1st PEC DEANS

International Conference

of Engineering Institutions

Accreditation & Challenges

Professor Megat Johari MEGAT MOHD NOOR

Board Member, Board of Engineers Malaysia, BEM
Council Member, Engineering Technology Accreditation Council (ETAC), BEM
Council Member, Engineering Accreditation Council (EAC), BEM
Former Director, Engineering Accreditation Department, BEM
Associate Director (International), Engineering Accreditation Department (EAD), BEM
Professional Engineer with Practicing Certificate, BEM
Deputy President & Fellow, Malaysian Society for Engineering & Technology (MySET)
Vice President, Federation of Engineering Institutions of Islamic Countries (FEIIC)
Former Vice-President & Fellow, Institution of Engineers Malaysia (IEM)
Former Director, Centre for Quality & Risk Management (QRiM), UTM
Professor & Founding Dean, Malaysia Japan International Institute of Technology, UTM

UTM UNIVERSITI TEKNOLOGI MALAYSIA | MJIIT MALAYSIA-JAPAN INTERNATIONAL INSTITUTE OF TECHNOLOGY

MySET

Outlines

- Introduction
- Accreditation & Quality
- Going Global
- Conclusions

Introduction

OBE Accreditation Meets Pakistan HEIs (Before ... 2017)

Washington Accord a US hegemony?

Pakistan Washington Accord Route (2010 – 2017)

- **Nominator (EME, GIKI)**
  First visit: Jan 2010
  Provisional Status: Jun 2011

- **Mentor (Islamabad, Topi, Taxila, Risalpur, Faisalabad, Peshawar, Karachi, Lahore, Jamshoro, Quetta)**

- **1a Reviewer (GIKI, NUST, IST)**
  Visit: Nov 2016
- **1b Reviewer (ADM)**
  Visit: 27 Jan 2017

Nominators
Prof Abang (MAL)
Prof Megat (MAL)
Prof Lock (SIN)

Mentors
Prof Megat (MAL)
Ir Azlan (MAL)
Prof Lock (SIN)

Reviewers
Kim (Korea)
Collins (UK)
Basil (NZ)

Full Signatory in Jun 2017
at IEAM Anchorage, Alaska, USA

2010 – 2017

Sponsor Visit – Mentor Visits – Reviewer Visits – WA decision

WASHINGTON ACCORD FULL SIGNATORY

1. Australia - Engineers Australia (*1989*)
2. New Zealand - Institution of Professional Engineers NZ (*1989*)
3. Canada - Engineers Canada (*1989*)
4. United States - Accreditation Board for Engineering and Technology (*1989*)
5. United Kingdom - Engineering Council UK (*1989*)
6. Ireland - Engineers Ireland (*1989*)
7. Hong Kong China - The Hong Kong Institution of Engineers (*1995*)
8. South Africa - Engineering Council of South Africa (*1999*)
9. Japan - Japan Accreditation Board for Engineering Education (*2005*)
10. Singapore - Institution of Engineers Singapore (*2006*)
11. Chinese Taipei - Institute of Engineering Education Taiwan (*2007*)
12. Korea - Accreditation Board for Engineering Education of Korea (*2007*)
13. Malaysia - Board of Engineers Malaysia (2009)
14. Turkey - MUDEK (2011)
15. Russia - Association for Engineering Education of Russia (2012)
16. India - National Board of Accreditation (2014)
17. Sri Lanka - Institution of Engineers Sri Lanka (2014)
18. China - CAST (2016)
19. Pakistan – PEC (2017)

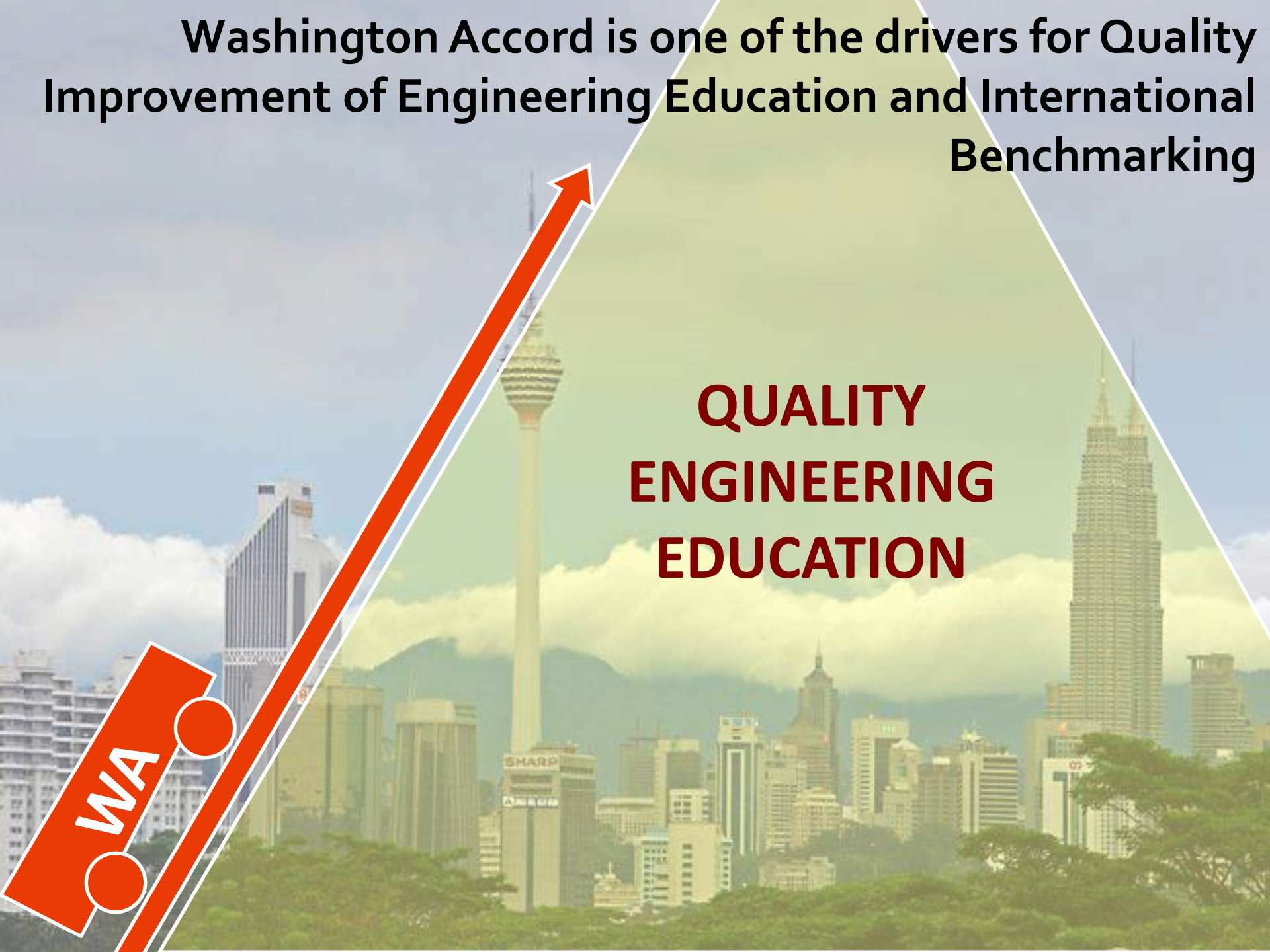
Provisional Status

20. Bangladesh
21. Phillippines
22. Peru
23. Costa Rica
24. Mexico

Potential Applicants

25. Thailand
26. Indonesia
27. Chile
28. Saudi Arabia
29. Nigeria

Washington Accord is one of the drivers for Quality Improvement of Engineering Education and International Benchmarking

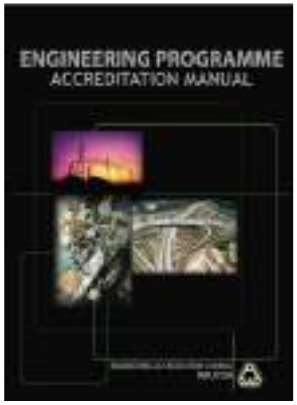


Accreditation Manual

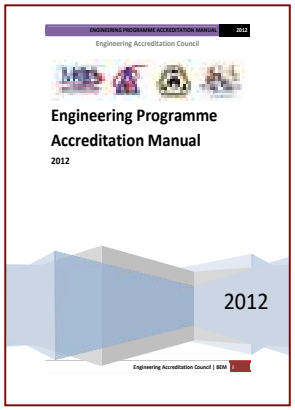
From input based to outcome based

1999

2003



2006



2012

2017

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MySET

Accreditation & Quality

Importance of Accreditation

- Recognises institutional **missions and goals**
- Involves faculty/staff in **evaluation and planning**
- Assists institutions in determining the acceptability of **transfer credits**
- Promotes **“best practices”** in education
- Increases **visibility and reputation** of the institution
- Aids engineering schools to identify **required operational resources** to institution management

Importance to the Profession

- Ensures that graduates have **met the educational requirements** to enter the profession
- Enhances the **mobility of graduate** professionals
- Provides **professional development** for faculty and industry practitioners
- Provides opportunity for the profession to **guide the educational process** to reflect current and future needs

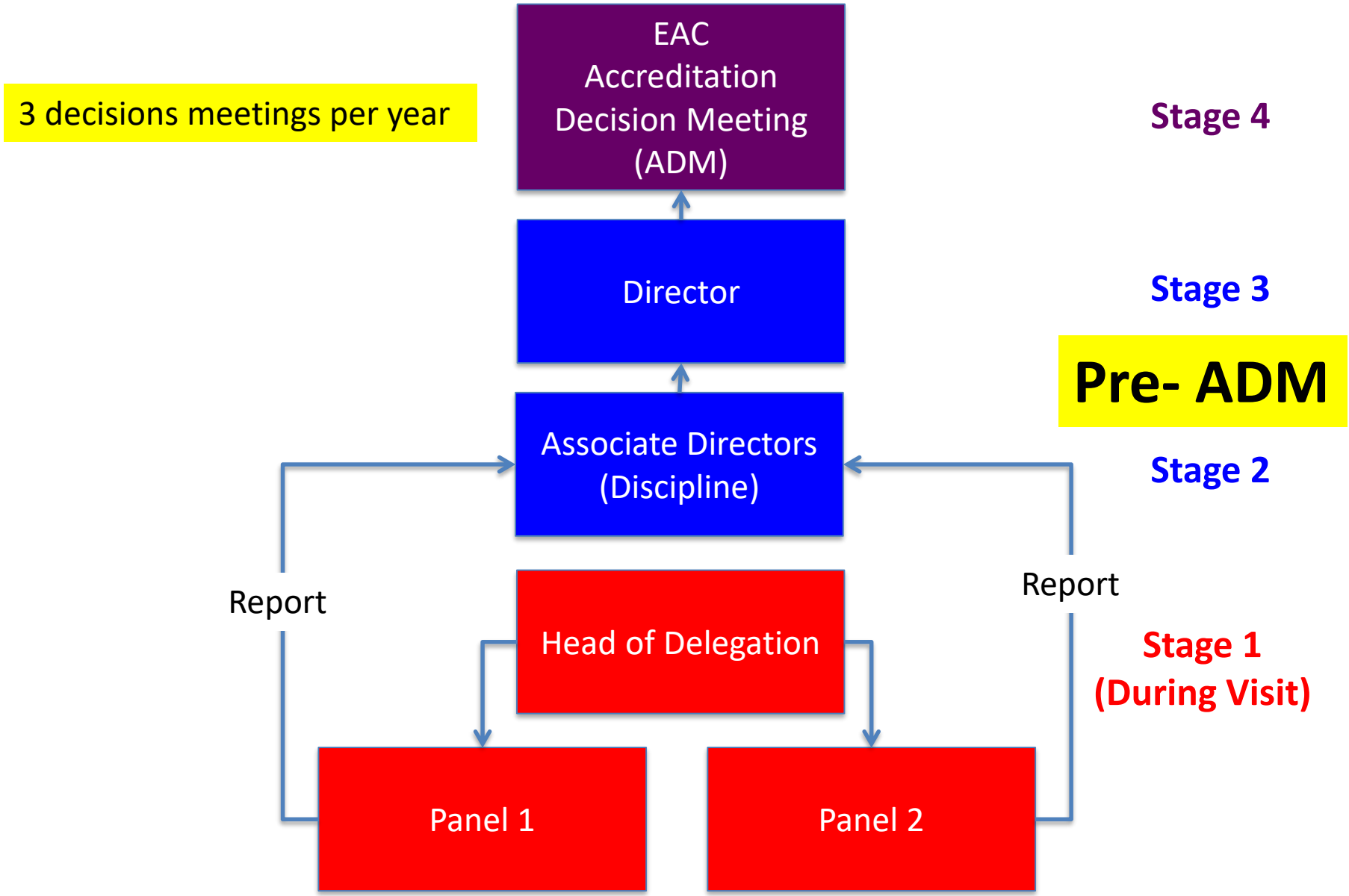
Accreditation Issues & Challenges

- Engineering education is to prepare graduates to face **challenges of the future** while meeting the **current needs**
- Paradigm Shift – **Outcome & Quality**
- Maintain **Fundamentals** while Encourage Inclusion of **Latest Technology** Advancement in the Curriculum
- Allow Academic **Innovation** and **Creativity**
- Variety of Modes of **Delivery**

Data on Accreditation Years Accorded for Malaysia Engineering Programmes (2008 – 2015)

Year	Accreditation Year Accorded/Programme							Total Accredited Programme	Total IHL
	1 Year	2 Years	3 Years	4 Years	5 Years	Defer	Decline		
2008	0	64	13	0	0	1	0	78	20
2009	7	69	11	0	0	2	0	89	15
2010	9	89	19	0	0	2	0	119	26
2011	1	76	41	0	1	9	0	128	30
2012	26	41	11	0	0	7	3	88	26
2013	18	55	50	0	12	1	0	136	32
2014	2	30	47	5	42	1	0	127	27
2015	4	28	30	0	4	0	3	69	28

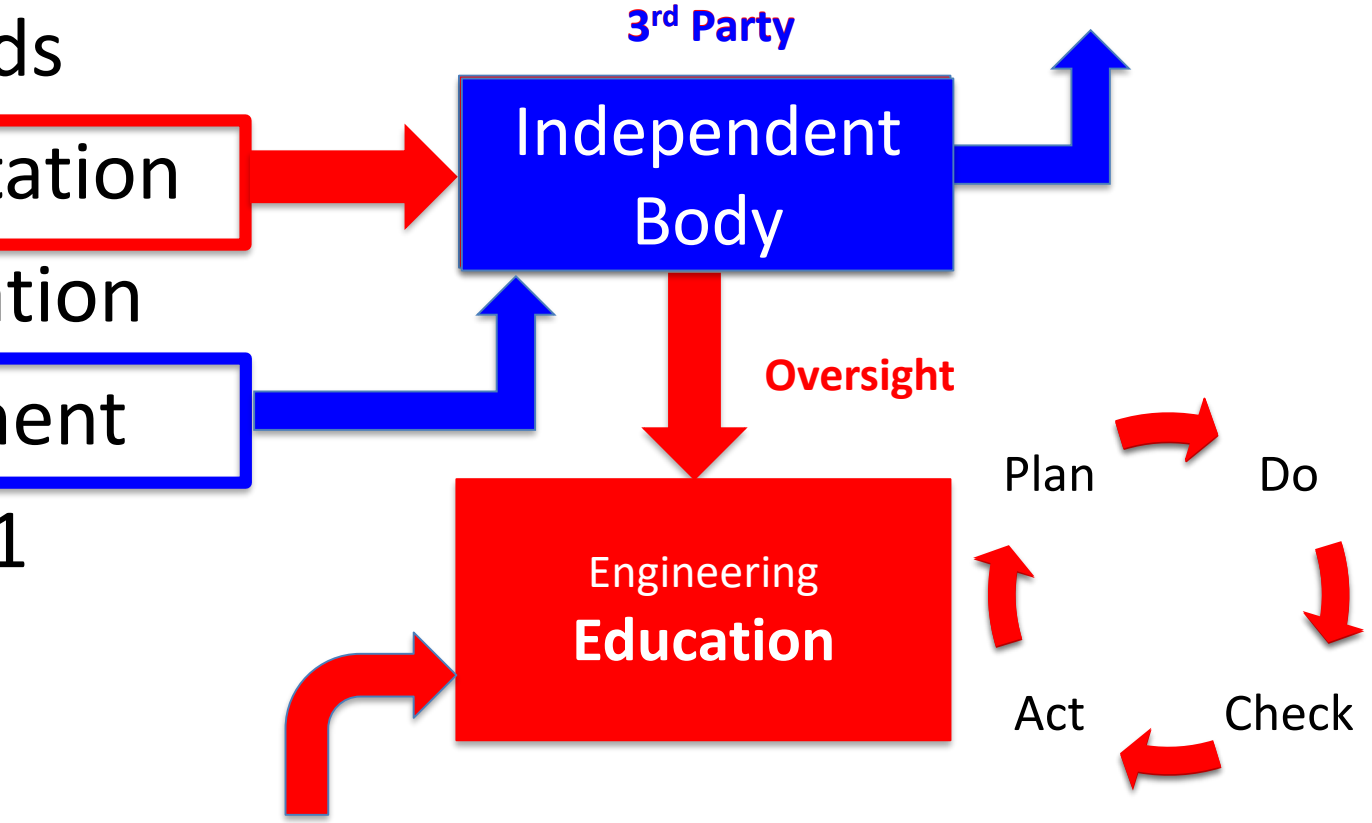
Consistency of Decision



Quality

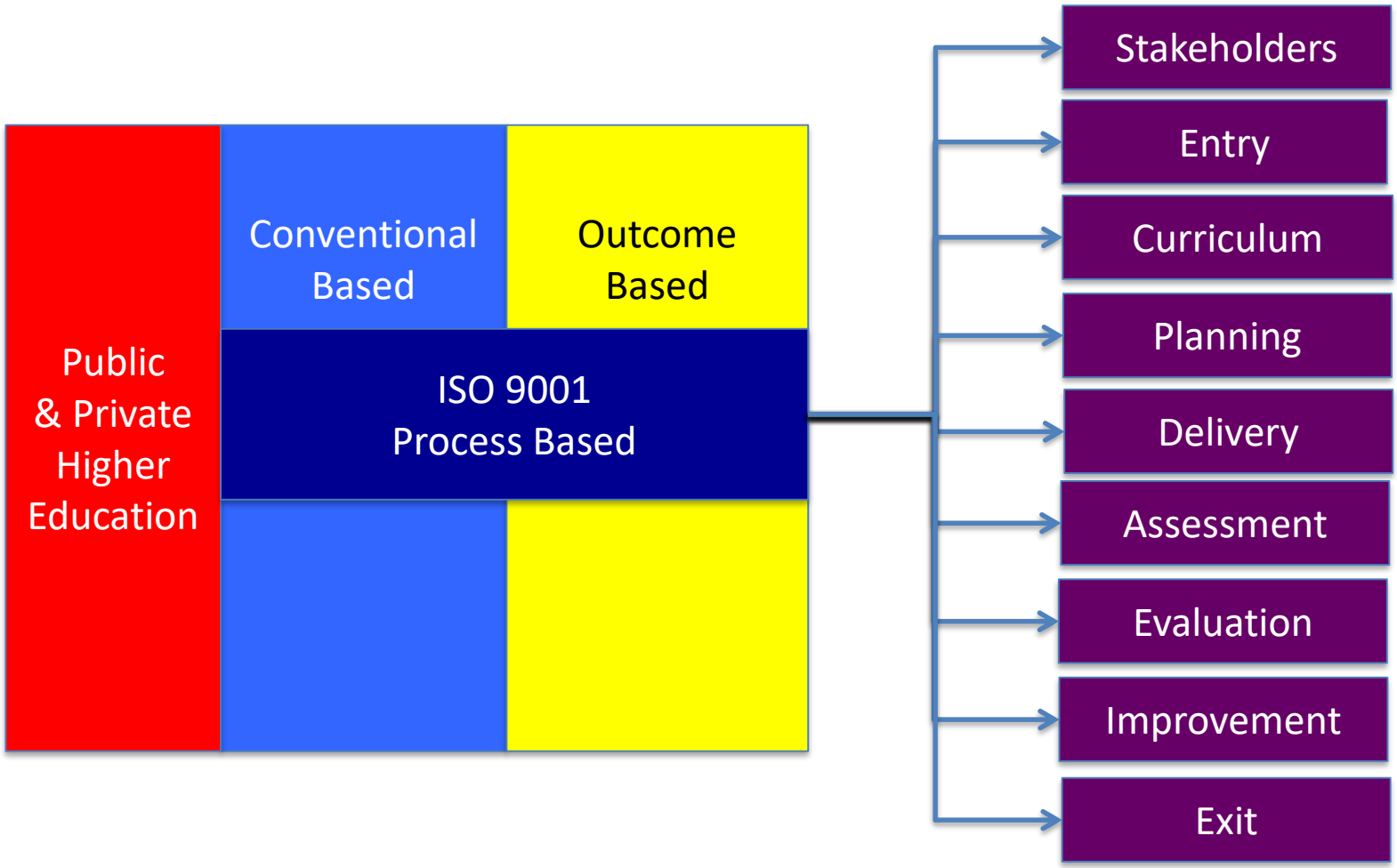
Engineers
Competency Assessment

- Standards
- Accreditation
- Certification
- Assessment
- ISO 9001



Industry Input

Quality Assurance

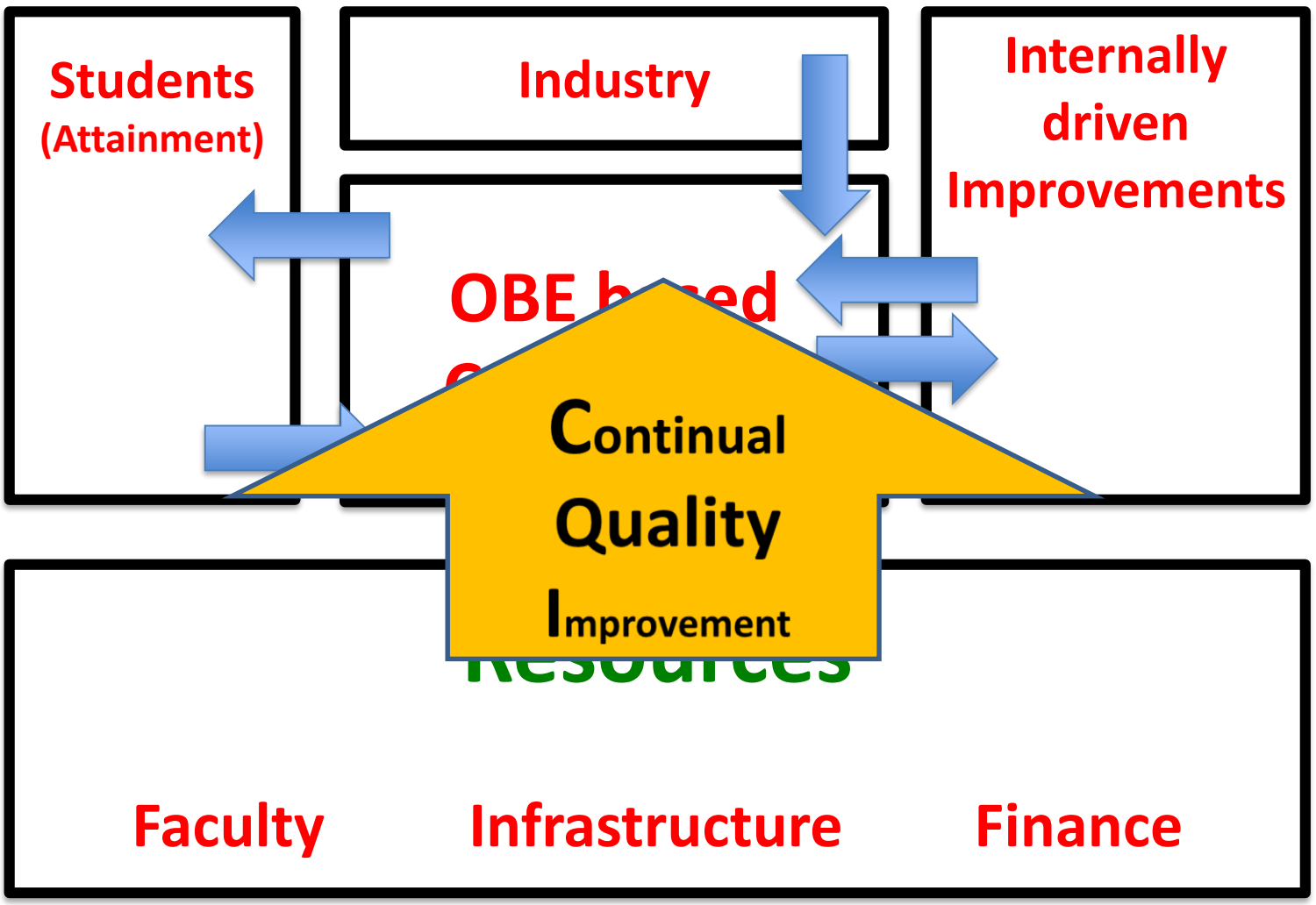


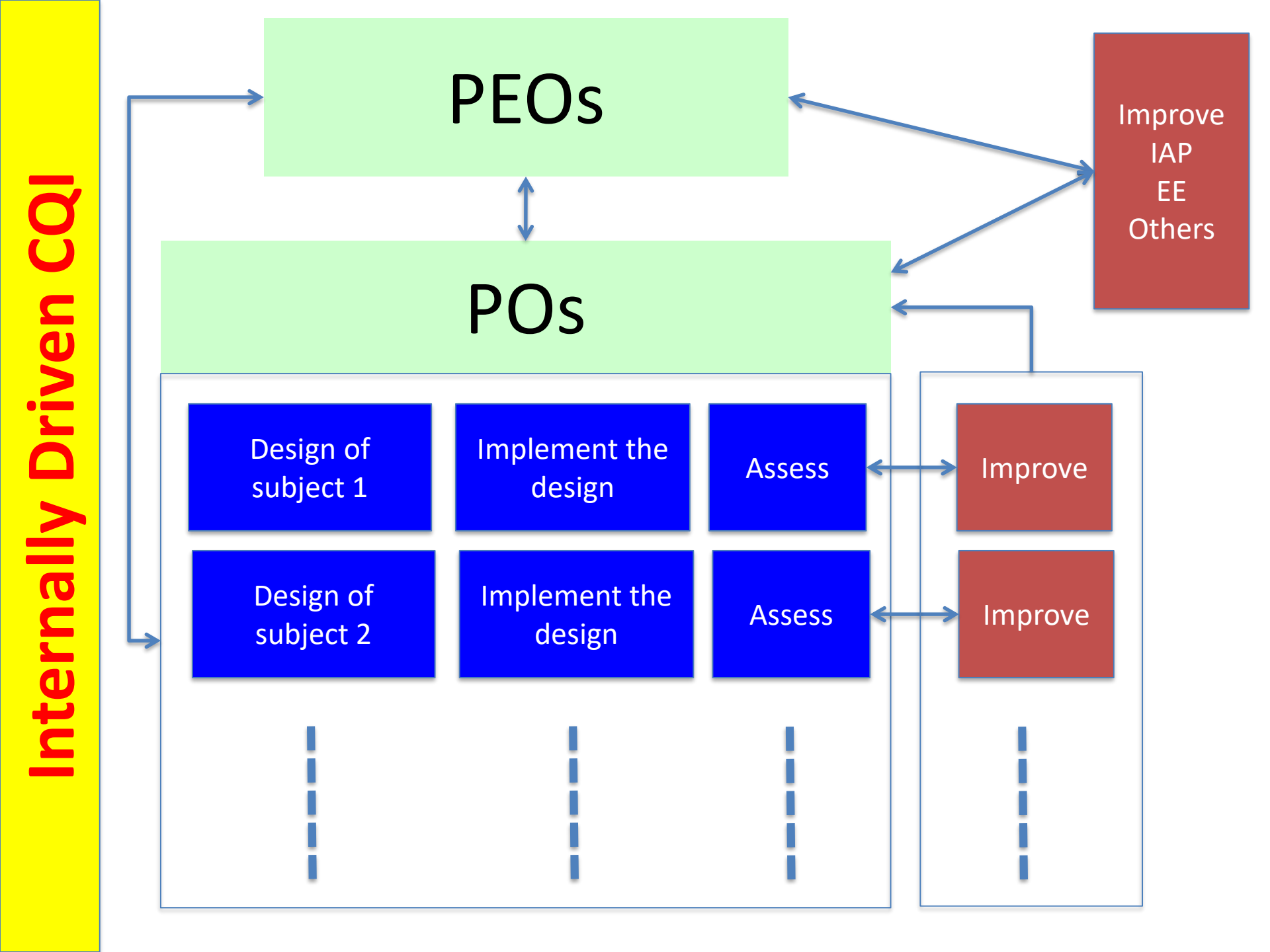
ACCREDITATION & ACCULTURALISATION

QUALITY EDUCATION

- Knowledge
- Behaviour
- Attitude
- DNA

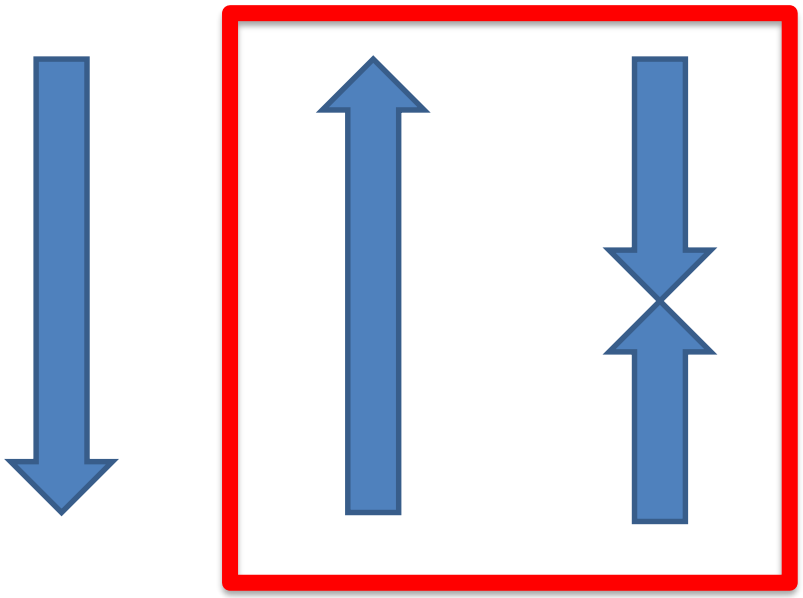
Quality Management System

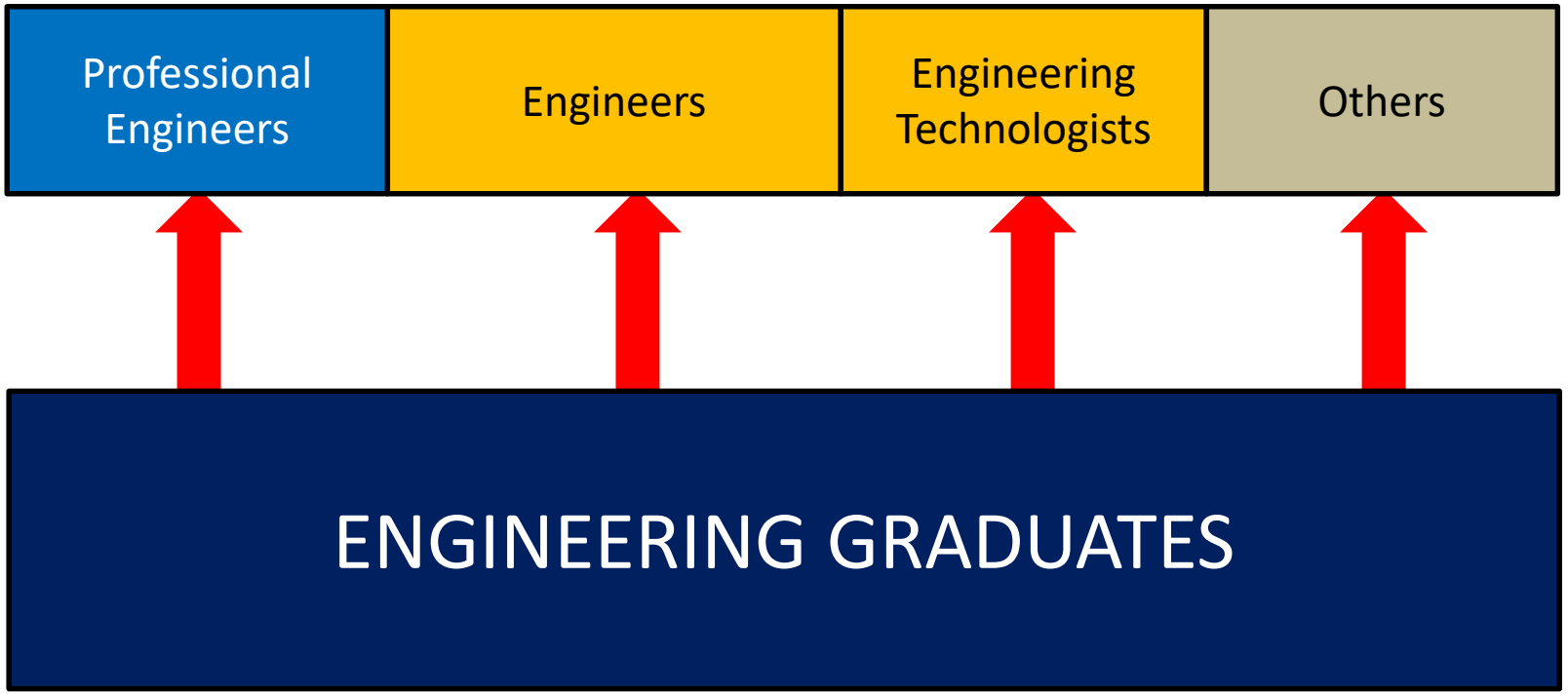



Internally Driven CQI
PEOs
POs
Improve
IAP
EE
Others
Design of subject 1
Implement the design
Assess
Improve
Design of subject 2
Implement the design
Assess
Improve

Strategy of OBE

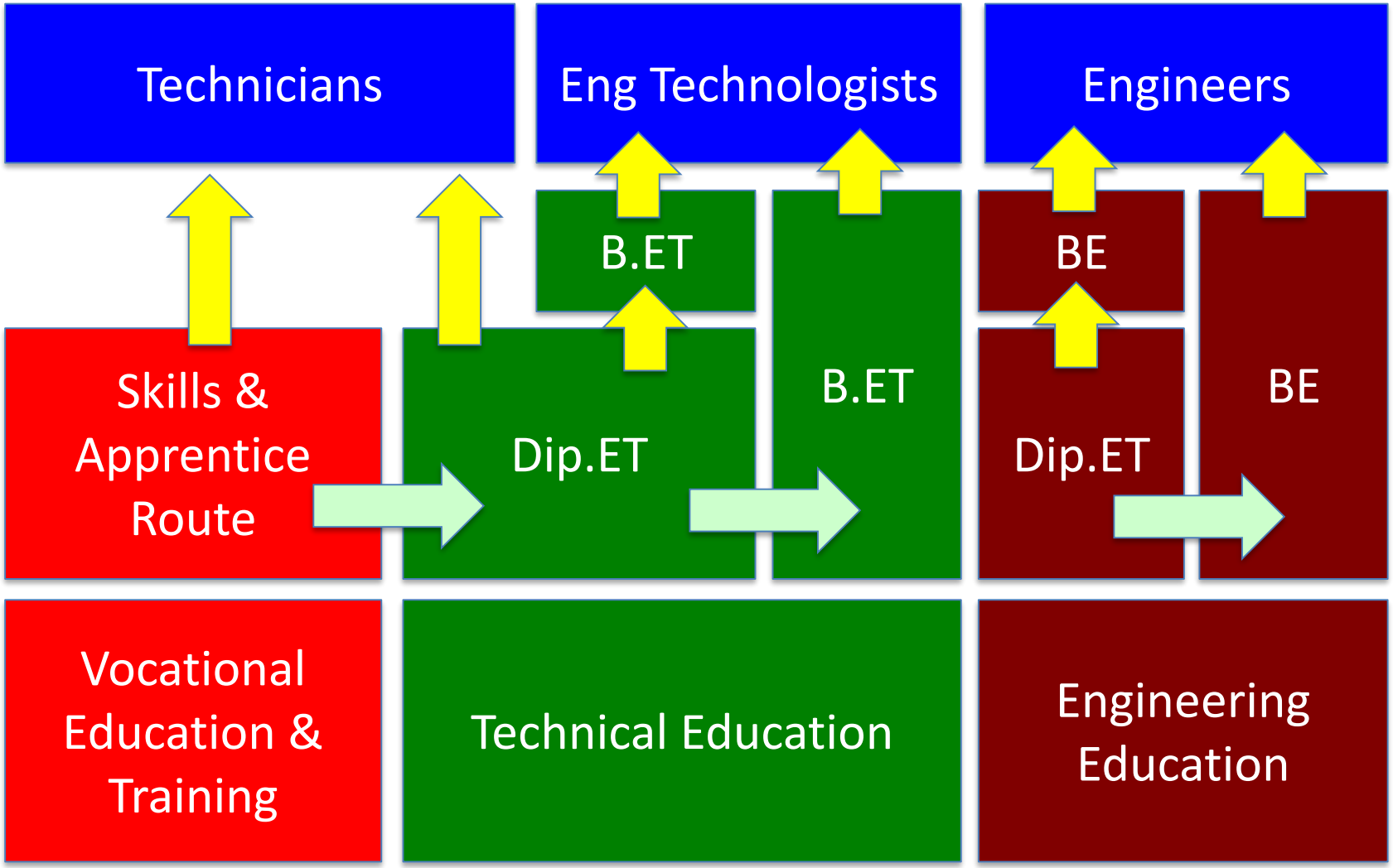
- Top down curricula design
- Appropriate Teaching & Learning Methods
- Appropriate Assessment & Evaluation Methods



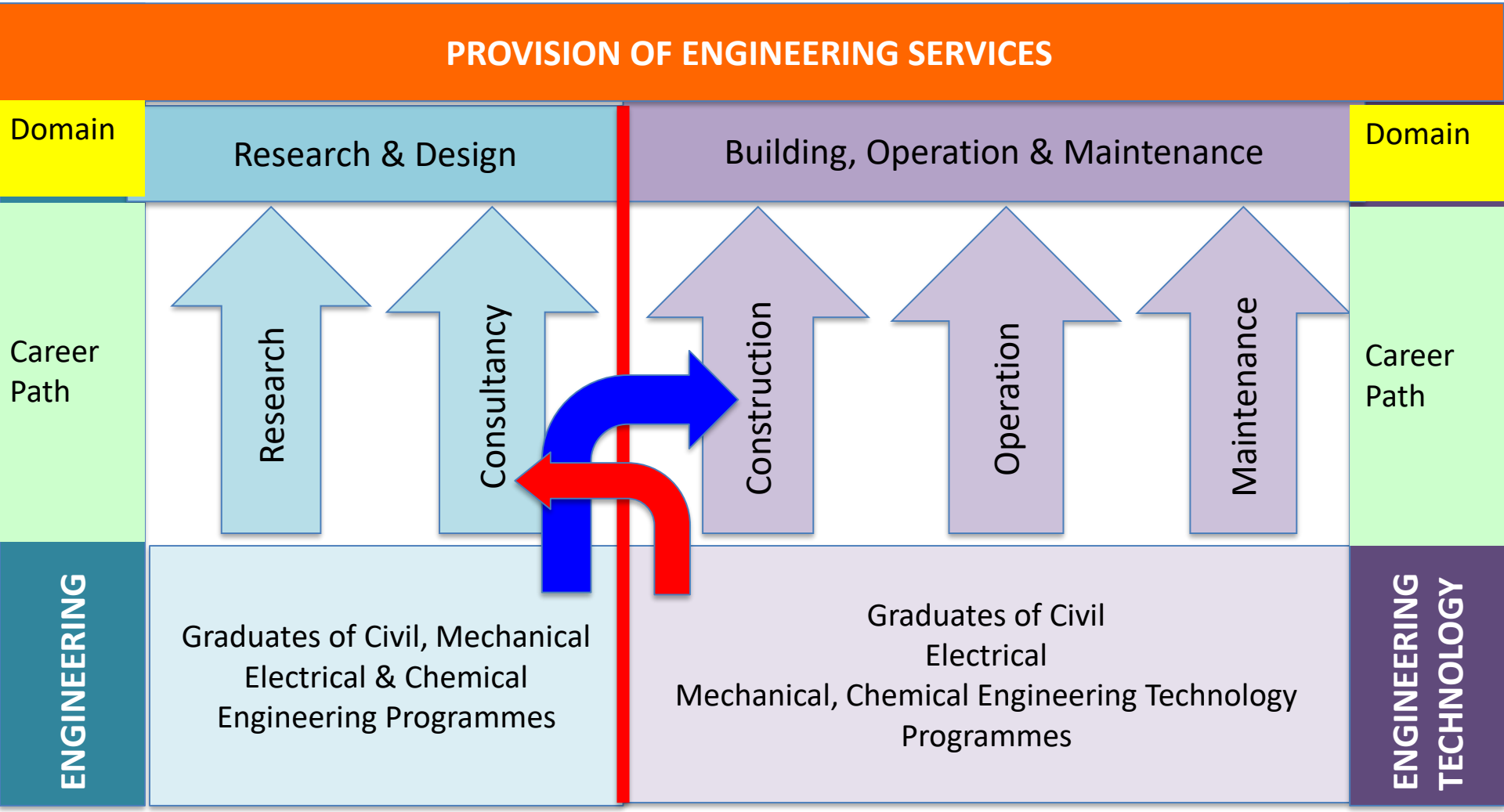

Professional Engineers
Engineers
Engineering Technologists
Others
ENGINEERING GRADUATES

Engineering Team

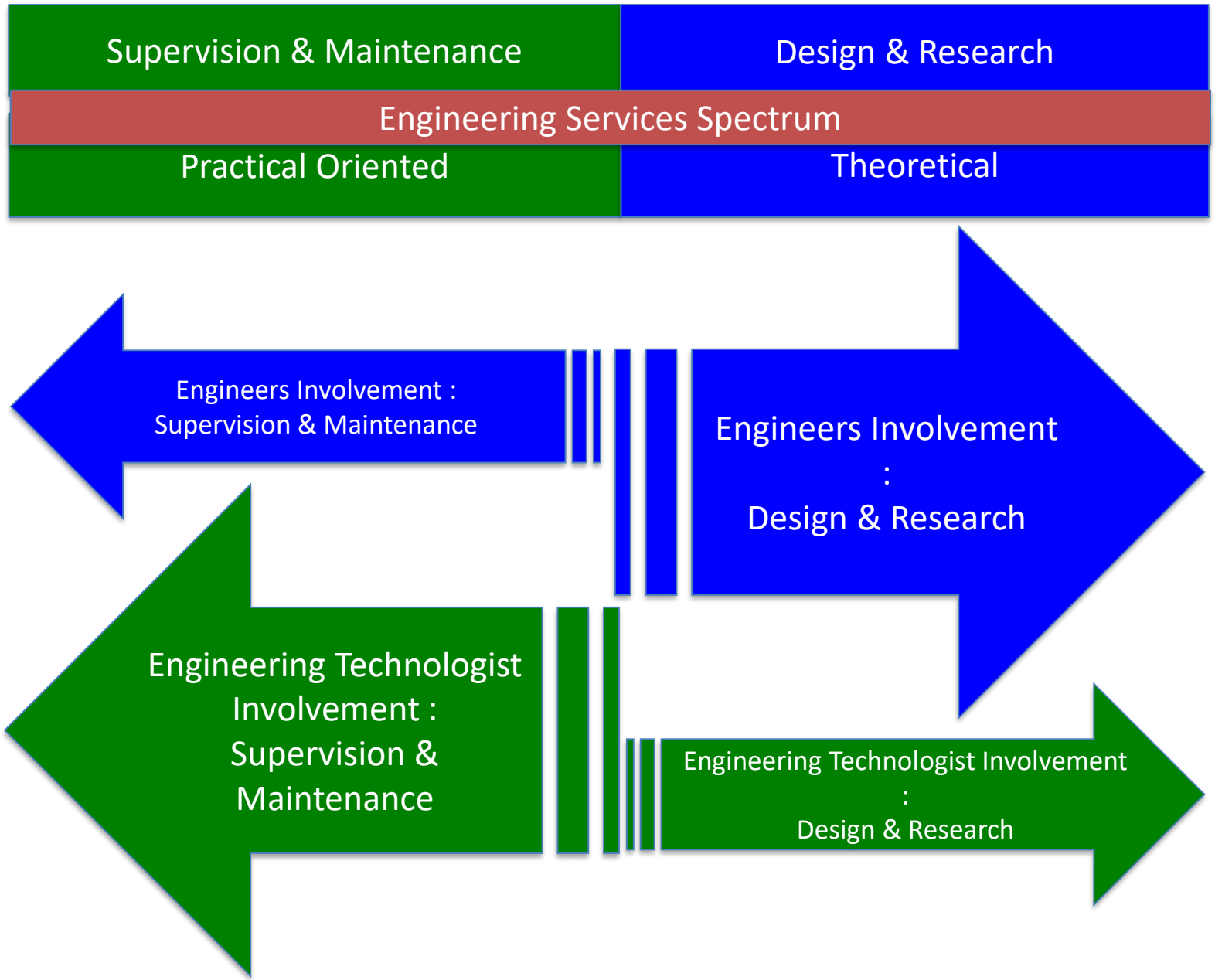
Training & Education Pathways

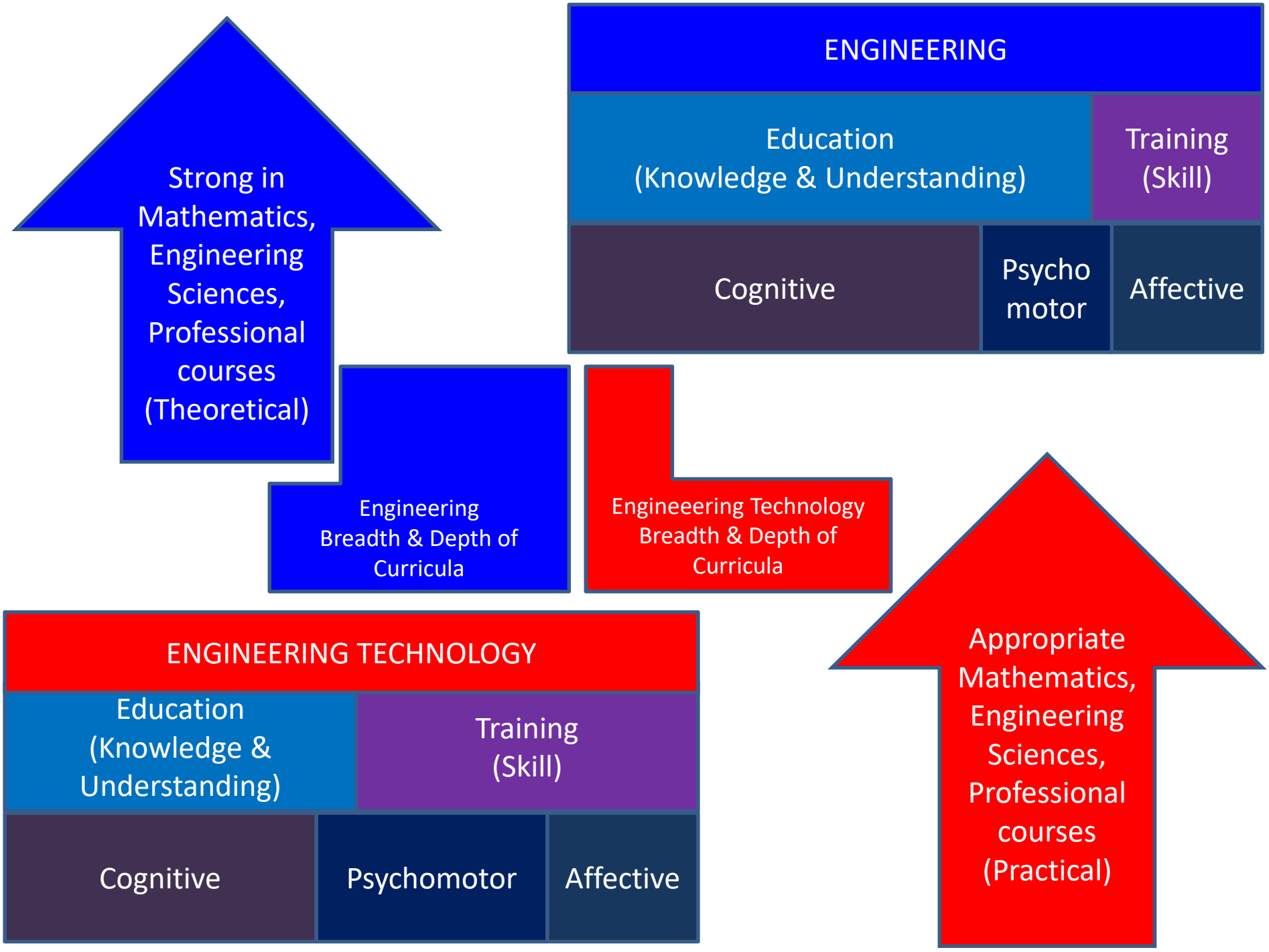


Career Paths



Domain of Practice




ENGINEERING
Education
(Knowledge & Understanding)
Training
(Skill)
Cognitive
Psycho
motor
Affective
Strong in
Mathematics,
Engineering
Sciences,
Professional
courses
(Theoretical)
Engineering
Breadth & Depth of
Curricula
Engineeering Technology
Breadth & Depth of
Curricula
ENGINEERING TECHNOLOGY
Education
(Knowledge &
Understanding)
Training
(Skill)
Cognitive
Psychomotor
Affective
Appropriate
Mathematics,
Engineering
Sciences,
Professional
courses
(Practical)

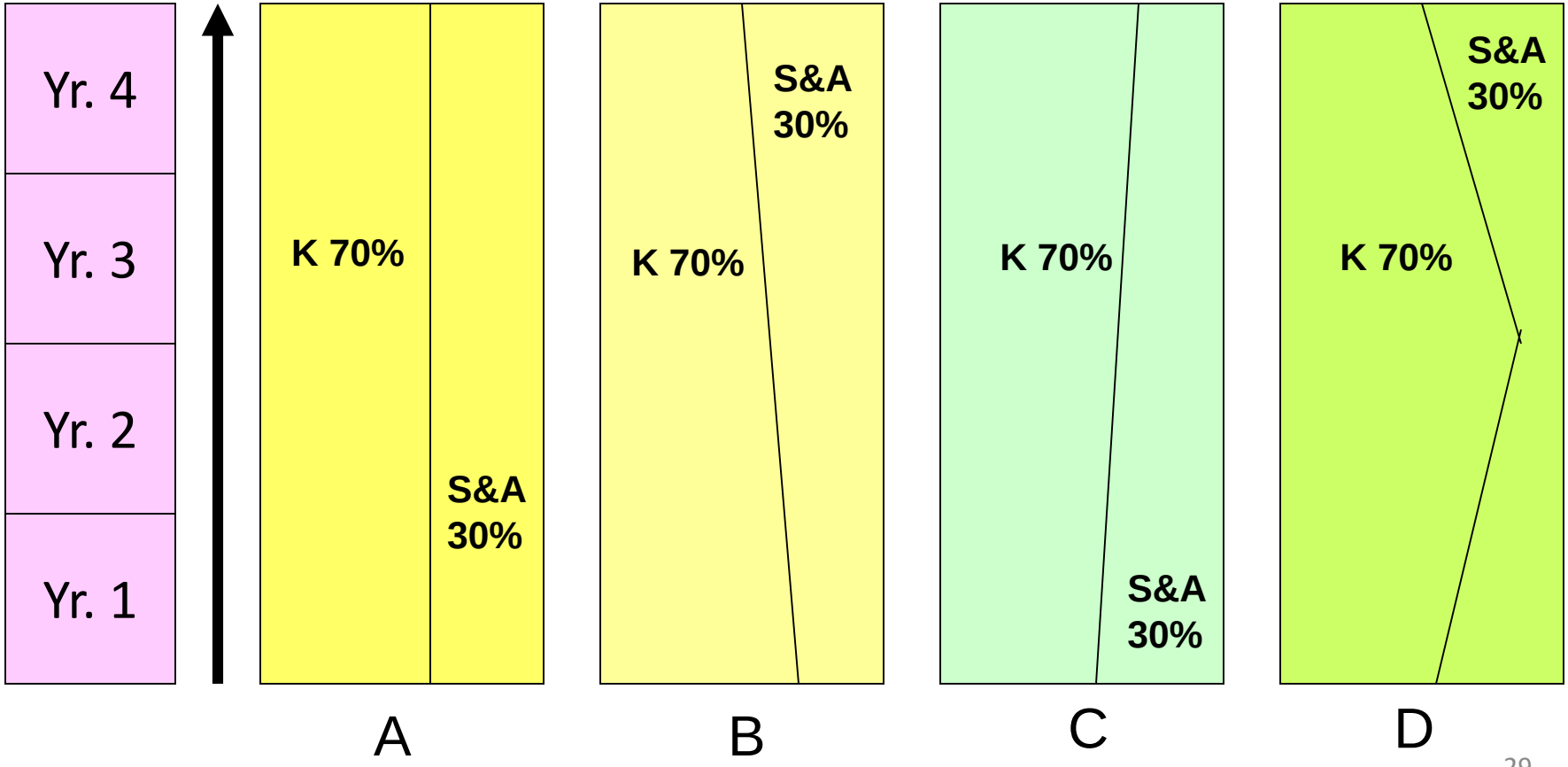
Programme Educational Objectives

WHAT YOU WANT YOUR GRADUATES TO BE IN 3 - 5 YEARS

EXTRA-CURRICULAR	PLO 1 ENGINEERING KNOWLEDGE PLO 2 PROBLEM ANALYSIS	PLO3 DESIGN	PLO9 IND & TEAM	UNIVERSITY EXPERIENCE
		PLO5 MODERN TOOLS	PLO10 COMMUNICAT-ION	
		PLO6 ENGR & SOC PLO7 ENV & SUST PLO8 ETHICS	PLO11 PROJ MGMT & FINANCE	
		PLO4 INVESTIGATION	PLO12 LIFE LONG	

Curricula Models

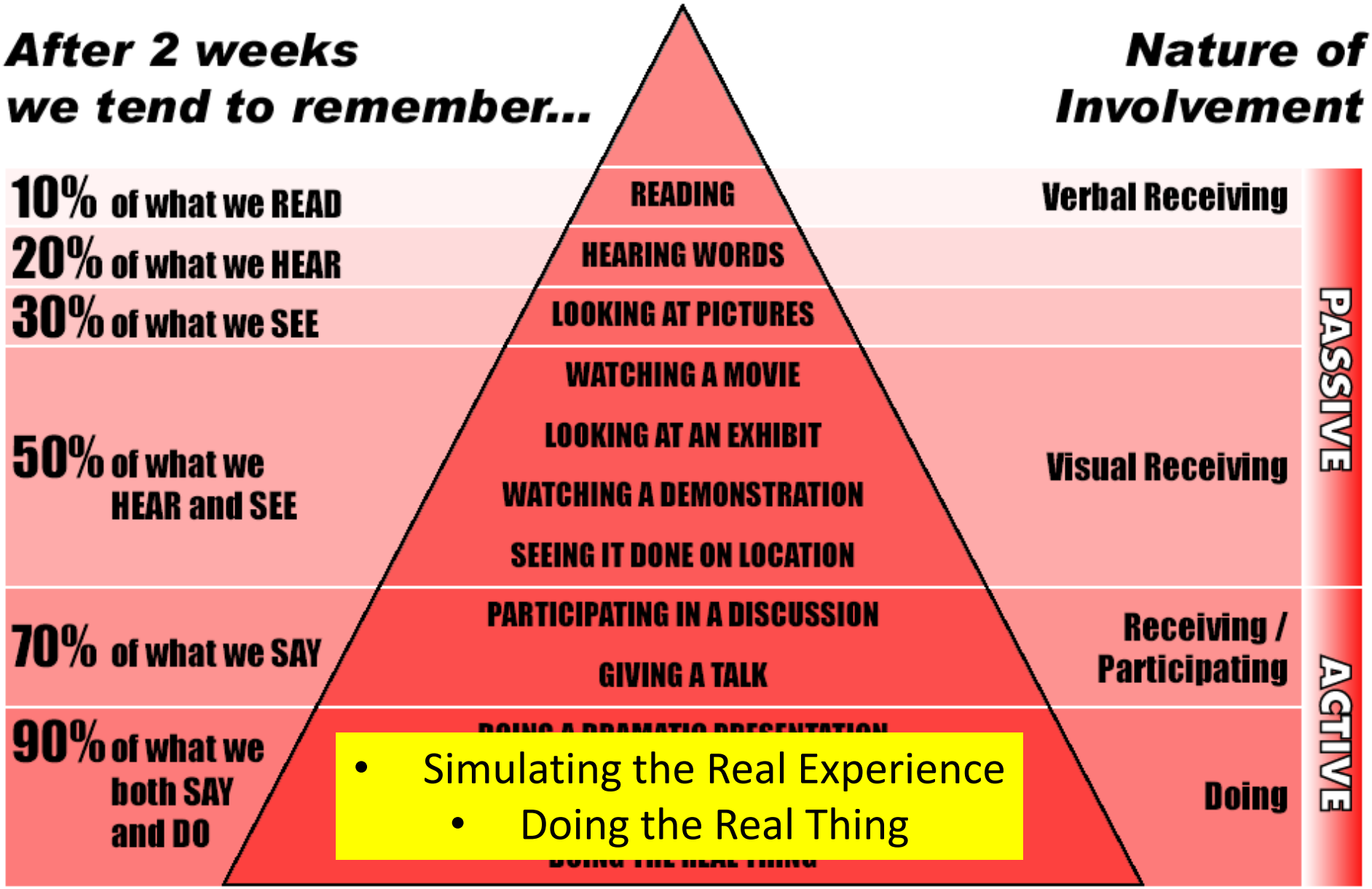
Distribution of Knowledge, Skills & Attitude elements throughout the 4 years



Learning Style Model

- Perception — Sensing — Intuitive
- Input Modality — Visual — Verbal
- Processing — Active — Reflective
- Understanding — Sequential — Global

Cone of Learning (Edgar Dale)



Problem Oriented, Team-Based Project Work as a Learning/Teaching Device

1. Problem-oriented project-organized education deals with the solution of theoretical problems through the use of any relevant knowledge, whatever discipline the knowledge derives from. We are dealing with **KNOW WHY** (Research Problems).
2. In design-oriented project work, the students deal with **KNOW HOW** problems that can be solved by theories and knowledge they have acquired in their previous lectures. (Design Problems).

OBE

Directed & Coherent Curriculum
Graduate Relevant to Industry

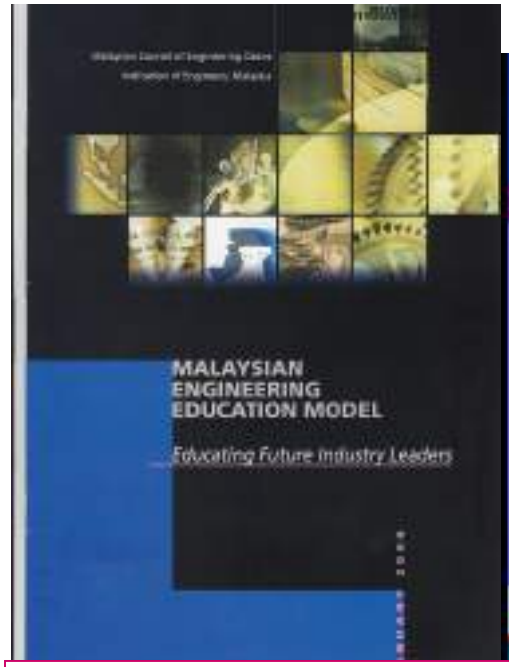
Programme Educational Objective
(after 3-5 Years)

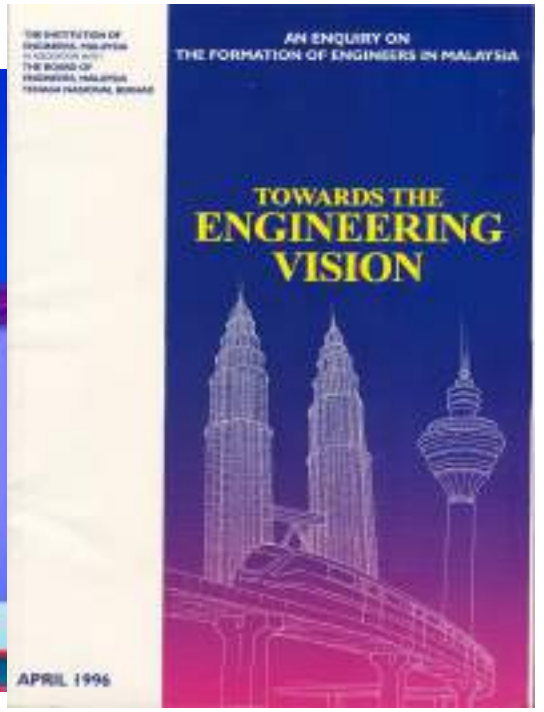
Programme Learning Outcome
(at Exit)

Course/Unit/Learning Outcome
(Abilities & Intentional)

Accountable

Malaysian Engineering Formation Studies





Formation of Engineers in Malaysia, 1996.
Towards the Engineering Vision.

Malaysian Engineering Education Model, 2000.
Educating Future Industry Leaders.

Malaysian Engineering Technologist and Engineering Technician, 2003
Blueprint for a highly competent engineering workforce

Future Direction for Engineering Education in Malaysia, 2006

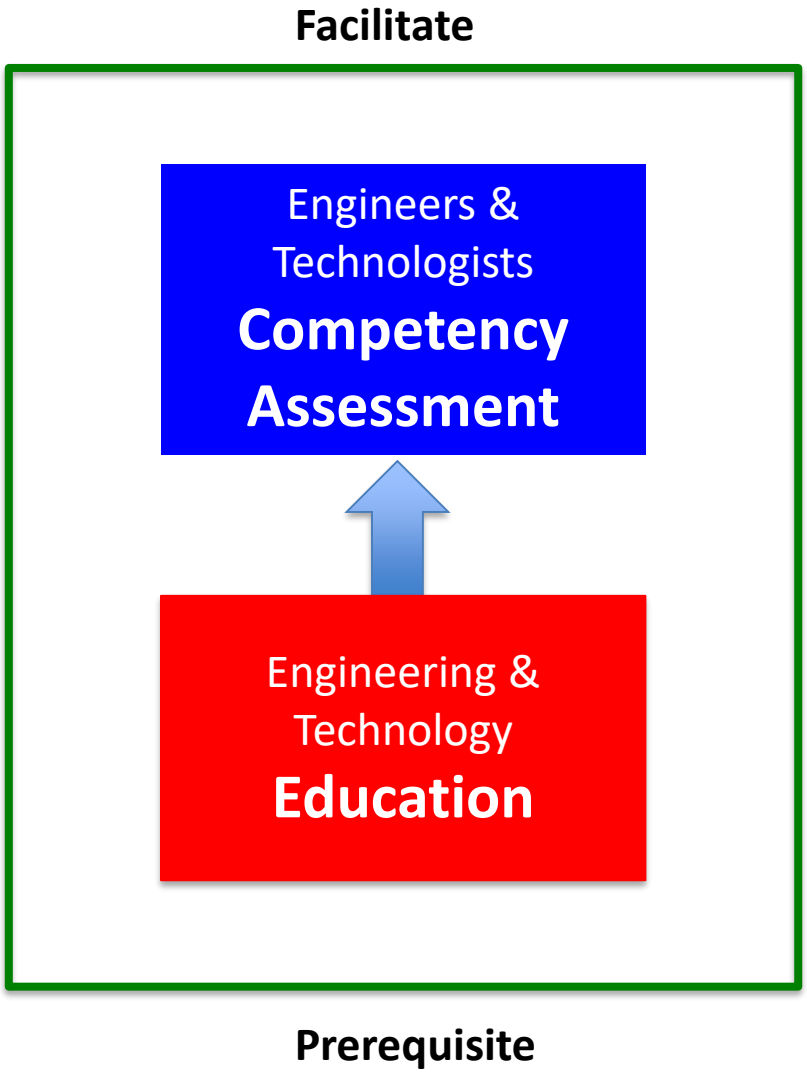
Engineering Education in Malaysia

- Providing **scientific** and **engineering** solutions.
- Fulfilling **national** and **global** requirements**.**
- Addressing **industry** needs.
- Stimulating **innovativeness** and **creativity**.
- Addressing **interdisciplinary** and **multidisciplinary** challenges.
- Sustaining **resources**.

Global

Mobility

- Employment
- Support
- Relief
- Interactions
- Initiatives

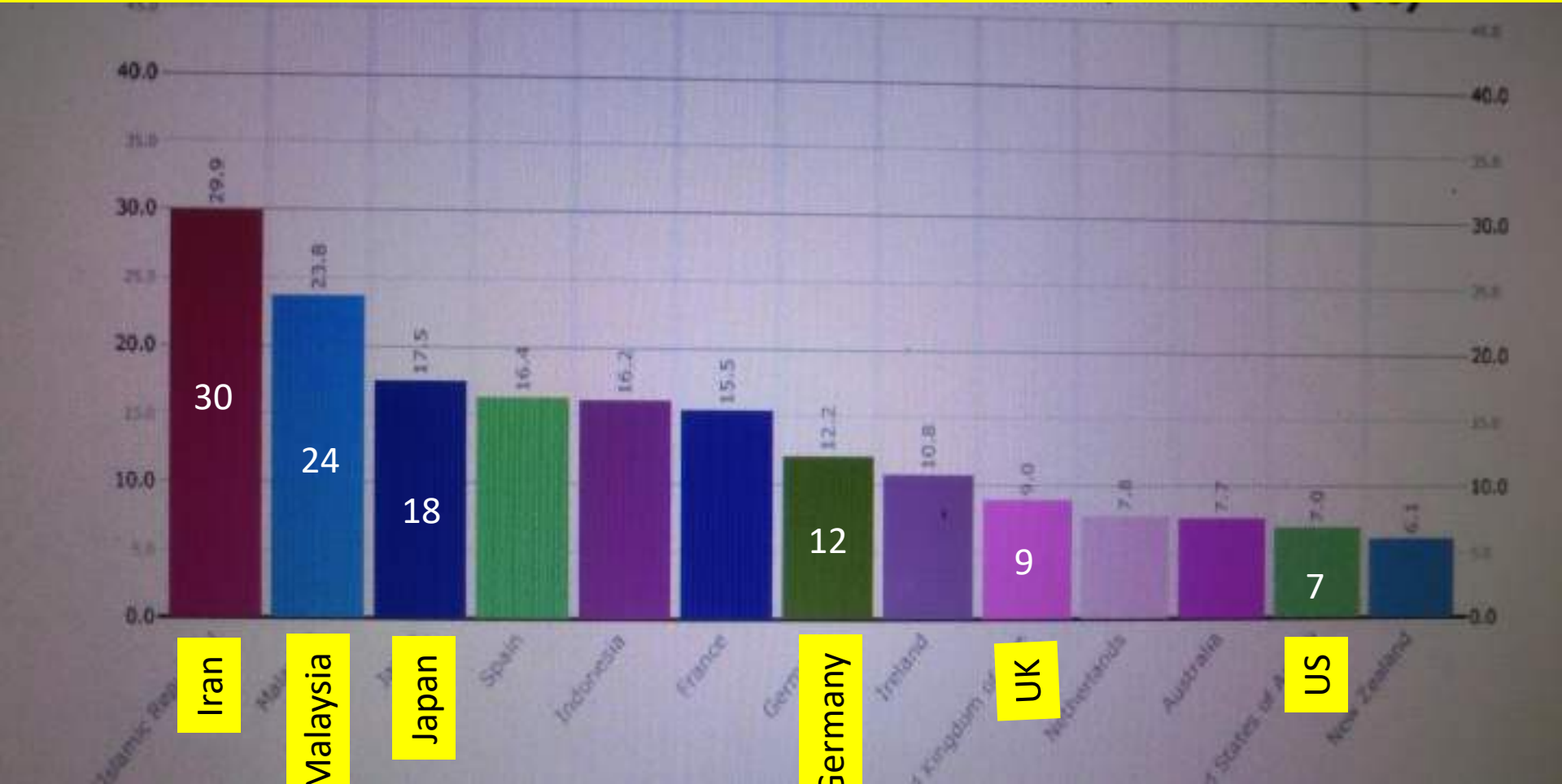


Mobility

- Global initiative (eg due to Climate change that requires planning & mitigation)
- Man-made disasters (increasing frequency & intensity)
- Entry into disaster areas (qualified)
- Short supply
- Migration

UNESCO 2009

Percentage of graduates from tertiary education graduating from Engineering, Manufacturing & Construction programmes



Global initiatives

- World Federation of Engineering Organisations (WFEO)
- International Engineering Alliance (IEA)(Education and Practice agreements)
- European Federation of National Engineering Associations (FEANI)
- European Network for Accreditation of Engineering Education (ENAEE) (EUR-ACE Label)
- Network of Accreditation Bodies for Engineering Education in Asia (NABEEA)
- International Federation of Engineering Education Societies (IFEES)
- Engineering For the Americas (FftA)
- Greater Caribbean Region Engineeering Accreditation Scheme (GCREAS)
- Caribbean Region of World Federation of Technology Education (WFTO)
- Caribbean Accreditation Council for Eng Tech (CACET)
- Federation of Engineering Institutions of Asia and the Pacific (FEIAP)
- Federation of Engineering Institutions in Islamic Countries (FEIIC)(Education and Practice Agreements)
- Union Panamericana de Asociaciones de Ingenieros (UPADI)

UPADI PAN AMERICAN FEDERATION OF ENGINEERING SOCIETIES

http://www.upadired.com/front

European Accreditation of Engineering Programmes EUR-ACE®

ASEAN Federation of Engineering Organisations (AFEO)

ASEAN ENGINEERS REGISTER VISIT THE AER Website

http://aer.afeo.org/

Federation of Engineering Institutions of Asia and the Pacific (FEIAP)

http://www.feiap.org/

ENAEE European Network for Accreditation of Engineering Education

Federation of Engineering Institutions of Islamic Countries

http://www.feiic.org/

World Federation of Engineering Organizations
Fédération Mondiale des Organisations d'Ingénieurs

http://www.wfeo.net/

http://cec.ice.org.uk/

Commonwealth Engineers' Council

NABEEA
Network Of Accreditation Bodies For Engineering Education In Asia

official website
http://www.nabeea.asia/

EDUCATION ACCORDS

WASHINGTON ACCORD	4 YEARS
SYDNEY ACCORD	3 YEARS
DUBLIN ACCORD	2 YEARS
FEANI / EUR-ACE / ENAEE (EUROPE)	3 + 2 YEARS
NABEEA (ASIA)	

PRACTICE AGREEMENTS

IPEA
International Professional Engineers Agreement
(ENGINEERS MOBILITY FORUM)

APEC ENGINEER

IETA
International Engineering Technologists Agreement
(ENGINEERING TECHNOLOGISTS MOBILITY FORUM)

AIET
Agreement of the International Engineering Technicians

INTERNATIONAL ENGINEERING ALLIANCE (IEA)
(INTERNATIONAL ENGINEERING MEETING, IEM)

Europe

- Bologna Process in Europe impacted on
  - Quality and standards of university programs
  - Assessment of engineers for independent practice.
- 1st & 2nd cycle, duration, award nomenclature (Qualification Framework)
- FEANI & ENAEE
- EUR ING & ENG Card

Federation of Engineering Institutions of Islamic Countries

Engineering Qualifications Accreditation & Professional Systems (EQAPS)

A FEIIC Project initiated in 2013

Signing of the

Makkah & Madinah Accords

Makkah Clock Royal Tower, A Fairmont Hotel

19th December 2016

EQAPS Project

Substantial Equivalency & Mobility

Leading to a **FEIIC Register**
of Qualified Professional Engineers

Accord Models

Governmental (European Union)

- EUR ACE (Bologna Declaration: 2 tiers)
- EUR ENG

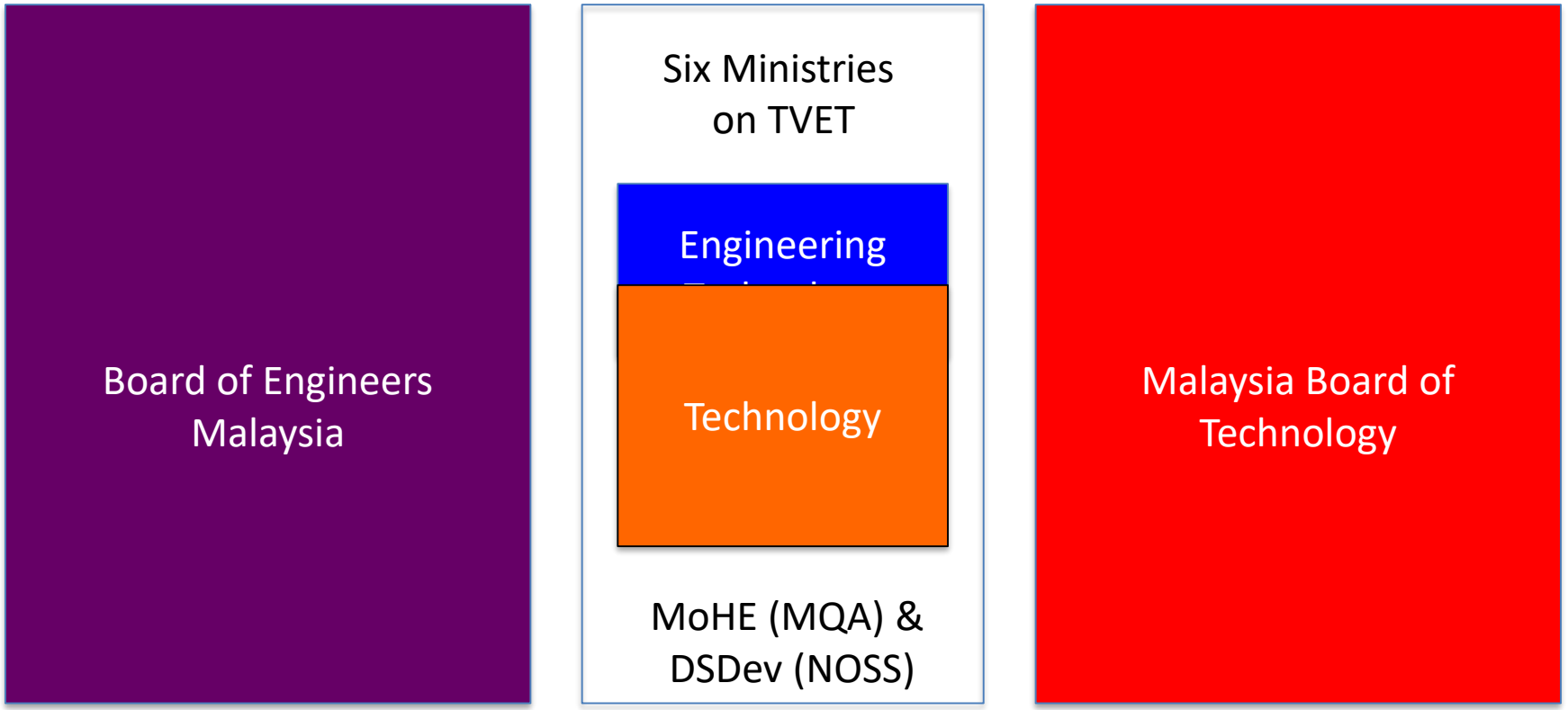
Non-governmental (International}

- IEA (International Engineering Alliance)
- WA, SA, DA, IPEA, IETA, APEC, AIET

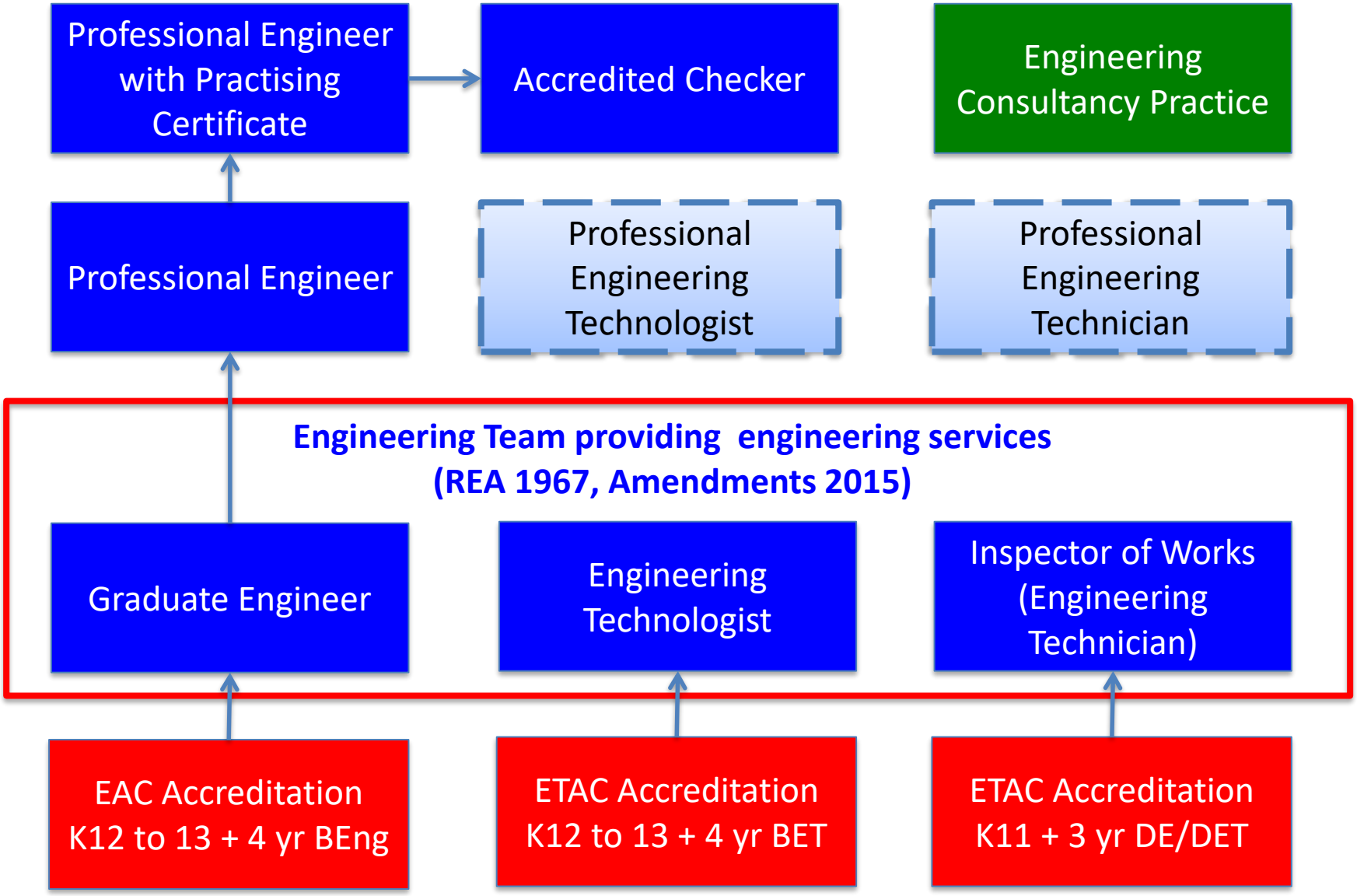
FEIIC EQAPS

- Madinah Accord
- Makkah Accord

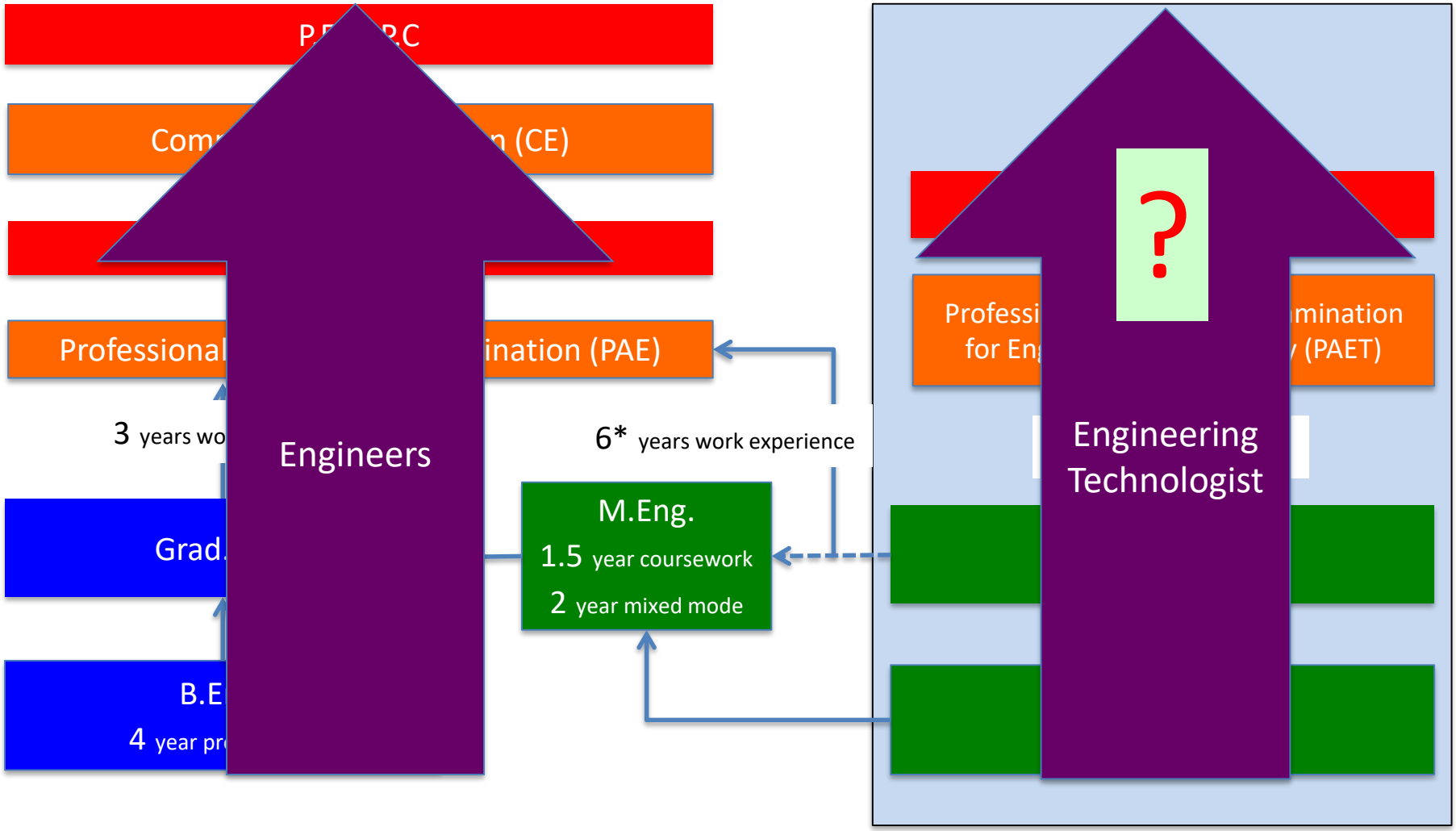
Malaysia Scenario



BEM Statutory Role



Pathways for Professional Engineers with Practising Certificate (P.Eng.P.C.)/Professional Engineers (P.Eng.)/ Professional Engineering Technologist (P.Eng.Tech.)



Professional Qualification Pathway

Professional Engineer
with Practising Certificate

Pass PCE for Practising Certificate

International Mutual Recognition

Professional Engineer

Pass PAE for P.Eng

Makkah Accord

Graduate Engineer

3 Years Engineering Work Experience

Recognised P.Eng with 1 year work experience in Malaysia

Washington Accord

Madinah Accord

4 Years Accredited Engineering Degree

12 – 13 Years Pre-degree Education

The Future for Engineering Education

- **Emerging industries** are gaining importance
- Disciplines boundaries are **blurring** with time
- Fundamental verses **Specialisation**
- **Standardisation** verses Innovation
- **Mosaic** and hybrids models
- **Digital** explosion - distance learning, Massive Open Online Courses (MOOCs)
- **Innovation**
- **Disciplines less relevant** – more specialisation
- Need for **collaboration** in engineering education research to accomplish more

The Future _ cont…

- Digital technology and active learning for **large cohort size**
- Increased **flexibility, choice and diversification** to students
- **Cross disciplinary** learning
- **Global** experience
- Drive **society change**
- **Work-based** learning

Conclusions

- Clear targets for HEIs
- Accreditation targets and processes will continue to change (Quality Improvement)
- Seamless flow between Programme Accreditation and Professional Assessment
- Crystal ball gazing into the future
- Mobility is not all about economics
- Government and regulatory bodies to cooperate with industry
- The engineering world will continue to be networked
- Disruptive technology

Shukria - Thank You - Terima Kasih

Malaysia Engineering Accreditation Department Directors

UPM/UTM	UPM	UKM	USM/UTP
			
Megat 2007 - 2011	Azlan 2011 - 2013	Wan 2013 - 2016	Aziz 2017 -