, while technical skills may be considered adequate, there are significant soft skills inadequacy such as communication, problem solving skills and personal attributes (e.g. attitude, initiative etc.) that are found lacking.

¹ Employability skills are defined as 'skills required not only to gain employment, but also to progress within an enterprise so as to achieve one's potential and contribute successfully to enterprise strategic directions'.

4 Attraction of new talent

- ⇒ Some companies especially the local mid and smaller sized companies have indicated a generally higher degree of difficulty in attracting good talent
- ⇒ Opportunities from larger MNCs and other competing industries make it difficult to attract these talent to smaller and lower profile companies .
- ⇒ This difficulty in attraction of good talent is aggravated by salary differences between the E&E industry vs other competing industries e.g. Oil & Gas
- ⇒ “Although employers complain of shortages and of staff turnover, it is not apparent that the salaries of the most highly-skilled workers, and particularly of researchers, have risen sufficiently to be attractive to them.”¹

¹Cities, people, & the economy: A study on positioning Penang, Homi Kharas, Albert Zeufack & Hamdan Majid, p.43

5 Difficulties in retaining good talent (attrition)

- ⇒ There is a high degree of competition for skilled E&E talent from other competing industries as well as from markets like Singapore and China at a higher salary, in all likelihood.
- ⇒ In addition, in some instances talent that have been trained by hiring companies often leave for better opportunities within the local or foreign E&E sector, or to other competing industries.

6 Potential shrinking talent supply pool in the future

- ⇒ There have been reports¹ that there is a declining interest among students to study engineering, although this trend is not yet apparent in the current talent supply data
- ⇒ This declining interest will be further exacerbated by a lower take up rate of science stream at high school levels. Currently, only 29% of all students are in the science stream, from a target of 60%
- ⇒ “The university’s ability to attract more students into its science and technology (S&T) graduate programs and to raise quality will be strongly influenced by the demand for high level skills reflected in better entry-level salaries and career prospects for graduates and PhD holders”²

¹ The Star Newspaper ‘Lack of Interest in Engineering’, 9 February - researchers from UTM are conducting a study to investigate the lack of interest among students to study engineering

² Cities, people, & the economy: A study on positioning Penang, Homi Kharas, Albert Zeufack & Hamdan Majid, p.43

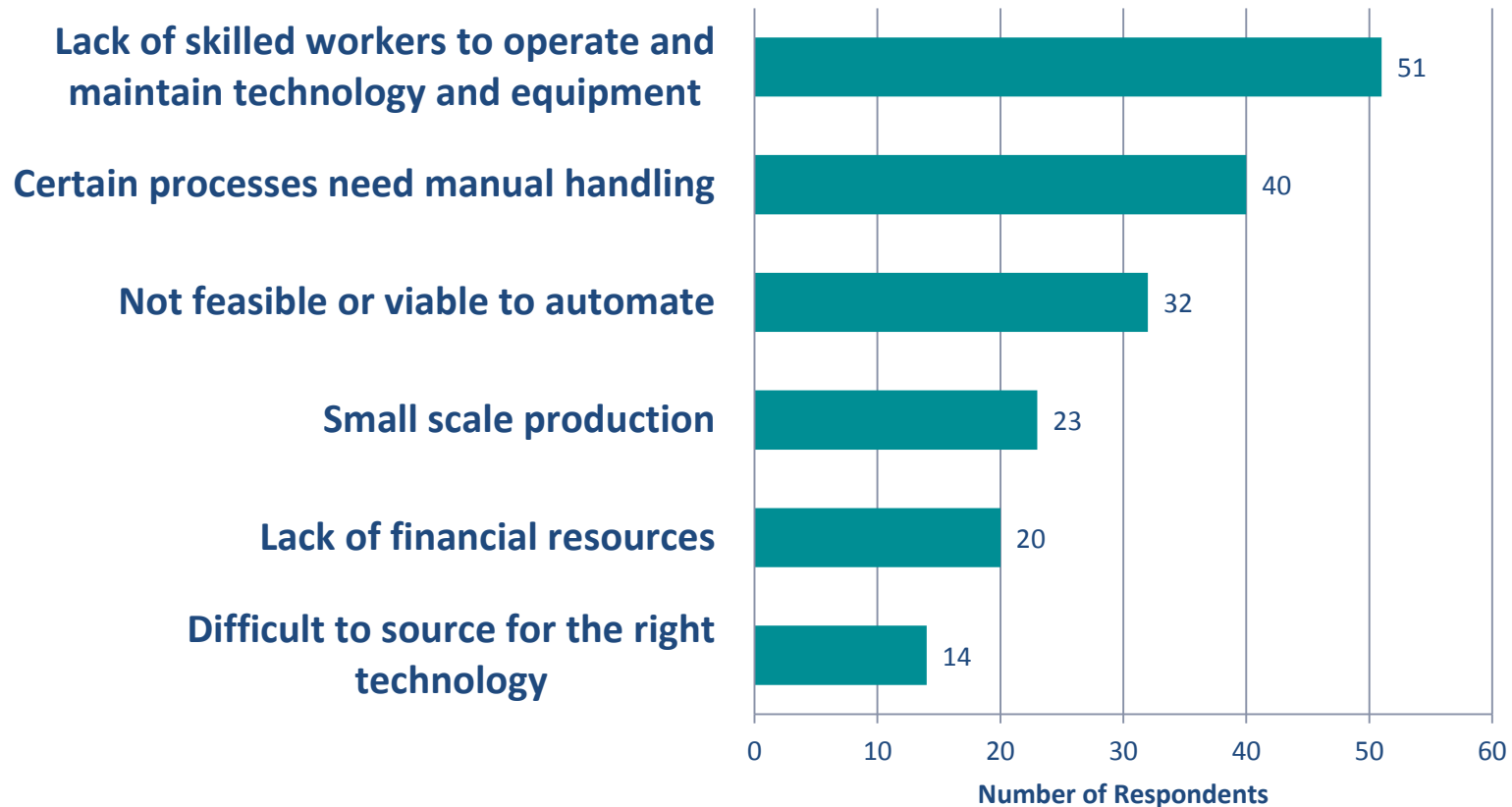
The key talent issues facing the E&E sector includes drivers that requires the involvement of all stakeholders

	Key Talent Issues	Drivers
1	Talent supply from Institutions of Higher Learning are not industry-ready	1a. Curriculum does not fully meet the sector needs 1b. Students lack strong industrial exposure
2	Lack of employability skills among entry level talent	2a. Curriculum / students do not fully embrace the importance of soft skills
3	Skills gaps in existing Talent pool	3a. Skills sets of talent pool do not move in tandem with the ever-changing sector needs
4	Difficulty in attracting good talent	4a. Better available options (e.g. salary) in competing sectors and/or markets
5	Difficulty in retaining good talent (attrition)	5a. Better available options (e.g. salary) in competing sectors and/or markets
6	Potential shrinking talent supply pool	6a. Lack of interest in taking up engineering courses due to lack of awareness of career options



It is hoped that with the introduction of “Engineering Technologist” the manufacturing industry at large will have the required talent pool that can address the issues of mechanization and automation

Constraints in moving towards mechanisation and automation



Source: FMM Salary, Benefits and Employment Conditions Survey in the Manufacturing Sector 2010 / 2011

Note: The FMM Survey was based on inputs provided by 194 companies in the manufacturing sector which included those from the E&E industry

Analyzing Talent Shortages within the Core Technical Functions of the E&E Value Chain

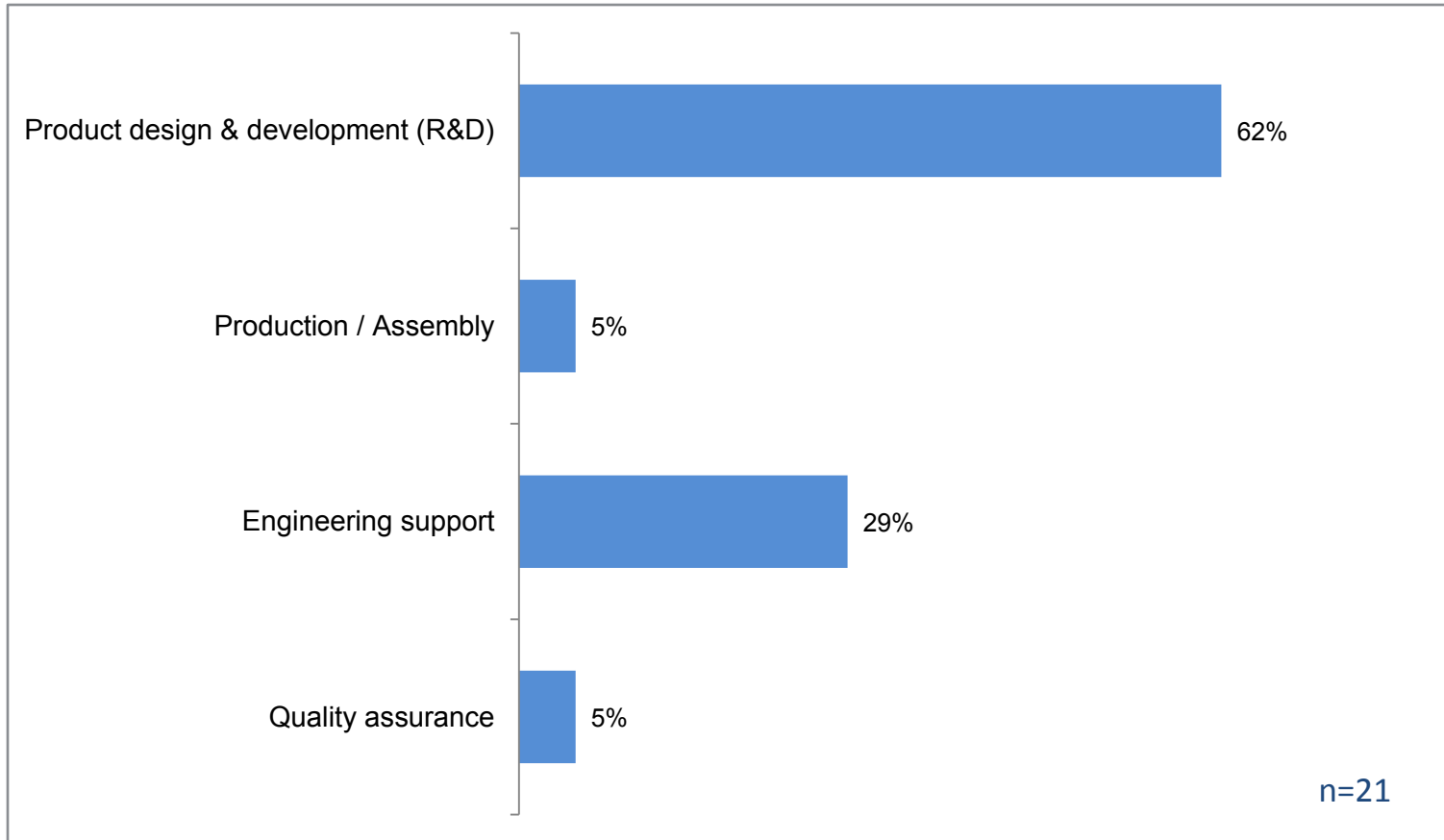
The major technical functions within an E&E sector can be generally divided into four core functions

Figure: Typical Core Functions Within An E&E Sector

Core Functions	Research & Development	Engineering Support	Production	Quality Assurance
Type of Work	<ul style="list-style-type: none"> • Applied research • Product development 	<ul style="list-style-type: none"> • Process engineering • New product introduction • Tooling and machining • Process improvement 	<ul style="list-style-type: none"> • Assembly • Maintenance 	<ul style="list-style-type: none"> • Test engineering • Failure analysis • Incoming / Outgoing • Process inspection

While talent shortages exist in some degree in all of the core functions, industry players indicate the greatest challenge lies within the R&D function

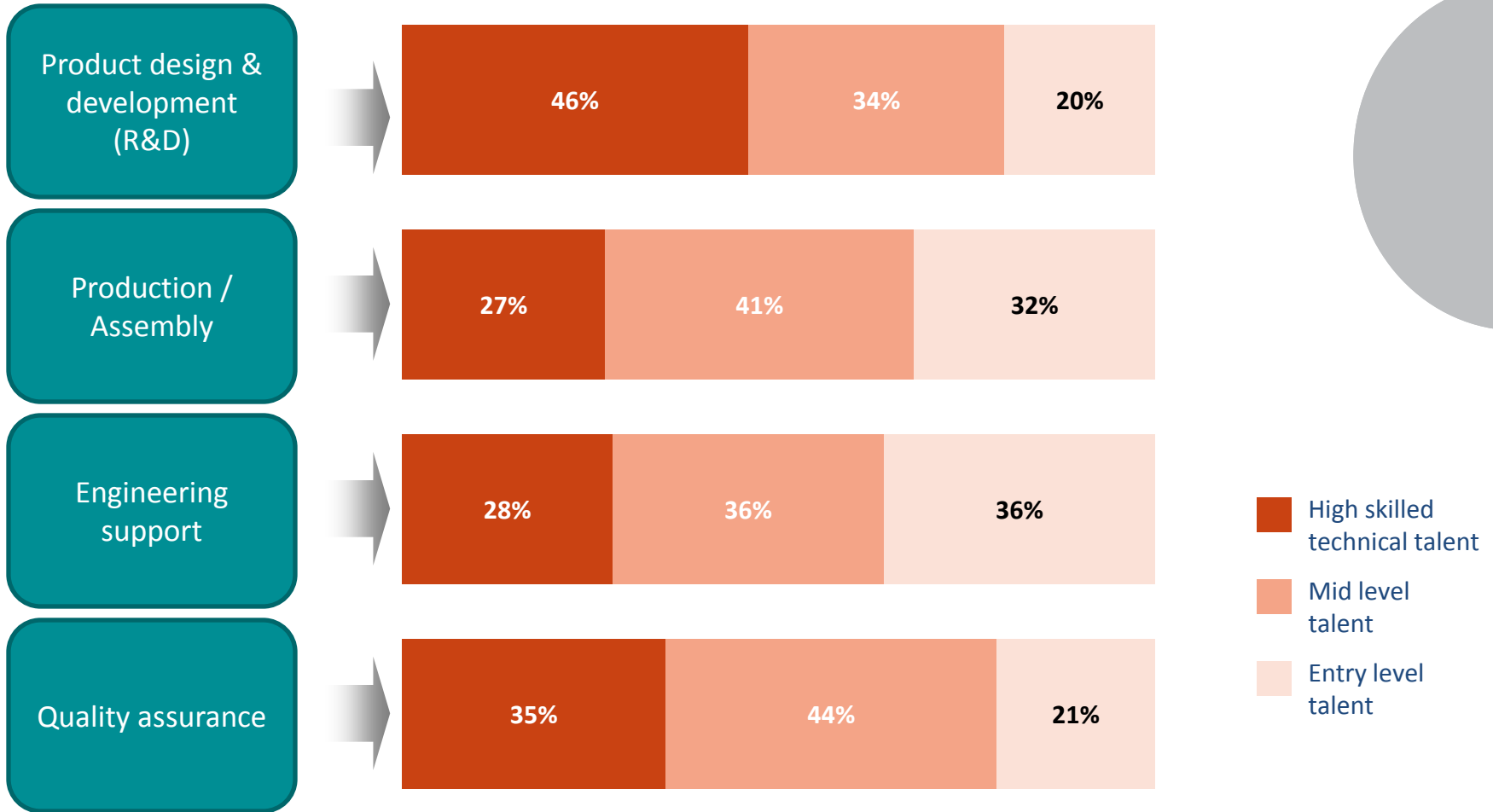
Figure: Departments / functions with skilled core technical staff talent shortage



Source: Ipsos Survey Analysis

The R&D functions also require the highest percentage of highly skilled technical talent ...

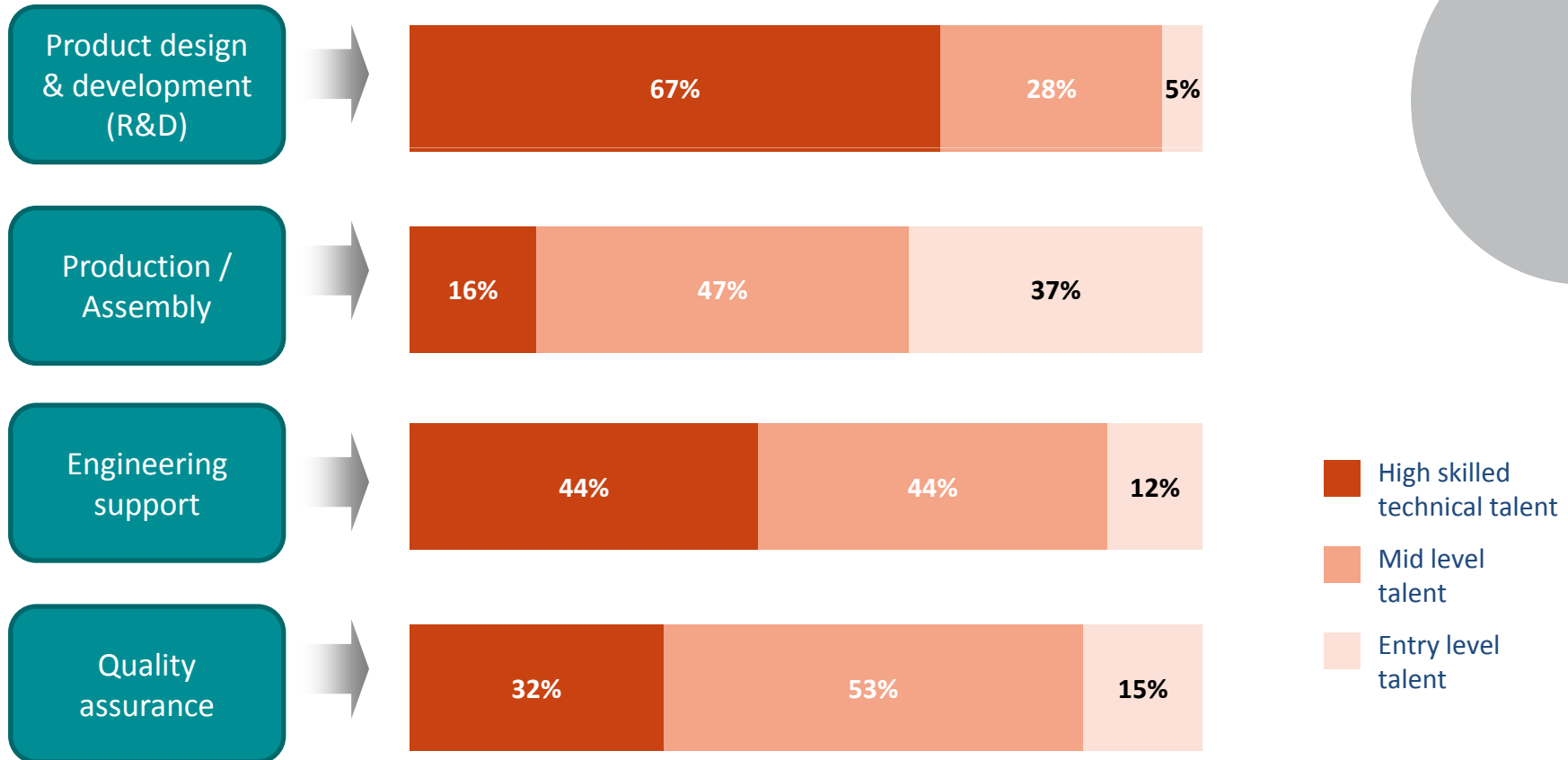
Skilled Core Technical Staff headcount breakdown in 2012



Question: For Skilled Core Technical Staff (i.e. degree-holders and above), what is your current and projected headcount for the different departments / functions and by experience levels?

... and as such the hiring priorities for R&D will be for high skilled talent, while mid level talent will be the priority for the rest of the core functions

Hiring priorities in 2012



Question: Hiring priorities in 2012: In 2012, where would your hiring priorities be for each department/function?

Source: Ipsos survey

There are two main reasons why the issues and requirements of the R&D function is different from the other core technical functions

1

The talent profile required for an R&D talent is typically different than those within the other core functions; and

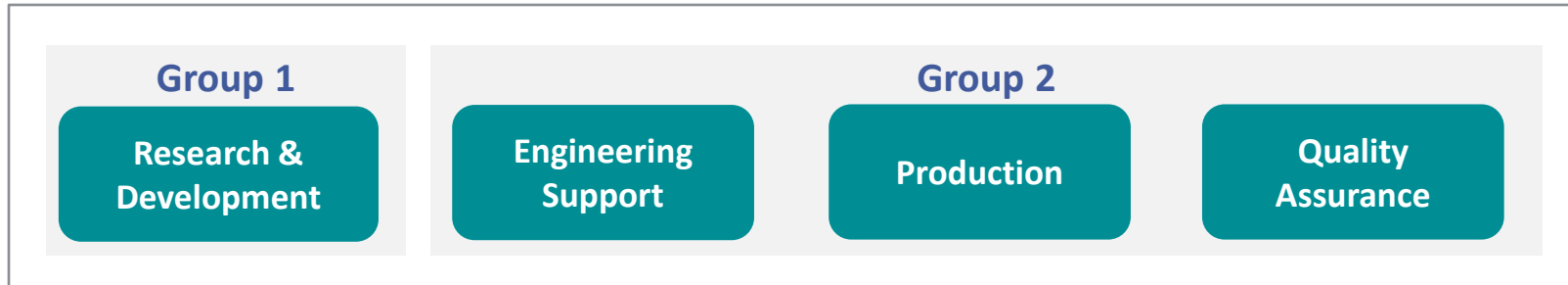
2

The current E&E ecosystem in Malaysia is still not actively involved in product R&D activities (i.e. component or system level) which does not provide a ready pool of experienced talent.

1. Talent Profile Required of an R&D Engineer

The talent profile for the R&D talent is typically different from the other core functions

- In terms of talent requirements, issues, and challenges the four core functions can be segmented into two groups:-



- The talent profile, issues and challenges for the core functions within Group 2 are typically similar in nature and very much different from Group 1 (i.e. R&D). See next pages for Talent profile of Group 1 and 2

Comparison of Talent Profile between the core functions

Group	One	Two		
Core Function	Research & Development	Engineering Support	Production	Quality Assurance
Industry Maturity	Growing	More Established		
Preferred Academic Requirements By Industry	Post Graduates and Graduates with excellent academic results	Graduates with good academic results		
On the job training Period for new hires	~12 Months	~ 6 Months		
Intra Company Mobility	Lower	Higher		
Inter Company Mobility	Lower	Higher		
Level of Importance for Technical Skills	Higher	Lower		
Level Importance for Soft Skills	Lower	Higher		



Intercompany mobility for R&D talent is a lower compared to Engineering Support, Production , and QA

- Due to the talent profile for the Engineering Support , Production , and QA being somewhat similar, the ease of mobility (inter-company and intra-company) within these core functions is higher vs in R&D
- This is because the skills-sets for Engineering Support , Production , and QA are less specific to a product but more towards to the manufacturing process and technology whereas for R&D its more specific for the product being developed
- However the intercompany mobility of the talent for both of the groups is also dependent on the depth of the ecosystem of that particular sub-sector

Training period for new hires and skill requirements for R&D is typically longer than for the other core technical functions

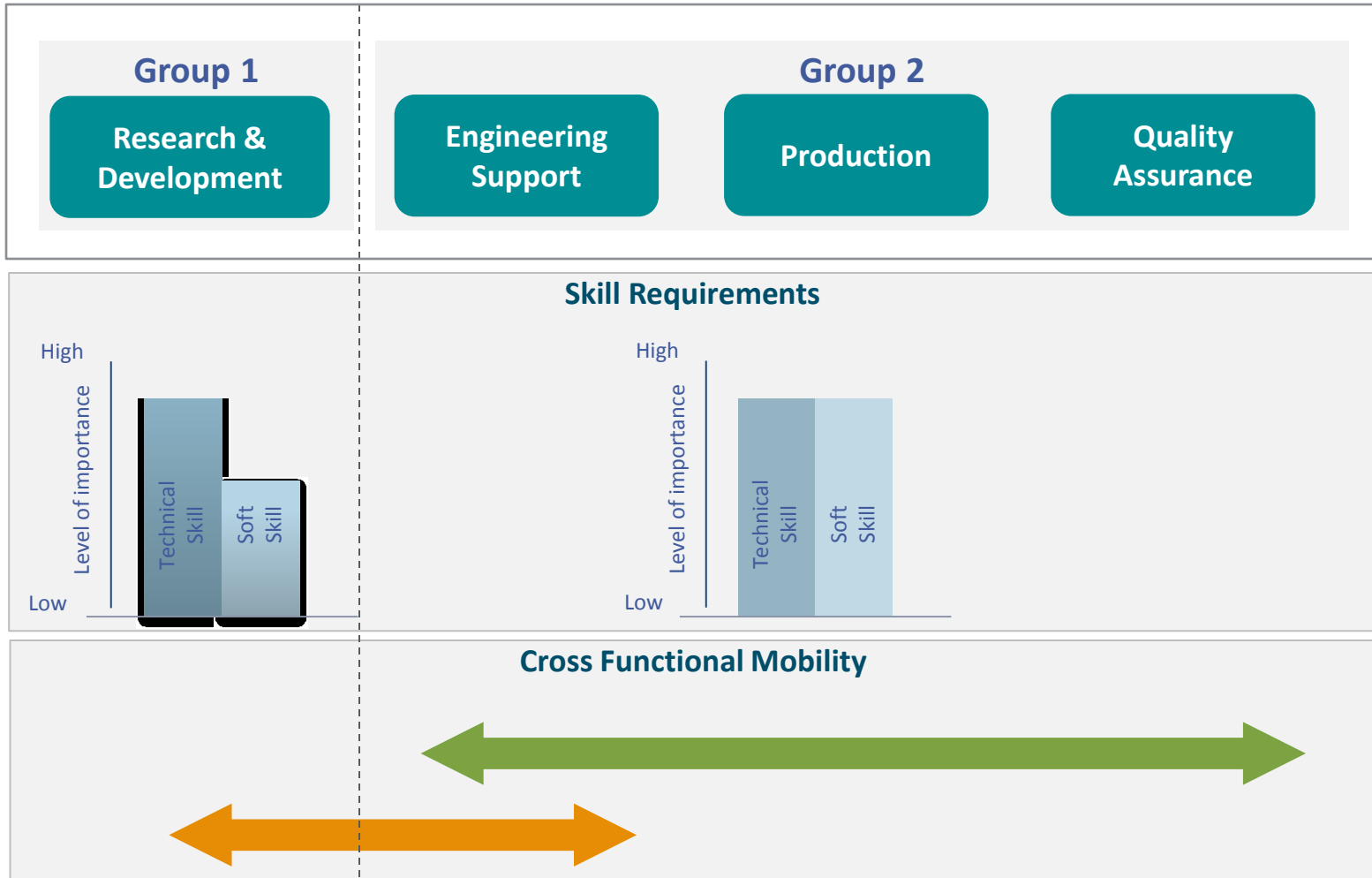
Training duration

- The duration of training for R&D talent and for Engineering Support, Production, and QA differ due to the different skill sets and level of specialization required for the core functions
- The average training period for a new hire in Engineering Support, Production, and QA is ~6 months which stands in contrast to the average training period of ~12 months for R&D
- Similarly, the academic requirements for fresh graduates entering R&D is typically higher compared to Engineering Support, Production, and QA
- Post Graduates and Graduates with excellent academic results are preferred in R&D while, for Engineering Support, Production, and QA the talent requirements are mainly graduate level engineers with good academic results
- This pattern in the difference of requirements can be attributed to the type of work and level of specialisation involved in both R&D and Engineering Support, Production, and QA . R&D function requires higher levels of specialisation compared to Engineering Support, Production, and QA

Technical Skills vs. Soft Skills levels for R&D and Engineering Support, Production, and QA are different


- Due to the nature of work, the technical skills and soft skills requirements for R&D and Engineering Support, Production, and QA are different.
- Engineering Support, Production, and QA engineers are mainly tasked to support the daily operational activities on a production floor and are required to interact with colleagues from various levels, e.g. Managers to factory staff.
- As such, for Engineering Support, Production, and QA , the requirements for soft skills are as important as technical skills
- In contrast, for R&D where the interaction between various departments are not as frequent compared to Engineering Support, Production, and QA , the requirements on the soft skills are less important

Comparison of cross functional talent mobility between R&D functions and the other core technical functions indicate its more difficult to substitute R&D talent from the other core technical function



Source: Ipsos Analysis, Primary Interviews, Secondary Research

■ Relatively Easier Mobility
 ■ Relatively Difficult Mobility



2. Current R&D Ecosystem in E&E

The current E&E ecosystem is not concentrated in product R&D activities which leads to a smaller pool of experienced talent

- Assembly and manufacturing activities (i.e. major activities in Engineering Support, Production, and QA) can be considered to be the more mature part of the E&E industry while high-level product R&D activities is still relatively new to the Malaysian E&E industry. As such the availability of local talent to carry out the function of Engineering Support, Production, and QA is widely available compared to R&D.
- Most R&D activities within the E&E industry are centred around process development i.e. the creation of new or improved manufacturing processes.
- The companies and correspondingly the talent pool involved in applied research and product development are still in the minority.

Most of the current talent pool is focused on process development / improvement rather than product development or applied research

Level of experience of R&D activities in Malaysia within the E&E sector

Undertaken by Institutes of Higher Learning (IHL)	Basic Research	Original experimental work without a specific commercial aim, frequently done by university based research institutes	Conducted by universities in Malaysia
	Applied Research	Original experimental work with a specific aim	Still at infancy stage in Malaysia
Undertaken by the Industry i.e. E&E manufacturers	Product Development	The improvement and extension of existing products	Few E&E manufacturers are involved
	Process Development / Improvement	The creation of new or improved manufacturing processes	Many E&E manufacturing companies are involved in this type of R&D

Lower

Higher



Overview of Current Training and Up-skilling Programs

Relevant training agencies are in regular discussion with the industry players to provide various up-skilling programs

- Training and up-skilling programs are generally provided by companies to their talent pool either through internal or external training, and by sending their personnel for overseas assignments to acquire special skills unavailable locally
- In addition, various stakeholders (e.g. PSDC, SHRDC, MDeC, etc.) at the state or federal levels have been proactive in offering a multitude of up-skilling and training programs aimed at entry and experienced level talent
- However, it still takes considerable time and practical experience by the trainees to be fully competent in acquiring the breadth and depth of the skills required
- The new trainees may have the theoretical knowledge but lack the necessary practical experience. Therefore, the skills gap issue cannot be fully addressed within a short period of time, and will require a long term and multi level strategy

Examples of some up-skilling and training incentives are shown below

Examples of some up-skilling/training initiatives

Undergraduate Level

High End Industries Graduate Internship Training (HEIGIP)

Structured Internship Program (SIP)

Graduate Level

FasTrack (Lite)

High Income Talent Research Scientist Engineer (HIT-RSE)

National Talent Enhancement Program (NTEP)

Technology Specialist in Specific Domain Expertise (TeSSDE)

Northern Corridor Industrial Technical Enhancement Scheme (NCITES)

Experience Hire Level

PSDC

SHRDC

Various
(eg. Usains, ICMic, MDeC etc.)

Note: The impact and the effectiveness of training programs are yet to be ascertained as many of the training/up-skilling programs were introduced recently or still very much work-in-progress

An effective up-skilling and training program needs to be specific to a particular company's needs

- While on the surface there seems to be ample training programs available, however, in view that the E&E industry is so diverse and the technology and product being manufactured for each company is unique and different, these training programs are therefore not able to address all the unique demands of the industry
- There are some basic and generic skill-sets that are applicable across a group of companies within an E&E sub-sector, however, every company operates and functions differently from one another. The tools, processes, and technologies used for each company is different
- Thus, for training and up-skilling programs to be effective, they have to be customized and should cater as closely as possible to each company's needs. This is especially so for technical training catered for experienced talent
- Feedback from training providers have indicated that training programs for experienced talent will require the customization for each product / technology in the areas where training is required. The effectiveness of one-size-fits-all or generic programs for experienced talent is considered less effective to meet the needs of experienced talent

Smaller and mid-sized companies face additional challenges in up-skilling its talent

- In addition, one will need to attain multiple training programs to have the domain knowledge for a particular job function. This is made even more important given the rapidly evolving technology which will require constant up- skilling
- The requirements for a customized and constant training / up-skilling program can be a financial constraint to many companies, especially for the smaller and mid-sized companies
- While the larger MNCs can afford a customized training program, many mid and smaller-sized E&E companies are not able to afford a customized program
- For example, the annual entitlement per employee with an average salary of RM60,000 per annum under the HRDF fund is ~RM600 per annum, whereas the cost of some of the required training can run into the thousands of Ringgit
- Although there are some training funds provided by the government to assist these companies to train their personnel, many training providers have indicated that the SMEs are not fully aware of these incentives and do not utilize these funds



Talent Supply-Demand Analysis

Analysis of Potential and Addressable Talent Supply Pool

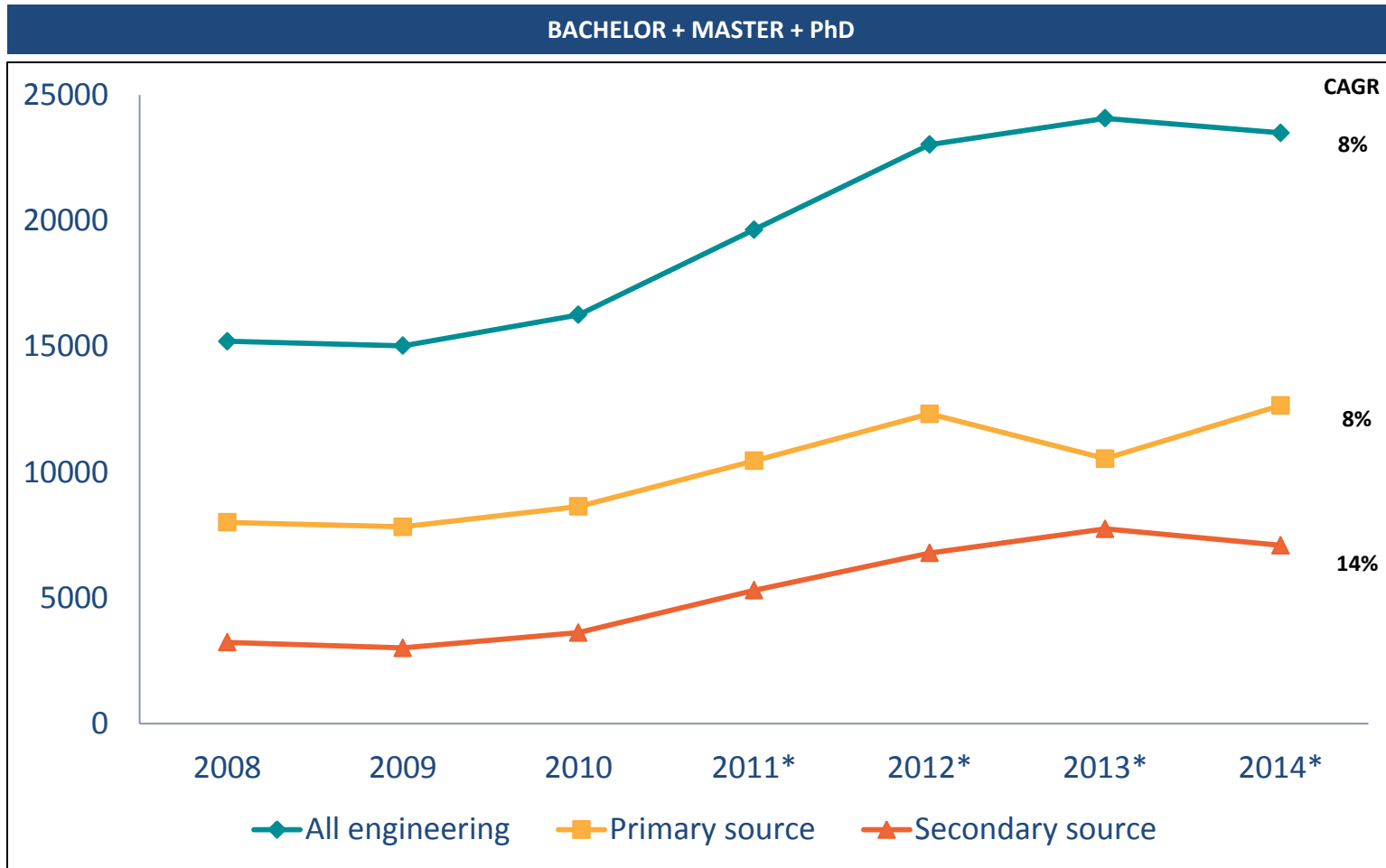
The main talent supply pool for the E&E industry can typically be categorized into two main groups:

Primary Source (Engineering Courses)	Secondary Source (Engineering Courses & Related Science Courses)
<ul style="list-style-type: none"> ▪ Electrical & Electronic ▪ Microelectronic ▪ Biomedical Electronic ▪ Industrial Electronic ▪ Mechanical ▪ Mechatronic ▪ Manufacturing ▪ Industrial Management & Technology ▪ System Design ▪ Product Design ▪ Design & Innovation 	<p data-bbox="871 358 1155 386"><u>Engineering Courses :</u></p> <ul style="list-style-type: none"> ▪ Chemical ▪ Materials & Mineral ▪ Polymer ▪ Metallurgy ▪ Computer ▪ Software ▪ Information Technology & Telecommunications <p data-bbox="871 836 1193 865"><u>Related Science Courses:</u></p> <ul style="list-style-type: none"> ▪ Physics ▪ Material Science ▪ Polymer Technology ▪ Statistics ▪ Software

Source: MOHE - Perangkaan Pengajian Tinggi Malaysia 2008, 2009 & 2010, IEO statistics by individual courses 2008-2010, Ipsos Analysis

The potential talent supply pool for the E&E industry is ~ 19K p.a

Total Graduate Output Trend, 2008-2014



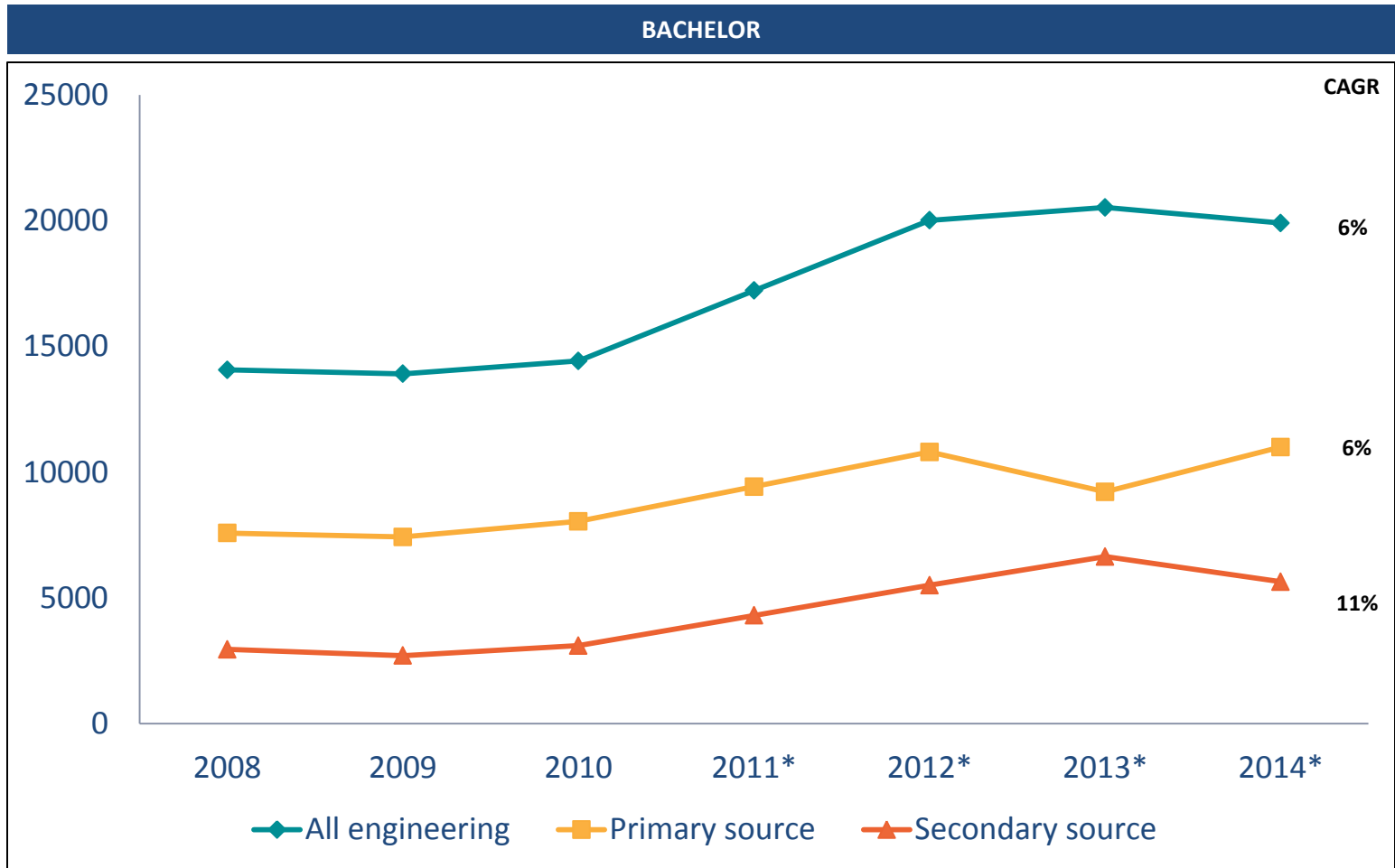
Source: MOHE - Perangkaan Pengajian Tinggi Malaysia 2008, 2009 & 2010, IEO statistics by individual courses 2008-2010

Note: The above figures only include graduates from courses relevant to this study (refer Appendix for the courses included for each category)

* estimate

The potential talent supply pool of undergraduates for has shown a steady growth

Total Graduate Output Trend, 2008-2014



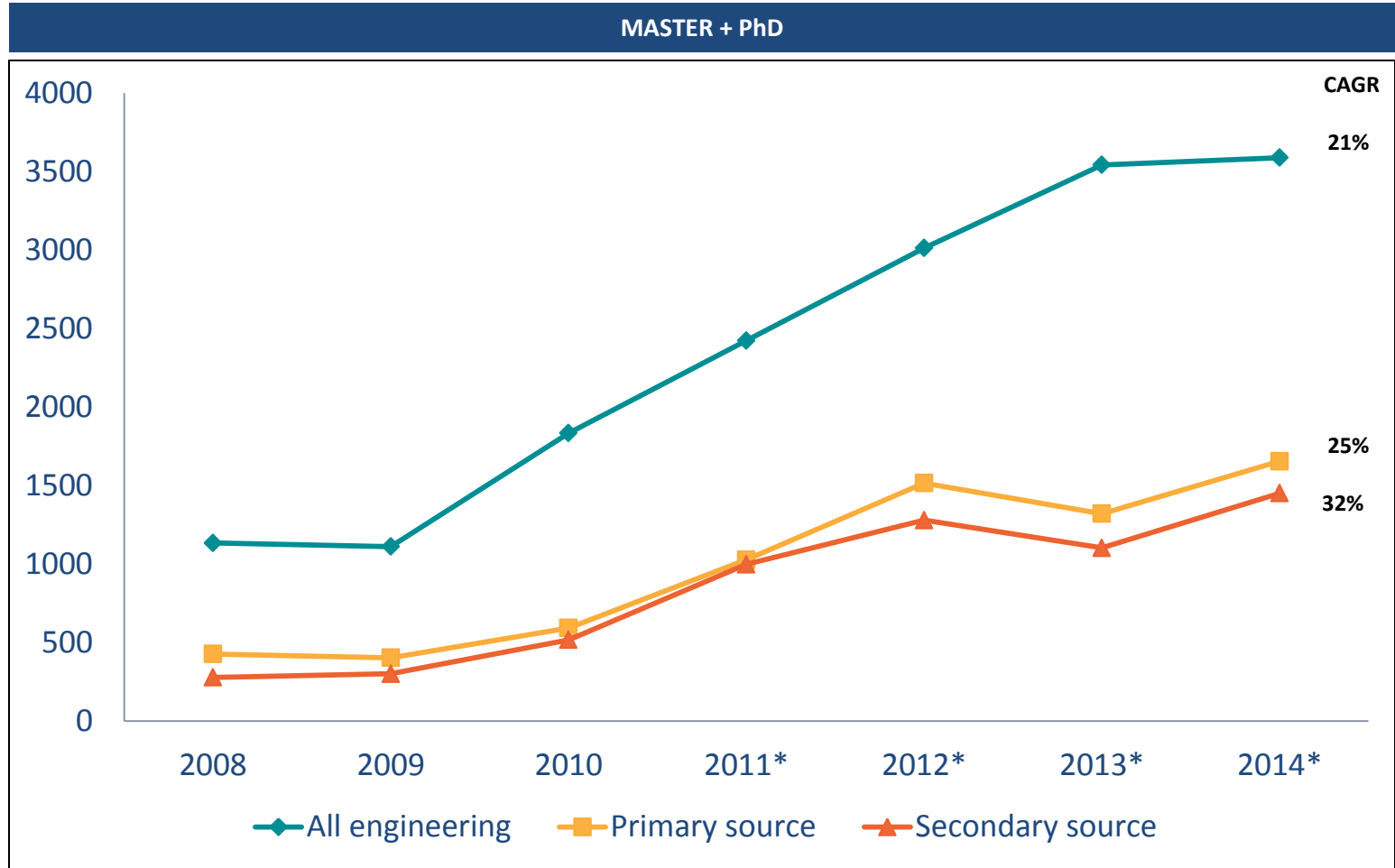
Source: MOHE - Perangkaan Pengajian Tinggi Malaysia 2008, 2009 & 2010, IEO statistics by individual courses 2008-2010

Note: The above figures only include graduates from courses relevant to this study (refer Appendix for the courses included for each category)

* estimate

Whereas the potential talent supply pool for post graduate students has shown a significant growth in the recent years. This positive trend should bode well in supporting higher value added activities

Total Graduate Output Trend, 2008-2014



Source: MOHE - Perangkaan Pengajian Tinggi Malaysia 2008, 2009 & 2010, IEO statistics by individual courses 2008-2010

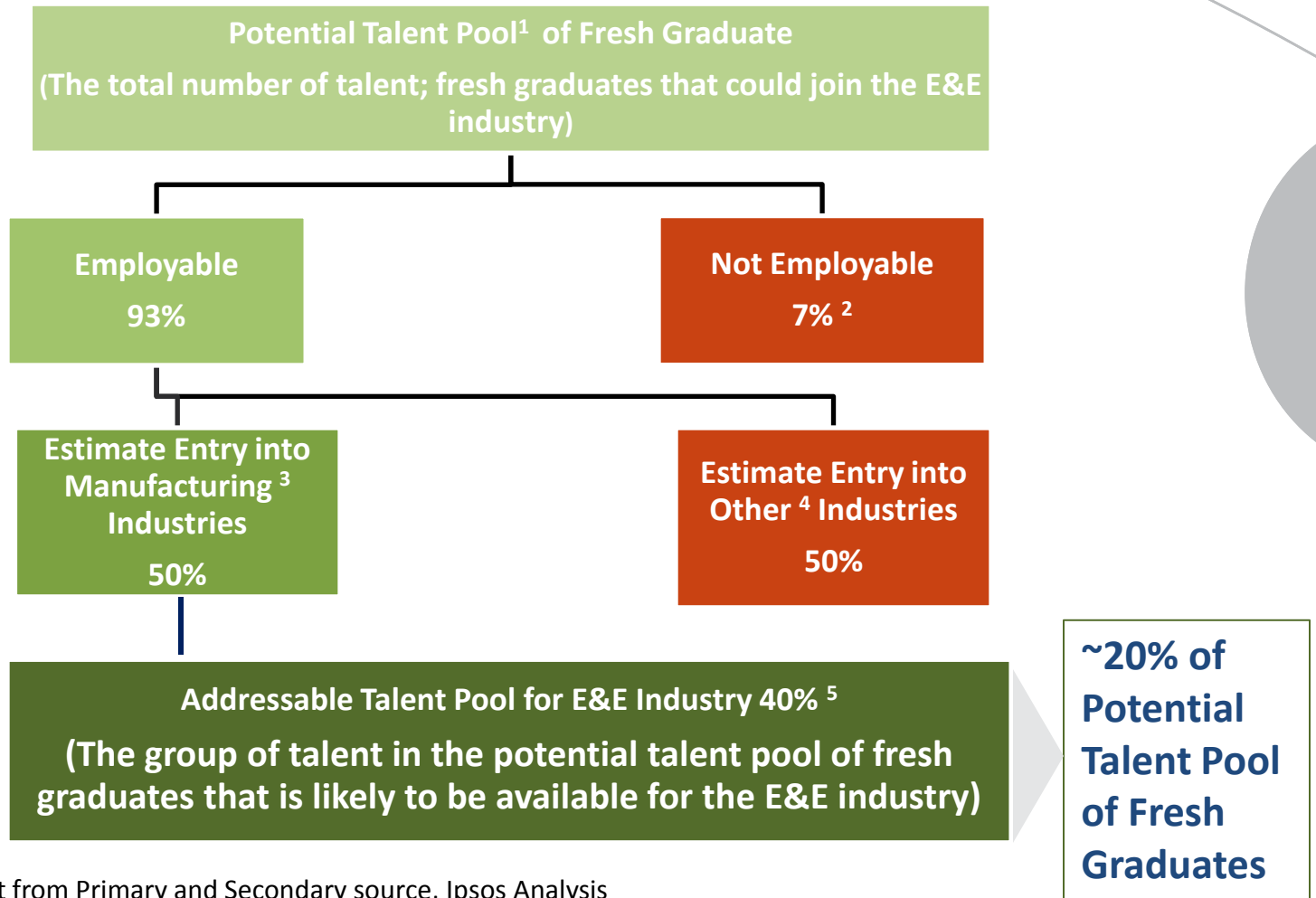
Note: The above figures only include graduates from courses relevant to this study (refer Appendix for the courses included for each category)

* estimate

Estimating the addressable talent supply from the total potential supply

- The primary and secondary source of talent for the E&E sector can be considered as talent that have employment opportunities across various sectors of the economy and are not necessarily restricted to employment within the E&E industry
- Given these scenarios, it is difficult to quantify the addressable supply of talent for the E&E sector owing to their potential demand in the other industries
- However, Ipsos analysis tries to establish the expected addressable talent pool based on some assumptions and analysis
- These assumptions have been taken after due consultation and analysis of feedback and interviews with various key stakeholders
- These assumptions are :
 - ⇒ ~7% of total supply pool from IHLs are not employable
 - ⇒ Only ~50% of the potential employable pool will join the manufacturing industry
 - ⇒ Of which ~40% will potentially join the E&E sector

Methodology to Estimate Addressable Talent Pool of Fresh Graduates for the E&E Sector



Note:

¹ Total graduate output from Primary and Secondary source, Ipsos Analysis

² Based on Graduate Tracer Study, Statistics of Higher Education of Malaysia 2010 and Ipsos Analysis. Reasons for unemployment ; responsibility towards family, not confident of working, choose not to work, not interested to work, taking a break, health problems, others

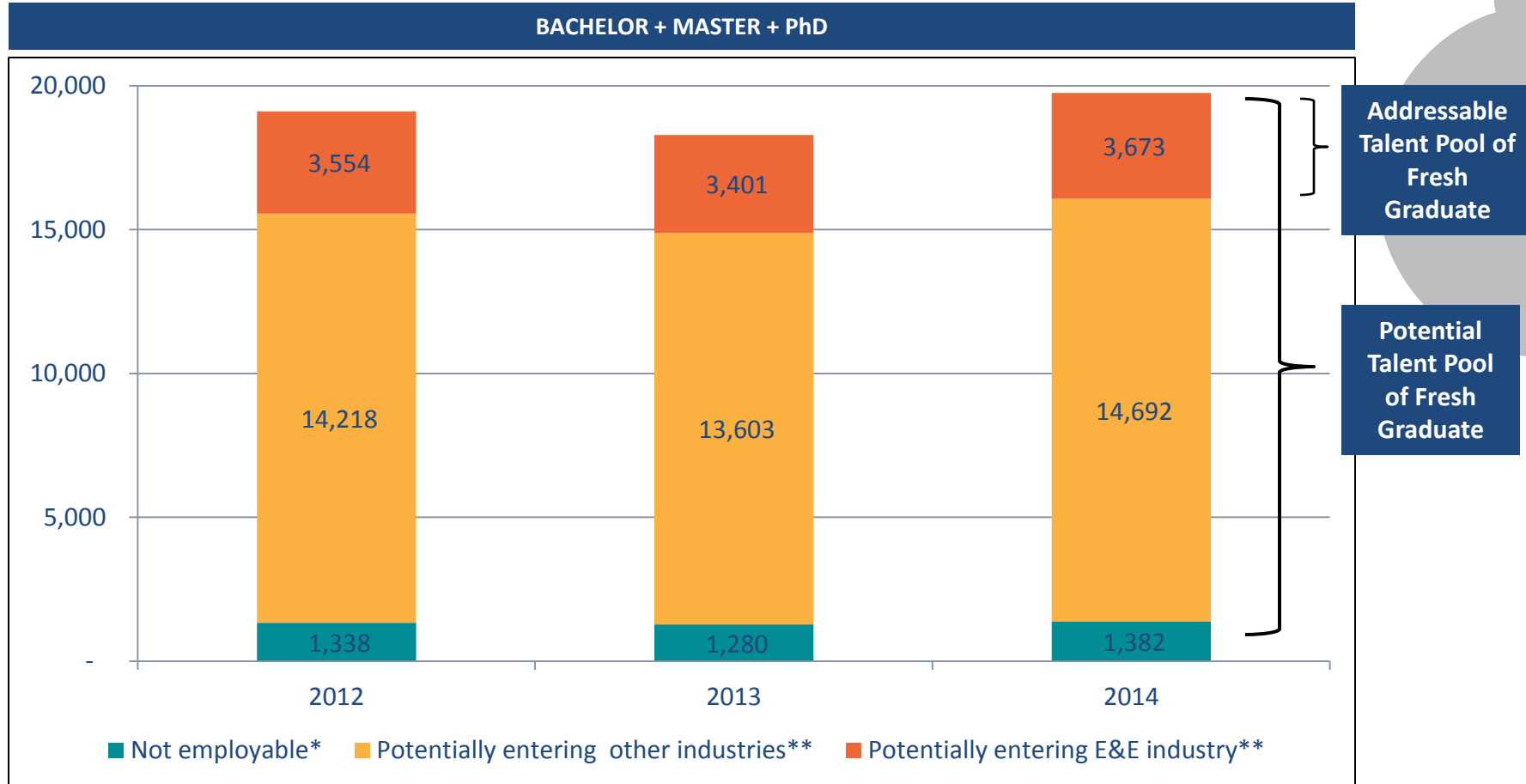
³ MITI, DOSM classification. Consist s of E&E, Transport Equipment, Chemicals & Chemical Products, Medical Devices, Metals, Machinery & Equipment, Non-Metallic Minerals, etc.

⁴ Ipsos Analysis. Includes Oil & Gas, Banking & Financial Services, Construction, Education, etc.

⁵ Employment of E&E Industry consist of 40% of total employment of Manufacturing in 2011. Manufacturing Statistics, DOSM

The new addressable talent supply for the E&E sectors is estimated to be around ~ 3500 p.a

Potential & Addressable Talent Pool of Fresh Graduate for the E&E Industry



Source: Intake and output statistics by individual courses 2008-2010, Ministry of Higher Education (MOHE), Statistics of Higher Education of Malaysia 2010, Ipsos Analysis

Note: Courses included: Bachelor Engineering, Bachelor Science, Master, PhD in Computer Engineering, Software Engineering

Potential Talent Pool refers to the total number of talent that could join the E&E industry

Addressable Talent Pool refers to the group of talent in the potential talent pool that is likely to be available for the E&E industry

* 7% of total graduates (Based on Graduate Tracer Study, Statistics of Higher Education of Malaysia 2010)

** Estimate (Based on Intake of individual courses 2008-2010, MOHE)

Analysis of Potential Incremental Demand for Talent

In estimating the projected incremental talent demand, various factors and assumptions were considered

- For ascertaining the total talent demand in the E&E sector, a four step approach had been adopted

▪ Step 1: Determining Organic Growth Rate

- ⇒ Assessment of organic growth levels of the present E&E industry to estimate the talent demand
- ⇒ 3 scenarios were considered:
 - 0% growth
 - 5% growth
 - 10% growth
- ⇒ Based on discussions and feedback from various key stakeholders, a 5% growth was considered as the baseline number

▪ Step 2: Ascertaining the Number of Technical Core Professionals in the E&E Industry

⇒ 3 assumptions were made;

- Technical core professionals make up ~10% of the total E&E talent pool (based on Dept. of Statistics 2009 data)
- Technical core professionals make up ~15% of the total E&E talent pool (based on Ipsos Analysis for higher value-added manufacturing companies)
- Technical core professionals make up ~20% of the total E&E talent pool (based on Ipsos Analysis for aspirational target)

⇒ A 15% rate was used for the purpose of this study

▪ Step 3: Identifying the Attrition Rate

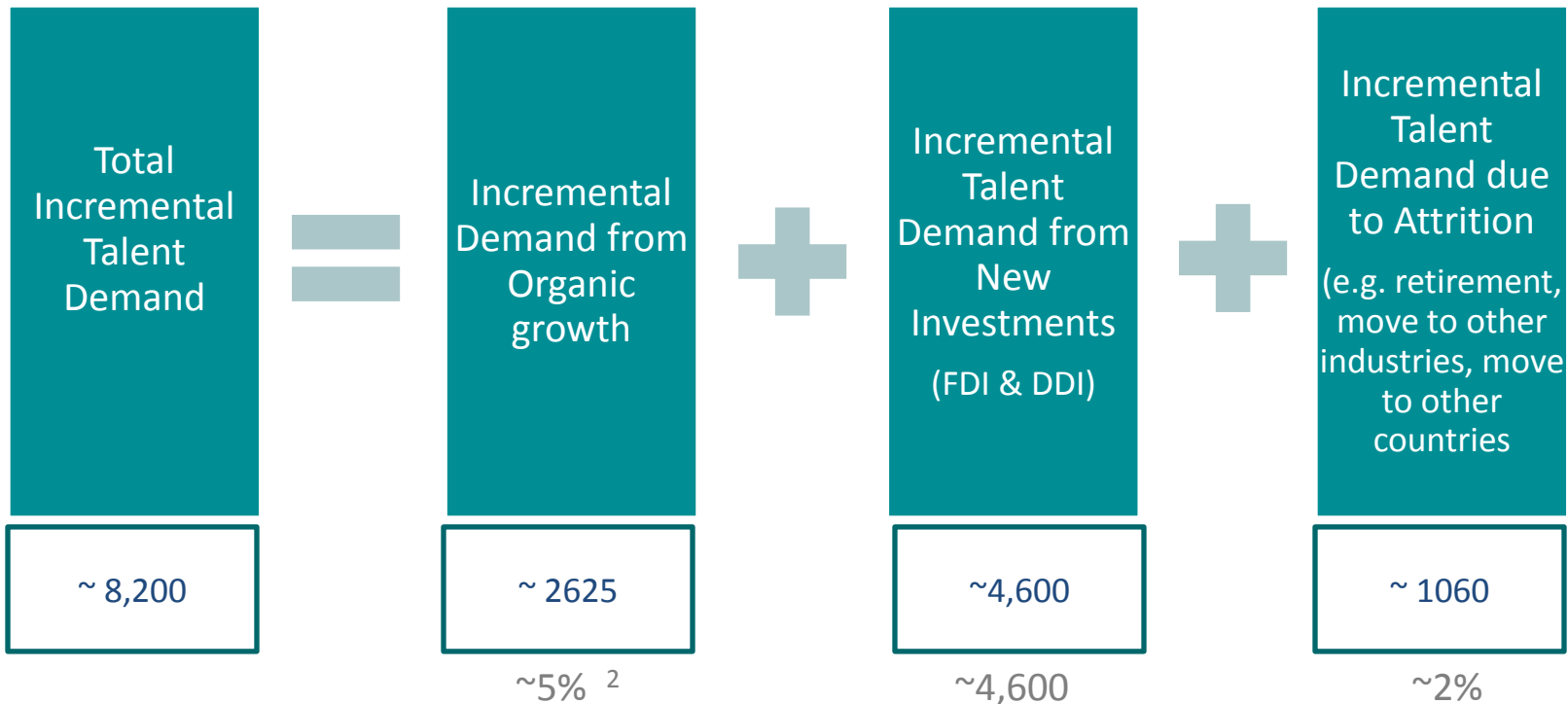
⇒ A 2% rate was used to indicate the number of talent leaving the sector (i.e. retirement, going abroad and leaving for other industries)

▪ Step 4: Identifying the Number of Technical Core Professionals from New Investments

⇒ The numbers have been derived from analysis of MIDA's average total employment from new investments

Methodology to estimate incremental talent demand ¹

- The following estimates are based on the Baseline Scenario which makes the following assumptions: % Core technical staff employed of 15%; organic growth of 5% p.a., attrition at 2%



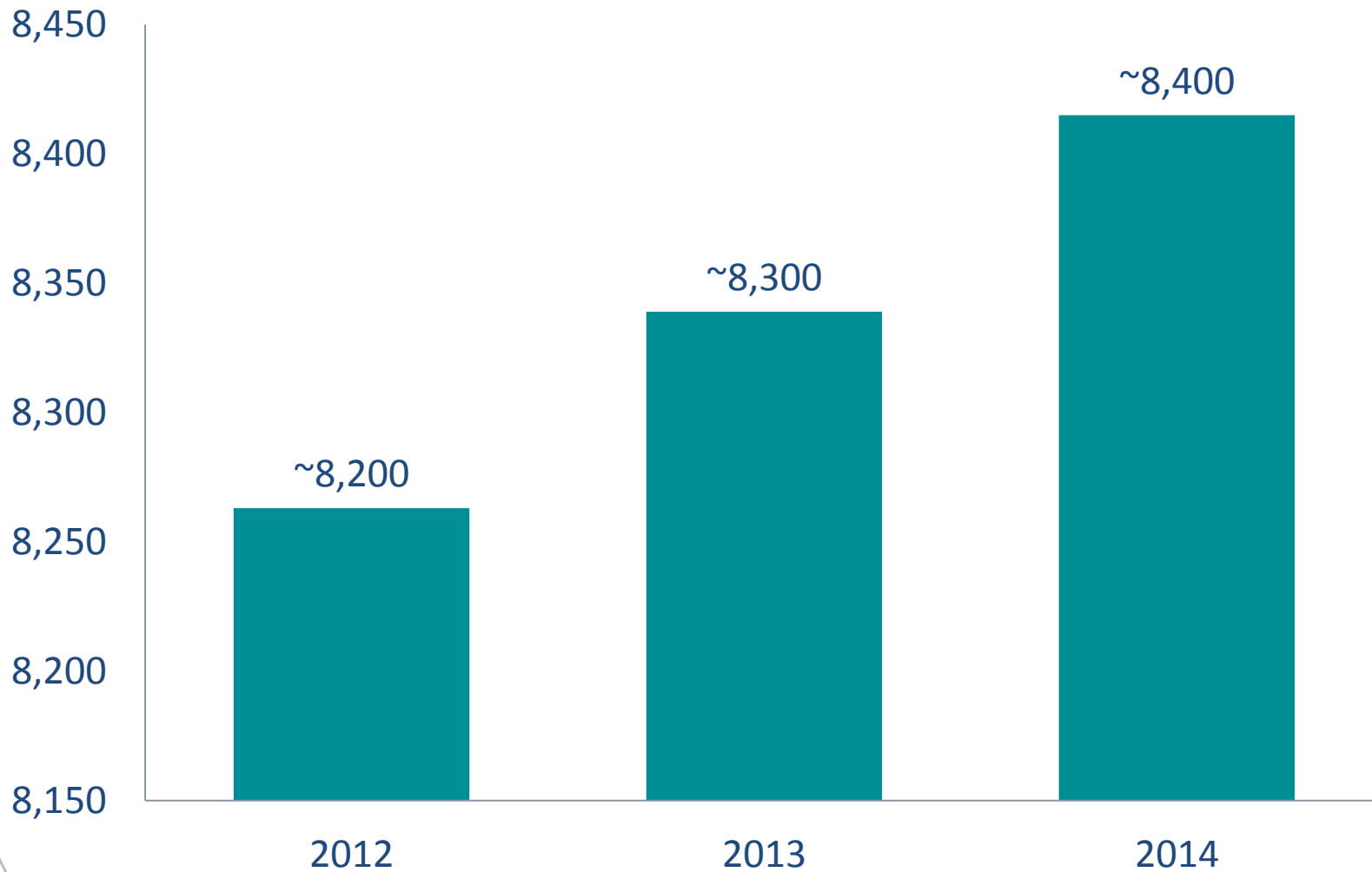
Note:

¹ The modeling of different scenarios can be found in the appendices to this report

² 5% of Base of 2011 Total Core Technical Staff in E&E (Baseline number) 350,000 x 15% = 52,500



Based on the baseline assumptions, it is estimated that the incremental talent demand will be ~8k per annum



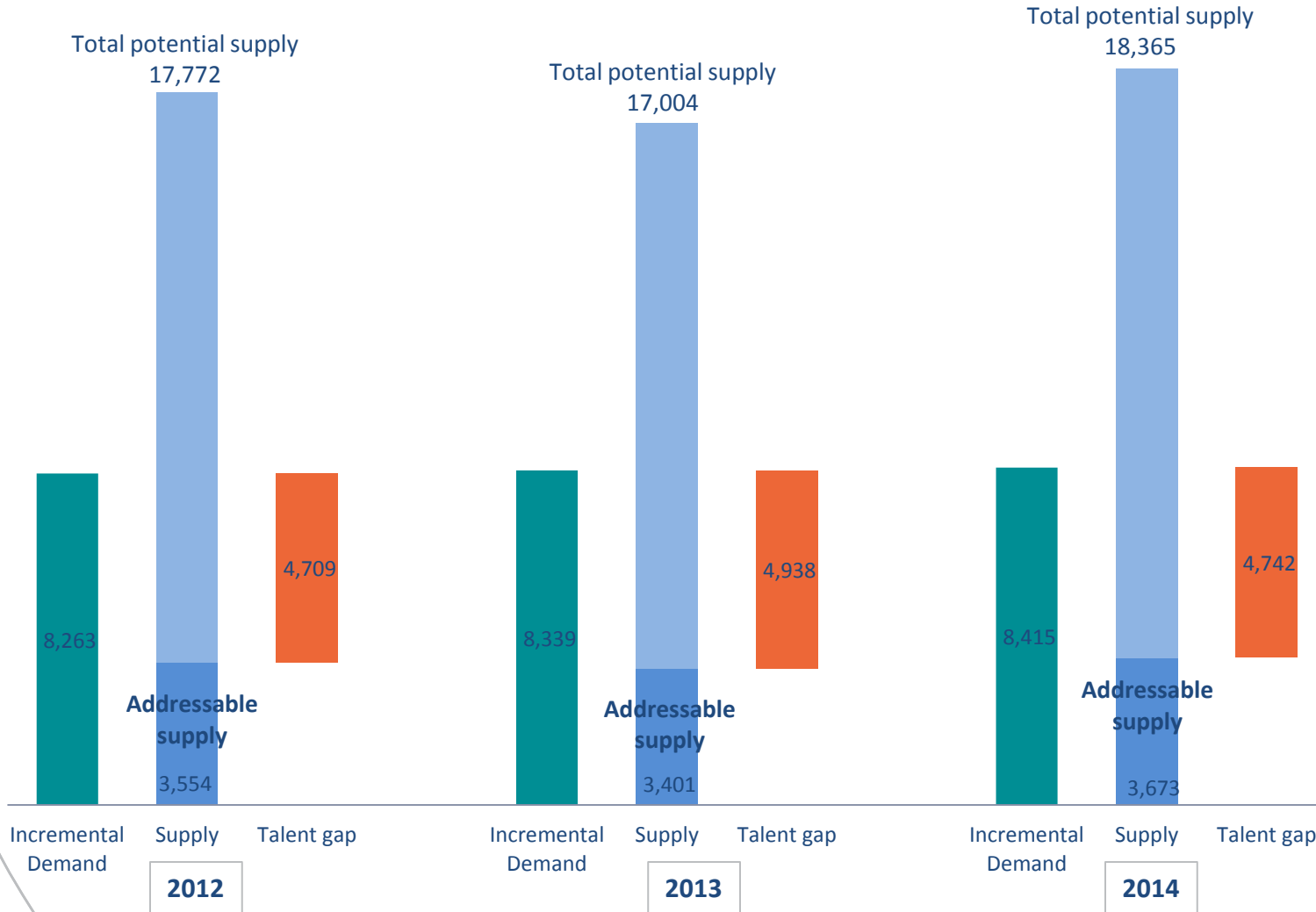
Note:

Scenario assumptions for demand estimation: core technical staff 15%; organic growth 5% per annum; attrition rate 2%

Talent Supply-Demand Analysis

A gap of ~4,700, or around ~ 57% of the incremental demand is projected based on the baseline scenario

Supply – Demand Gap 2012-2014



The talent gap are to be viewed as indicative numbers rather than absolute numbers as various assumptions have been built into the different models

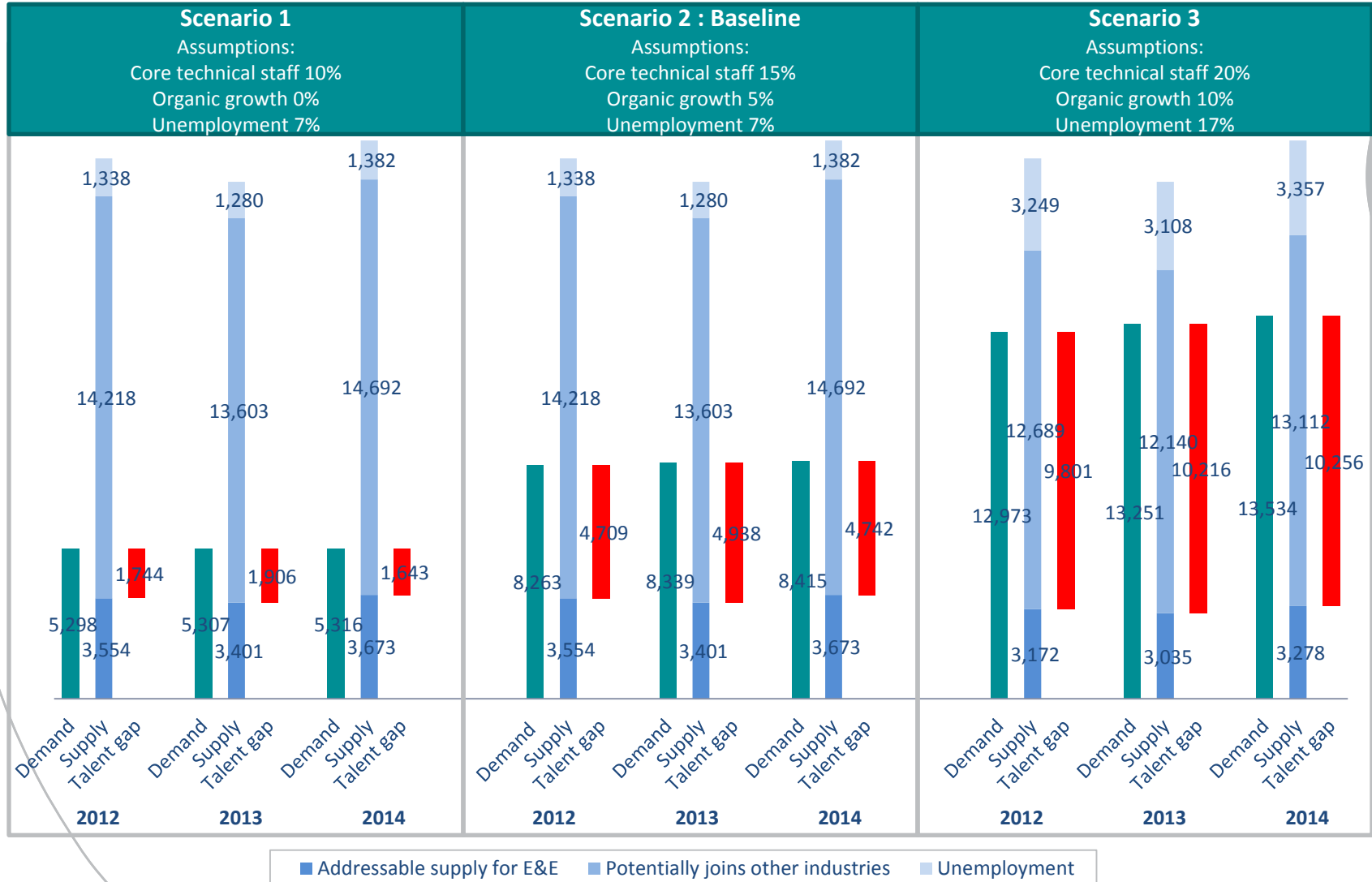
Note:

Scenario 2/Baseline assumptions for demand estimation: core technical staff 15%; organic growth 5% per annum, 7% unemployment

Ipsos analysis

Even if the variables were adjusted to reflect the most and least severe scenarios, the talent gap will still exist, the only difference is the magnitude of the gap

Supply – Demand Talent Gap Analysis 2012-2014



Note: Demand refers to incremental demand.
Ipsos analysis



While the potential talent pool is twice the amount of the projected incremental demand, the addressable talent pool will only be able to meet ~57% of projected incremental demand

- Based on the analysis of the potential addressable talent supply and the projected incremental demand, it is estimated that the addressable talent pool from primary and secondary sources will only be able to meet ~57% of the projected incremental demand.
- There will be a shortfall of ~4700 core technical talent within the E&E industry
- While the potential talent pool is twice the amount of what the incremental demand is, the addressable talent pool for the E&E industry is only ~20% of the total potential talent pool.
- This is because the potential talent pool is also highly sought after in other various industries outside the E&E domain. Talent market and the E&E industry do not exist in isolation and the demand from other industries and economies will lead to a talent shortage in the E&E industry

Competition from other sectors for the similar talent pool will result in talent shortage for the E&E sector

- Better job and career opportunities outside the E&E sector will consequently lead to a shortage of addressable talent pool for the E&E sector
- In the context of higher economic growth across various competing sectors in the coming years (e.g. Oil and Gas), the talent shortage is likely to be exacerbated in the future if remedial measures towards increasing addressable talent supply pool are not given priority
- The impact of talent shortages to the E&E sector will likely result in recruitment difficulties where the sector finds it difficult to recruit and retain talent.
- The sector may have to source for talent from a less ideal talent pool to meet its demand.
- There are already some evidence of this happening in some companies where they are hiring talent who are not specifically trained in the particular field of hire.



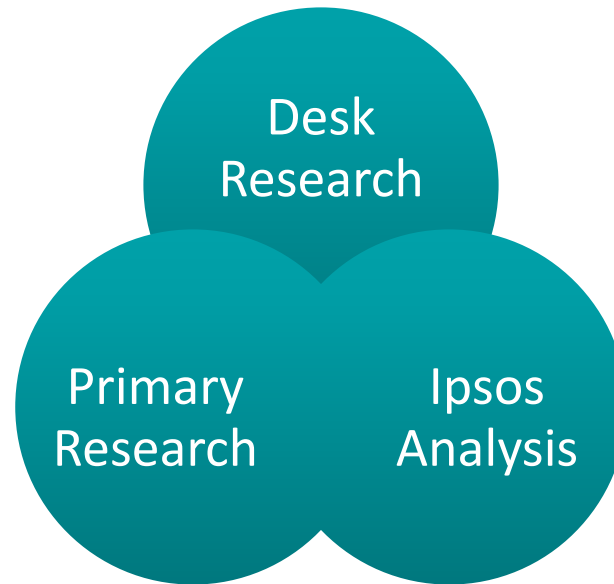
Main Talent Shortage Areas

Talent shortage areas have been identified based on industry feedback

- Apart from quantifying the talent demand-supply gaps, various talent shortage areas have been identified based on interviews with key stakeholders, i.e. industry players, recruitment agencies, desk research, institutions of higher learning, associations and trade bodies, state and federal government agencies, training agencies, etc.
- The identification of the talent shortage areas also took into account the key talent areas that can support the growth of the sector towards higher value added activities (e.g. R&D) as well, as key subsectors identified by the ETP

Desk Research

- Singapore and Regional Talent Requirements and Shortages within E&E
- Skills requirements in the E&E industry
- World Bank reports (e.g. PICS, etc.)
- E&E industry trends and development
- PEMANDU (e.g. lab reports, job projections etc.)
- Job advertisements for E&E talent
- Company websites
- Etc.



Primary Research

In-depth Interviews and Group discussions with:

- Industry players and experts
- Training centers and providers
- Institutions of Higher Learning (IHLs)
- Industry associations
- Government agencies

Key areas of discussion:

- Current talent needs
- Difficult to fill positions
- Key shortage areas
- Expected future key shortage areas
- Severity of shortage

Ipsos Analysis

- Trend analysis: current vs. demand in next 3 years within the E&E sector
- Cross-checking talent demand needs against supply pool
- Discerning rationale for talent shortage – company or industry specific
- Analysis, verification and validation of hypotheses and key findings

The eight key talent shortage areas identified are:

Identified Talent Shortage Areas

IC Design Engineer

Embedded System /
Firmware Engineer

Software Engineer

RF Engineer

Media Processing
Engineer

Wafer Fabrication
Engineer

Test / Measurement
Engineer

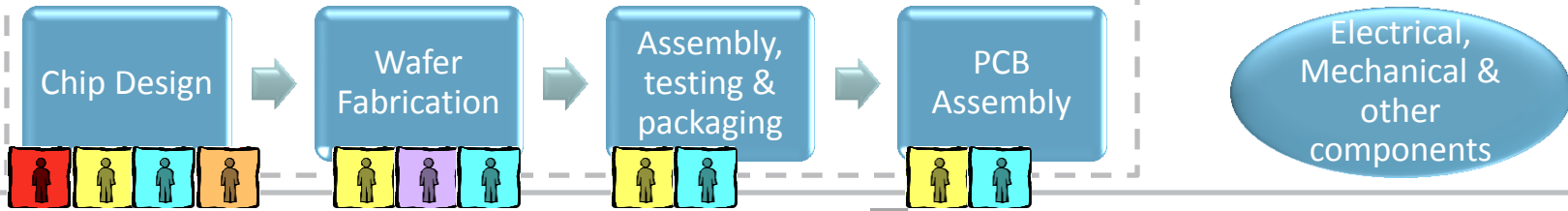
Product Design R&D
Engineer

- However, with the evolving nature of the E&E industry, the talent shortage areas are likely to change or evolve in tandem with new investments, technological changes as well as the availability of training and up-skilling programs.
- As such, it is recommended that the talent gap areas are monitored closely and continuously

Talent shortage areas are more prevalent in R&D and technical centric activities

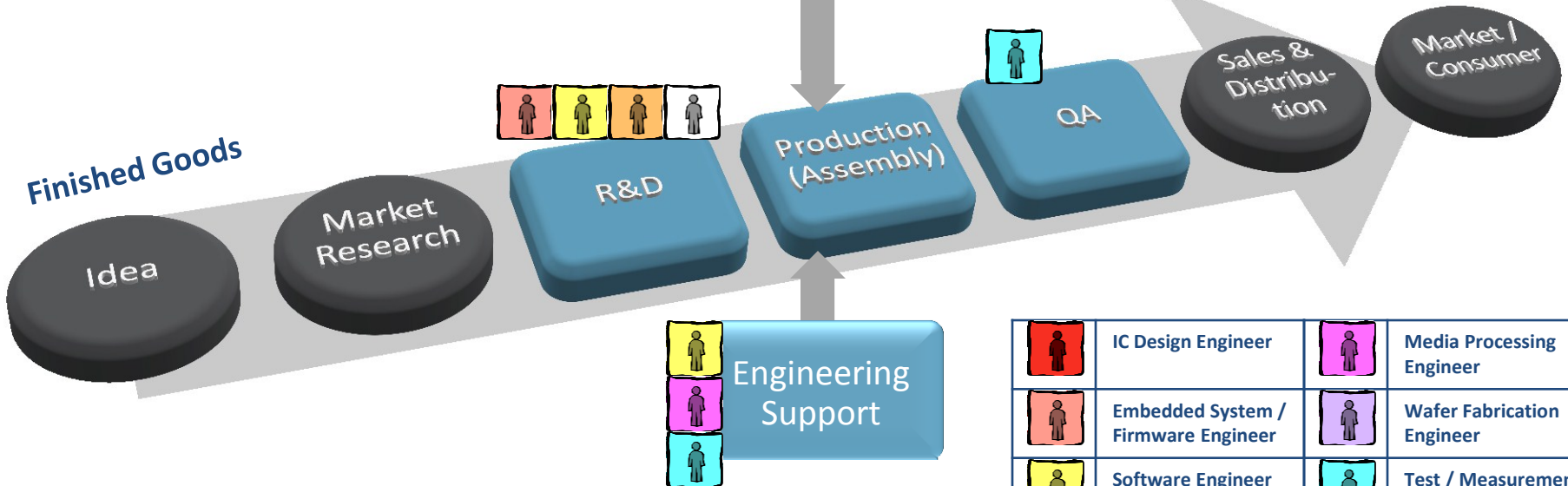
Components

Electronic Components Value Chain*



Supply Chain

Finished Goods



* Within the Electronic Components Value Chain, each cluster / sub-function will have their own elements of R&D, QA, Production (Assembly) and Engineering Support

	IC Design Engineer		Media Processing Engineer
	Embedded System / Firmware Engineer		Wafer Fabrication Engineer
	Software Engineer		Test / Measurement Engineer
	RF Engineer		Product Design R&D Engineer

Talent shortage areas in E&E Sector according to the sub-sectors and the value chain

Talent		Sector Affected																							
		Electronic Components				Consumer Electronics				Industrial Electronics				Electrical Components				Electrical Appliances				Industrial Electrical			
		Chip Design	Wafer fabrication	Assembly, packaging & testing	PCB Assembly	R&D	Eng. Support	Production	QA	R&D	Eng. support	Production	QA	R&D	Eng. support	Production	QA	R&D	Eng. support	Production	QA	R&D	Eng. support	Production	QA
	IC Design Engineer	X																							
	Embedded System / Firmware Engineer					X			X				X				X						X		
	Software Engineer	X	X	X	X	X	X		X	X			X	X			X	X			X	X			
	RF Engineer	X	X			X			X				X				X				X				
	Media Processing Engineer									X															
	Wafer Fabrication Engineer		X																						
	Test / Measurement Engineer	X	X	X	X	X	X		X		X		X		X		X		X		X		X		X
	Product Design R&D Engineer					X			X				X				X				X				

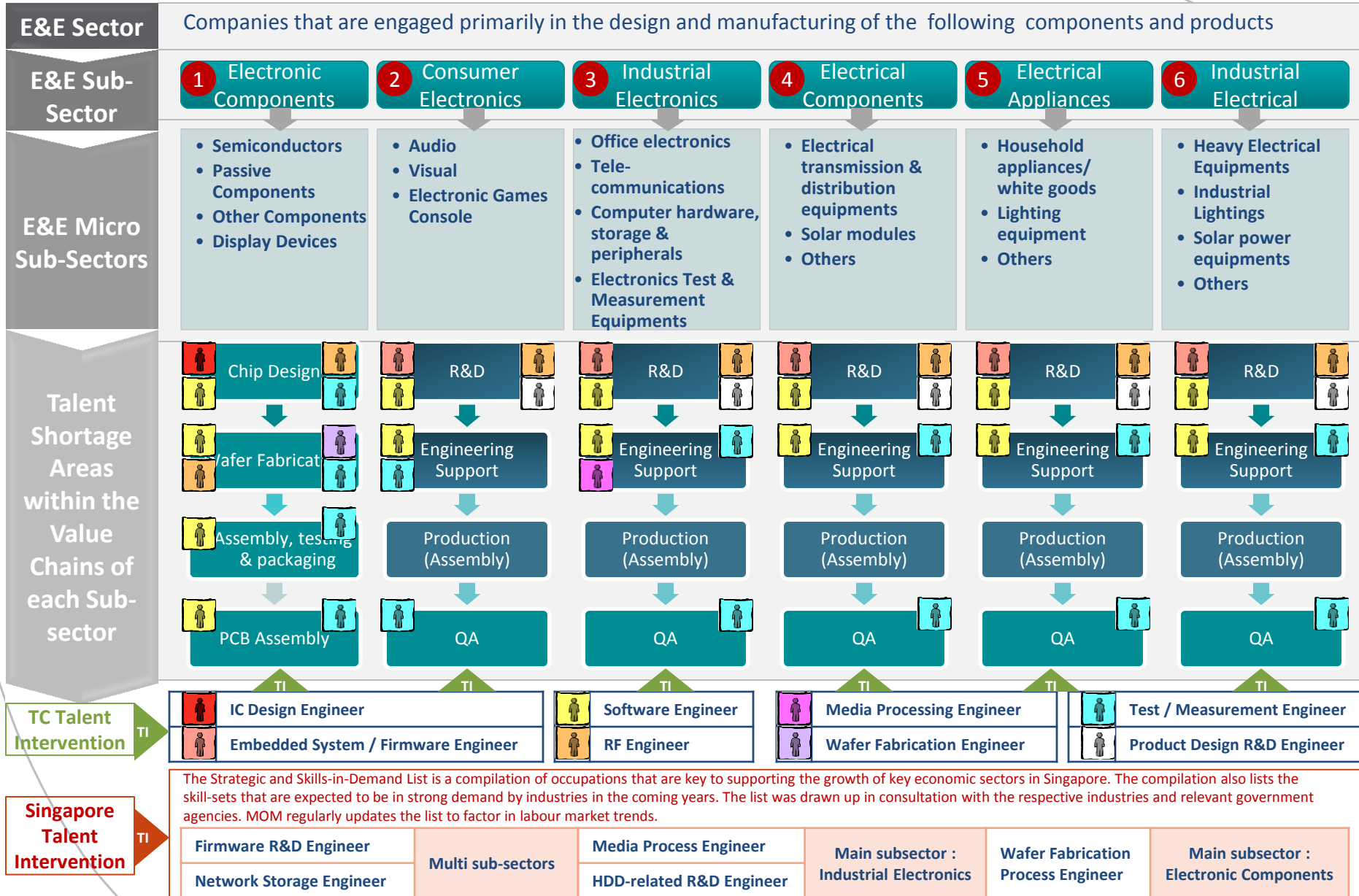
The talent mapping (X) is based mainly on the E&E “value- chain” . For talent mapping where talent requirements are not marked (X) , it does not indicate that the industry players will not need such talent in their organizations. They may need the talent within their organization as a direct or indirect support at the component or system level. For example many PCB assemblers are also contract manufacturers that design and manufacture at board and at system level; as such they may also need software or embedded systems engineers .

The main talent shortage areas in E&E Sector according to ETP priority areas

Talent Shortage areas		ETP Priority Sectors								
		Electronic Components			Industrial Electronics				Electrical Appliances	Industrial Electrical
		Chip Design	Wafer fabrication (IC, Solar, LED)	Assembly, packaging & testing	LED SSL	Test & Measurement	Automation Equipment	Wireless & RFID	Household Appliance	Transmission & Distribution
	IC Design Engineer	X								
	Embedded System / Firmware Engineer				X	X	X	X	X	X
	Software Engineer	X	X	X	X	X	X	X	X	X
	RF Engineer	X	X			X	X	X	X	
	Media Processing Engineer									
	Wafer Fabrication Engineer		X							
	Test / Measurement Engineer	X	X	X	X	X	X	X	X	X
	Product Design R&D Engineer				X	X	X	X	X	X

The talent mapping (X) is based mainly on the E&E “value- chain” . For talent mapping where talent requirements are not marked (X) , it does not indicate that the industry players will not need such talent in their organizations. They may need the talent within their organization as a direct or indirect support at the component or system level. For example many PCB assemblers are also contract manufacturers that design and manufacture at board and at system level; as such they may also need software or embedded systems engineers .









Talent intervention initiatives should be directed at addressing the Talent Shortage Areas across the various sub-sectors



The Strategic and Skills-in-Demand List is a compilation of occupations that are key to supporting the growth of key economic sectors in Singapore. The compilation also lists the skill-sets that are expected to be in strong demand by industries in the coming years. The list was drawn up in consultation with the respective industries and relevant government agencies. MOM regularly updates the list to factor in labour market trends.



Profile of the Talent Shortage Areas

Key Talent Shortage Areas at Different Talent Levels and the Educational Requirements

Talent Shortage Areas		Level			Educational Requirement*
		Entry	Mid-Level	Experienced	
	IC Design Engineers	●	●	●	Degree in Electrical & Electronic with emphasis in IC Design / Microelectronics
	Embedded System / Firmware Engineer	●	●	●	Computer Engineering, Electrical & Electronics
	Software Engineer	●	●	●	Degree in Software Engineering, Electrical & Electronic
	RF Engineers	●	●	●	Degree in Electrical & Electronic , Tele-communications
	Media Process Engineers		●	●	Mechanical Engineering , Material Engineering, Electrical & Electronics
	Wafer Fabrication Process Engineers		●	●	Chemical Engineering, Mechanical Engineering, Material Engineering
	Test / Measurement Engineer		●	●	Mechanical Engineering , Electrical & Electronics, Statistical
	Product Design R&D Engineer	●	●	●	Mechanical Engineering, Electrical & Electronics



The list is not exhaustive but shows some of the more common educational requirements of the industry

Nature of Work and the Key Technical Skills Required for the Talent Shortage Areas

Skills Shortage	Nature of Work	Level			Educational Requirement *	Key Technical Skills Required
		Entry	Mid-Level	Experienced		
IC Design Engineers 	The design of Integrated Circuits e.g. implement and integrate IC layout design for digital and analog circuit, perform thorough verifications on layout designs using industry leading EDA tools	●	●	●	Degree in Electrical & Electronic with emphasis in IC Design / Microelectronics	<ul style="list-style-type: none"> • Knowledge and skills in hardware specification, analysis, logic design, modeling, simulation, verification, synthesis, test and maintenance of integrated circuits • Able to understand design from a system-level perspective
Embedded System / Firmware Engineer 	Create and implement algorithms which enable the hardware to function	●	●	●	Computer Engineering, Electrical & Electronics	<ul style="list-style-type: none"> • Proficient in C/C++, assembly programming and debugging skills in embedded systems • Experience in Device Driver development for embedded systems and a strong mixed background in software and hardware engineering

*The list is not exhaustive but shows some of the more common educational requirements of the industry



Nature of Work and the Key Technical Skills Required for the Talent Shortage Areas (cont'd)

Skills Shortage	Nature of Work	Level			Educational Requirement *	Key Technical Skills Required
		Entry	Mid-Level	Experienced		
Software Engineer 	Design and develop the many types of software for product and engineering support (e.g. automation, testing equipment)	●	●	●	Degree in Software Engineering, Electrical & Electronic	<ul style="list-style-type: none"> Familiar with specialized languages relevant to the technologies employed (e.g. Machine Language, Assembly Language, C,C++, Java) Proficient in Software Product Life Cycle and familiar with software testing methodology at system/board level
RF Engineers [^] 	Responsible for the analysis, design, implementation, optimization and enhancement of wireless telecommunications products and networks	●	●	●	Degree in Electrical & Electronic, Tele-communications	<ul style="list-style-type: none"> Able to understand electronic hardware design, circuit board material, antenna radiation, and the effect of interfering frequencies that prevent optimum performance within the piece of equipment being developed

[^] RF Engineers are also required where there are RF Technology employed e.g. Chip Design and Wafer Fabrication



*The list is not exhaustive but shows some of the more common educational requirements of the industry

Nature of Work and the Key Technical Skills Required for the Talent Shortage Areas (cont'd)

Skills Shortage	Nature of Work	Level			Educational Requirement *	Key Technical Skills Required
		Entry	Mid-Level	Experienced		
Media Process Engineers 	Provide process engineering support in the production of magnetic media		●	●	Mechanical Engineering, Material Engineering, Electrical & Electronics	<ul style="list-style-type: none"> • Experience in a high volume manufacturing environment in the hard-disk drive facility • Good understanding of the materials and machines involved in the production process
Wafer Fabrication Process Engineers 	A process engineer position supporting processing and the chemical etching activities in a wafer fabrication manufacturing environment		●	●	Chemical Engineering, Mechanical Engineering, Material Engineering	<ul style="list-style-type: none"> • Experience working in a laboratory setting and clean room environment • Good understanding of the materials and machines involved in the production process

*The list is not exhaustive but shows some of the more common educational requirements of the industry

Nature of Work and the Key Technical Skills Required for the Talent Shortage Areas (cont'd)



Skills Shortage	Nature of Work	Level			Educational Requirement *	Key Technical Skills Required
		Entry	Mid-Level	Experienced		
Test / Measurement Engineer** 	Provide technical support for product test related issues in maximizing output through yield and process improvement		●	●	Mechanical Engineering, Electrical & Electronics, Statistical	<ul style="list-style-type: none"> • Good knowledge of testing and manufacturing process in high volume manufacturing environment • Familiar with 6-Sigma, FMEA, SPC and other data analysis skills
Product Design R&D Engineer 	Designs, develops, and refines new products. Assists in the transfer of newly developed products from R&D to production.	●	●	●	Mechanical Engineering, Electrical & Electronics	<ul style="list-style-type: none"> • Experience in product development of metal, plastic, mechanical, electrical and electronics parts/products • Familiar with product development tools e.g. DFMEA, CAD designing tool

*The list is not exhaustive but shows some of the more common educational requirements of the industry

** Test/Measurement Engineer may also be categorized as Failure Analysis / Reliability Engineers



Current Situation and Outlook of Main Talent Shortage Areas

Current Situation and Outlook for Identified Key Talent Shortage Areas

Talent Shortage	Main employment area	Current Situation	Projected Demand / Outlook
IC Design Engineers 	<ul style="list-style-type: none"> Mainly employed in around ~ 20 IC design companies in Malaysia e.g. Intel, Altera, ICMiC, Ssymmid etc. 	<ul style="list-style-type: none"> The biggest challenge faced is the current pool of talent does not have the breadth and depth in the skills required for IC / Chip design 	<ul style="list-style-type: none"> The overall demand for IC designers will be dependent on the growth of the current IC /Chip design companies in Malaysia and also the set-up of new IC/ Chip design companies
Embedded / Firmware Engineers 	<ul style="list-style-type: none"> Embedded/ Firmware engineers are mainly employed in companies that designs or supports embedded system / firmware enabled devices e.g. Finisar, Pradotec, Western Digital 	<ul style="list-style-type: none"> The limited pool of skilled embedded / firmware engineers is not able to keep up with the increasing demand of the sector 	<ul style="list-style-type: none"> As more products will need to communicate and connect with other devices to operate, the need for embedded / firmware engineers is expected to grow



Note: The companies cited above are just examples which serves as an indicative guide on some of the hiring companies based on current job postings and company websites

Current Situation and Outlook for Identified Key Talent Shortage Areas (cont'd)

Talent Shortage	Main employment area	Current Situation	Projected Demand / Outlook
Software Engineer 	<ul style="list-style-type: none"> Across different sub-sectors e.g. where navigational, measuring control instruments etc. are manufactured and/or designed in-house e.g. Altera, Philips Lumileds, NEC Corporation etc. 	<ul style="list-style-type: none"> The biggest challenge the E&E sector faces in attracting and retaining the software engineers are the many other possibilities that software engineers have outside the E&E sector 	<ul style="list-style-type: none"> Overall, employment of software engineers is projected to be on the increasing trend as products are being replaced or enhanced by software components to provide more adaptability and enhanced functionality. In addition, as the E&E sector migrates from labour intensive to higher value added type of operations, investments in automation equipment is expected to increase, which will result in the need for software engineers in the engineering support functions
RF Engineer 	<ul style="list-style-type: none"> Mainly employed in companies with that designs and manufactures devices which operate in the Radio Frequency spectrum (e.g. Cell Phones, Wi-Fi and Public Safety Solutions) e.g. Motorola, Agilent, National Instruments 	<ul style="list-style-type: none"> The complexities of RF engineering application has led to the industry preference towards experience and hands-on RF design skills 	<ul style="list-style-type: none"> The demand for industry-ready engineering graduates competent in RF is increasing in tandem with the growth in wired and wireless communication industries (e.g. tablets and mobile telecommunication devices, as well as from telecommunication base stations)



Note: The companies cited above are just examples which serves as an indicative guide on some of the hiring companies based on current job postings and company websites

Current Situation and Outlook for Identified Key Talent Shortage Areas (cont'd)

Talent Shortage	Main employment area	Current Situation	Projected Demand / Outlook
Media Process Engineers 	<ul style="list-style-type: none"> Mainly employed in Hard Disk Manufacturing companies Example of companies: Seagate, Western Digital, Showa Denko HD 	<ul style="list-style-type: none"> As the technology and process used in manufacturing disk drives gets more sophisticated (e.g. greater data storage capabilities), there is a greater need for skilled and experienced talent to manage and improve the manufacturing process 	<ul style="list-style-type: none"> The need for highly skilled media process engineers has increased recently as a result of recent floods in Thailand which resulted in a pent-up demand for Hard Disk Drives. Some Thailand based companies have even temporarily shifted production to Malaysia Media process engineers are also likely candidates for new investments in solar industry and wafer fabrication.
Wafer Fabrication Process Engineers 	<ul style="list-style-type: none"> Employed in Wafer fabrication related companies e.g. Siltera, Intel, Infineon 	<ul style="list-style-type: none"> Because of the relatively small number of companies that are in wafer fabrication, skilled and experienced wafer fabrication engineers are sought after whenever there is a new investment in wafer fabrication or related technologies in Malaysia or regionally 	<ul style="list-style-type: none"> The demand for wafer fabrication engineers will be dependent of the growth of the domestic wafer fabrication companies or new investment in wafer fabrication houses. Wafer fabrication projects have been identified as a strategy for the development of the semiconductor industry in the country. Wafer fabrication engineers are also likely candidates for new investments in solar industries

Note: The companies cited above are just examples which serves as an indicative guide on some of the hiring companies based on current job postings and company websites

Current Situation and Outlook for Identified Key Talent Shortage Areas (cont'd)

Talent Shortage	Main employment area	Current Situation	Projected Demand / Outlook
Test / Measurement Engineer 	<ul style="list-style-type: none"> Employed across various subsectors and companies e.g. Flextronics, Agilent, Finisar etc. 	<ul style="list-style-type: none"> The demand for highly skilled test engineers is in tandem with the complexity of products being produced and the need for improving quality and yield 	<ul style="list-style-type: none"> The demand of highly skilled engineers is expected to increase as products are produced in higher volume, the need for better quality and yield standards, with shorter life cycles
Product Design R&D Engineer 	<ul style="list-style-type: none"> Employed in various subsectors and companies that have R&D departments Example of companies: Bosch, Dyson, Motorola 	<ul style="list-style-type: none"> The talent pool for product design engineers at all levels are limited due to the industry ecosystem which is predominantly production / assembly based 	<ul style="list-style-type: none"> The demand for product engineers will be dependent on the progress / advancement of Malaysia E&E industry towards R&D activities

Note: The companies cited above are just examples which serves as an indicative guide on some of the hiring companies based on current job postings and company websites

Current Training and Up-skilling Programs for the Talent Shortage Areas

Various training / up-skilling programs are currently offered to address the talent shortage areas but their effectiveness cannot be ascertained yet

- There are already various initiatives (e.g. training/up-skilling programs currently available or planned for) to address the talent shortage areas (except for media processing). However, as most of these training programs have been introduced quite recently or are still work-in-progress, the effectiveness of the training programs cannot be ascertained as of yet
- Feedback received from industry players and training providers have indicated that these training/up-skilling programs are to some extent able to meet the needs at entry level talent, but are not able to fully address the talent shortage areas for the experienced/senior level talent
- This is because the up-skilling/training programs required for these talent pool is quite specific to the product and technology adopted by the respective industry players. These training / up-skilling programs will require, to a large degree, customization to the specific needs of the industry players
- It will be up to the industry players themselves with the support of various stakeholders to proactively customize the training programs according to their specific and evolving needs
- Because the customization is costly and beyond the affordability for most small and medium-sized industry players, additional support from the relevant government agencies will be crucial in addressing the gaps for these companies
- Eventually, the monitoring of the talent shortage trends will be required to understand the effectiveness of the various training / up-skilling programs

Selected up-skilling/training programs available for the identified talent shortage areas

Talent shortage area	Entry level up-skilling/training program	Experience level up-skilling/training program
IC Design	<ul style="list-style-type: none"> ▪ PSDC FasTrack Lite ▪ SHRDC HIRSE - Analog RFIC Design ▪ SHRDC /MIMS (Malaysia Institute of Microsystems) - Semiconductor Chip Design, Testing, Packaging ▪ NCIA/USains – Northern Corridor Analog & Digital Design (NCADD) ▪ MOHE/ICMic – IC Design Internship ▪ TeSSDE – IC Design 	<ul style="list-style-type: none"> ▪ SHRDC - various under High End Specialized and Niche Programs
Embedded System / Firmware	<ul style="list-style-type: none"> ▪ PSDC FasTrack Lite ▪ SHRDC - Embedded System Design Using Micro-controller ▪ MDeC Job Camp – Embedded system design 	<ul style="list-style-type: none"> ▪ PSDC FastTrack Pro
Software Engineering	<ul style="list-style-type: none"> ▪ PSDC FasTrack Lite ▪ SHRDC - Basic Technical Software Development 	<ul style="list-style-type: none"> ▪ SHRDC - Advanced Technical Software Development
Radio Frequency	<ul style="list-style-type: none"> ▪ PSDC FasTrack Lite ▪ TeSSDE – RF identification system 	<ul style="list-style-type: none"> ▪ PSDC :Fast Track Pro ▪ SHRDC - Practical RF Test and Measurement
Media Processing	NA	NA

The training programs identified here are not comprehensive as they are only an indication of the type of programs available. Many programs are currently being formulated but may not be in the above list

Selected up-skilling/training programs available for the identified talent shortage areas (cont'd)

Talent shortage area	Entry level up-skilling/training program	Experience level up-skilling/training program
Wafer Fabrication	<ul style="list-style-type: none"> ▪ PSDC FasTrack Lite ▪ PSDC / NCIA : Front End Technology Program for the Wafer Fabrication & Semiconductor Industry (NUFET) ▪ Silterra, NCIA, UniMap Centre of Excellence (SNUCoE) ▪ TeSSDE ▪ MIMOS 	<ul style="list-style-type: none"> ▪ QT Training Center
Test/ Measurement	<ul style="list-style-type: none"> ▪ PSDC - various under Skill Enhancement Courses e.g. FMEA, 6 sigma ▪ SHRDC - various under Manufacturing Skill Enhancement Programs : SPC, Root Causes Analysis ▪ SHRDC : HIT-RSE – Built in self test 	<ul style="list-style-type: none"> ▪ PSDC - various under Skill Enhancement Courses e.g. FMEA, 6 sigma ▪ SHRDC – various under Manufacturing Skill Enhancement Programs : SPC, Root Cause Analysis
Product Design R&D	<ul style="list-style-type: none"> ▪ SHRDC : HIT-RSE - System Design and Integration ▪ SHRDC - Reverse Engineering Basic For 3D CAD Modeling. ▪ TeSSDE – Product development & engineering ▪ TeSSDE – LED industrial R&D ▪ TeSSDE – Digital engineering design 	<ul style="list-style-type: none"> ▪ PSDC : Fast Track Pro – Designing for Compliance, Systematic Product Design ▪ SHRDC - Advanced Reverse Engineering For 3D CAD Modeling



Conclusion

The E&E Sector

- The E&E sector is an important contributor to Malaysia's economy as it is one of the 12 National Key Economic Areas (NKEA) in the country's Economic Transformation Programme (ETP)
- In line with ETP projections, Malaysia's E&E sector growth is expected to be robust in the coming years. This growth will require a steady supply of skilled talent, both in numbers and in the appropriate skills-sets , to meet the present and future needs of the sector
- However, the findings of this study points to several talent issues that will have an impact on the talent pool's ability to support the E&E sector

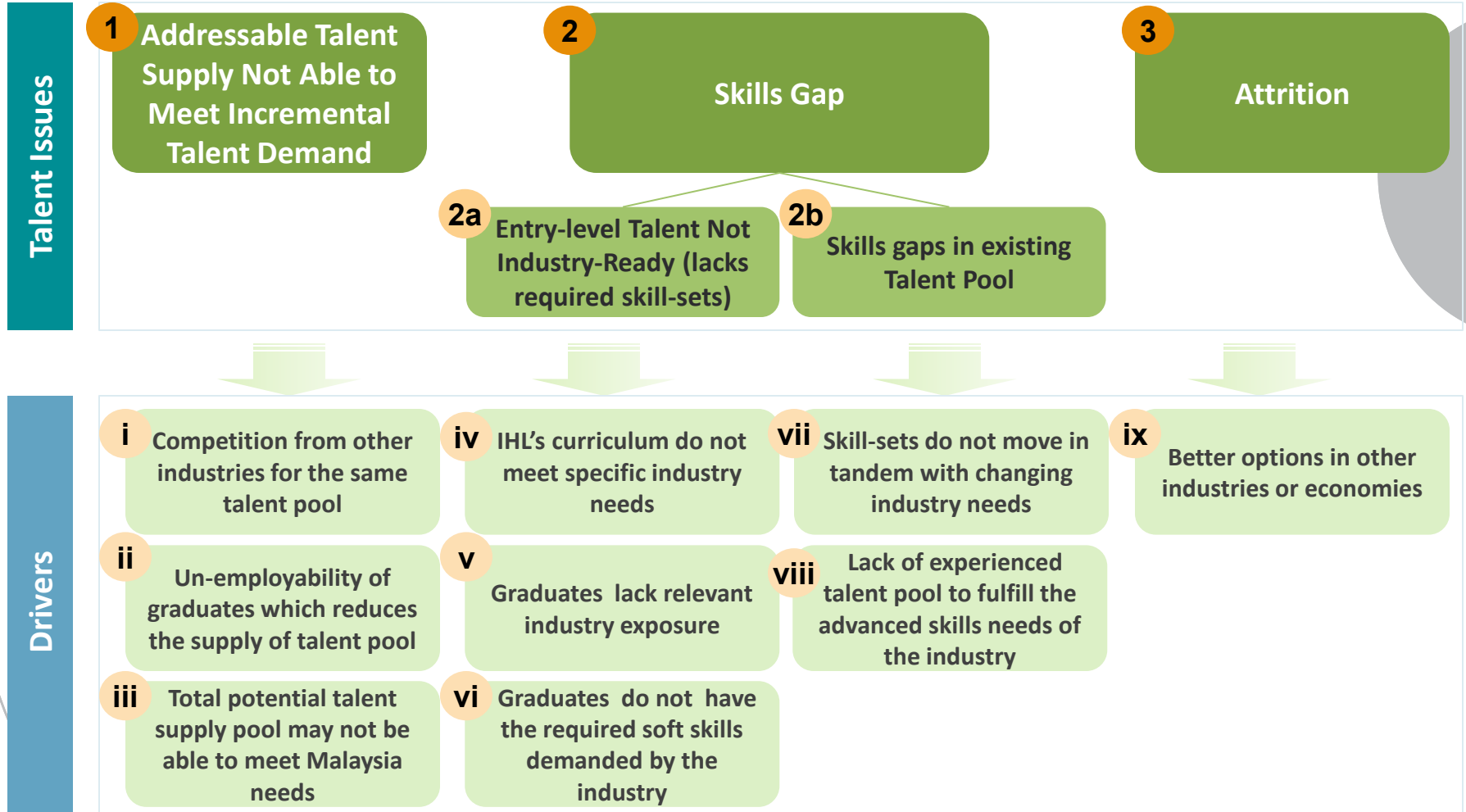
Gaps in Talent Supply-Demand and Skill- sets

- The analysis of this study indicates that new addressable supply is not able to meet the incremental talent demanded by the E&E sector for its core technical talent. There is a significant gap in the talent supply-demand projections
- This gap is due to several factors that includes competition from other sectors and economies for the same talent pool, as well as the un-employability of graduates that reduces the pool of addressable talent

Conclusion

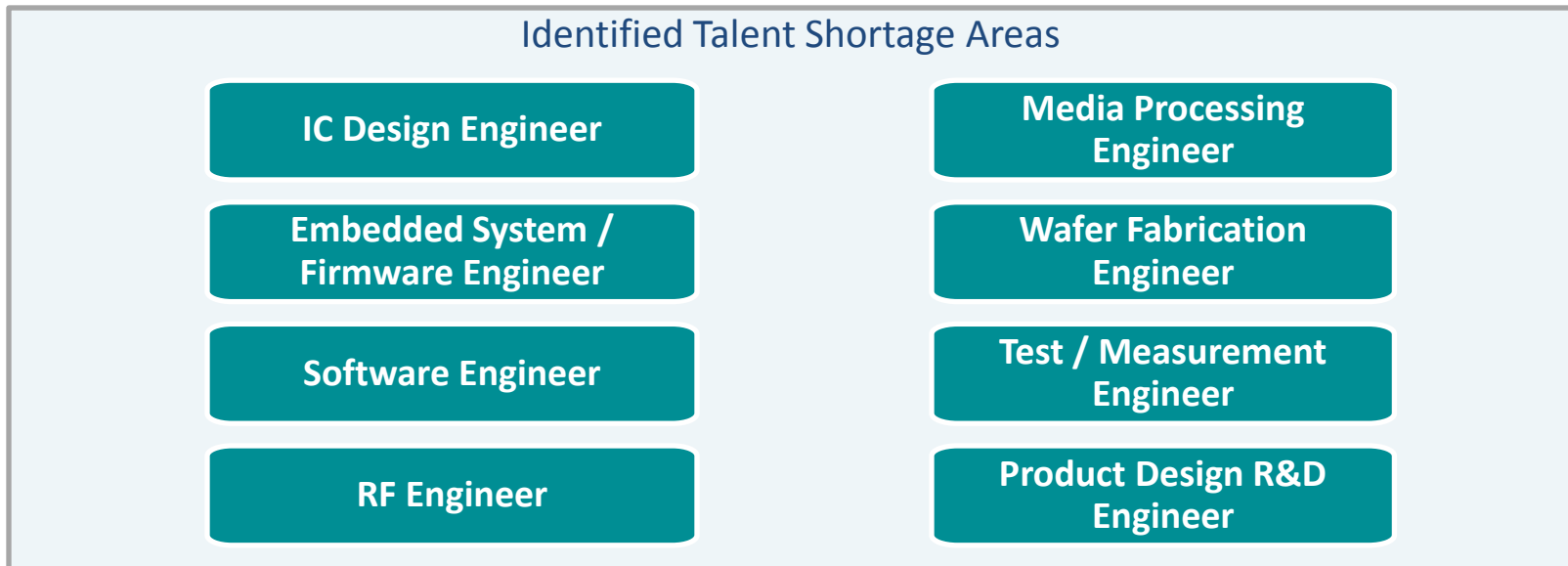
- The sector also faces a situation of skills gaps, where adequately trained and skilled talent, both at entry and experienced levels are lacking. These are mainly in the areas of high value-added activities such as in R&D and high end processing activities
- The gap in talent demand-supply numbers and skill-sets is further exacerbated by issues of talent attrition, whereby the E&E sector is losing its experienced talent to competing sectors and countries. The loss of these experienced talent has an adverse impact on the quality and level of skill-sets within the E&E sector since these talent would typically have good skill sets to be considered for international opportunities
- Collectively, these gaps or talent issues that the E&E sector is facing can be summarized into 3 broad areas:
 1. Addressable Talent Supply Not Able to Meet Incremental Talent Demand
 2. Skills Gaps in entry level and existing (experienced) talent pool
 3. Attrition
- These talent issues and the drivers for these issues are summarized in the following page

The talent issues and its drivers can be broadly categorized under the following headers



Key Talent Shortage Areas

- The study also identified several areas where the talent shortage is prevalent i.e., areas in which industry players are unable, or find it difficult, to recruit entry and experienced level talent with the required skill-sets needed for the specific roles. These are mainly in the areas of R&D and Engineering Support functions
- These talent shortage areas identified by this study are as follows:



The Talent Issues Demands Immediate Action from All Stakeholders

- There is a need for active participation by all stakeholders based on their respective roles within the E&E sector
- There has to be a cohesive and a comprehensive approach to enhance present initiatives and to formulate new initiatives to address the talent issues. It should cover programs in talent attraction to ensure the E&E sector has the adequate number of talent; talent development in ensuring the talent pool has the required skill-sets; and talent retention to ensure the E&E sector does not lose its experienced skilled talent

