Future Prospect for Engineering Technology

by
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13th MAY 2015

Presentation Outlines

• Background
• National Agenda
• MBOT & Engineering Technology
• Initiatives at MTUN
• Challenges
• Wayforward
Learning Objectives

At the end of presentation, participants will be able to:

• Understand the Engineering Technology issues in Malaysia.
• Value the benefits of Engineering Technology to the country.
• Appreciate initiatives in Engineering Technology.
• Experience the challenges faced during the whole process.
• Visualize the Future Direction.

MALAYSIAN SCENARIO ...

VISION 2020
NEW ECONOMIC MODEL
ROAD TO 2020
Malaysia’s has introduced 4 pillars to achieve Vision 2020

1Malaysia People First, Performance Now
April 2009

Government Transformation Programme (GTP)
6 NKRAs
January 2010

New Economic Model - A high income, inclusive and sustainable nation

10th Malaysia Plan
Macroeconomic growth targets & expenditure allocation
June 2010

Preservation and enhancement of unity in diversity
Effective delivery of government services
Smooth implementation of government’s development programme

The Goals
- HIGH INCOME
  Targets US$15,000-20,000 per capita by 2020

- People quality of life

- INCLUSIVENESS
  Enables all communities to fully benefit from the wealth of the Country

- SUSTAINABILITY
  Meets present needs without compromising future generations

CHARACTERISTICS IN 2020
- MARKET LED
- WELL-GOVERNED
- REGIONALLY INTEGRATED
- ENTREPRENEURIAL
- INNOVATIVE

The New Economy Model
ETP focuses on:

- 12 National Key Economy Areas (NKEAs)
- 131 entry point projects
- 3.3 millions new jobs by 2020
- 60% are middle & high income jobs

ETP 1 year progress:

- 66% or RM10 billion worth of projects have started
- 53% of 131 entry point projects have taken off
- Private investments increased 23.4% to RM512.2 billion from RM415.5 billion

Source: Academia-Industry Consultative Council 8th Dec 2011
Across the NKEAs, nearly 1 million jobs requiring vocational certificates or diplomas will be created over the next 10 years.

<table>
<thead>
<tr>
<th>No. of jobs required by NKEAs by 2020</th>
<th>Vocational</th>
<th>Diploma</th>
<th>Examples of top jobs</th>
<th>Ability to attract?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Services</td>
<td>20</td>
<td>138</td>
<td>• Insurance agents</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>345</td>
<td>• Hotelling staff</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Convention hall exhibition service staff</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td>Tourism</td>
<td>37</td>
<td>117</td>
<td>• Clerical staff</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Aerospace technicians</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td>Business Services</td>
<td>0</td>
<td>37</td>
<td>• Production worker</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• E&amp;E technician</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td>Electrical and Electronics</td>
<td>35</td>
<td>60</td>
<td>• Hospitality workers</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Nurses</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td>Healthcare</td>
<td>3</td>
<td>117</td>
<td>• Clerical staff</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Hospitality workers</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Nurses</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td>Wholesale and retail</td>
<td>35</td>
<td>22</td>
<td>• Stone keeper</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Sales supervisor</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td>Telco</td>
<td>20</td>
<td>14</td>
<td>• Agriculture</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Agriculture</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td>Agriculture</td>
<td>6</td>
<td>6</td>
<td>• Feedlotting supervisors</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Farm supervisors</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>30</td>
<td>23</td>
<td>• Chemical engineers</td>
<td>Sufficient supply today and in 2020</td>
</tr>
<tr>
<td>Oil Gas &amp; Energy</td>
<td>24</td>
<td>8</td>
<td>• Solar maintenance technician</td>
<td>Insufficient supply today and in 2020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mechanical engineering supervisor</td>
<td>Insufficient supply today and in 2020</td>
</tr>
</tbody>
</table>

Examples
- Insurance agents
- Hotelling staff
- Convention hall exhibition service staff
- Clerical staff
- Aerospace technicians
- Production worker
- E&E technician
- Hospitality workers
- Nurses
- Stone keeper
- Sales supervisor
- Agriculture
- Feedlotting supervisors
- Farm supervisors
- Chemical engineers
- Solar maintenance technician
- Mechanical engineering supervisor

SOURCE: Labour estimates from NKEA labs, dated July 8th 2010
INDUSTRY SCENARIO IN MALAYSIA 1970 - 2000

FOREIGN DIRECT INVESTMENT – set up manufacturing plants.

RESEARCH AND DESIGN COMPANIES – very few.

MALAYSIAN ENGINEERING EDUCATION SCENARIO

1970 and 80s

THEORY-ORIENTED; DESIGN AND RESEARCH-based

1990s

TRANSITION

Paper to Cabinet on setting up technical University colleges

2000 onward

PRACTICE-ORIENTED

Technical universities established
TEVT is critical in the 10th Malaysia Plan

Policy guidelines from the 10th Malaysia Plan

- Improving the Perception of TVET and Attracting More Trainees
  - A national media campaign will be developed and rolled-out...
  - 69 out of 88 technical schools will be converted into vocational schools... six new vocational schools will be established by 2015...

- Upgrading and Harmonising TVET Curriculum Quality in Line with Industry Requirements
  - Standardize TVET curriculum...
  - Recognizing and equating various levels of Malaysian Skills Certificate with certifications issued by TVET providers
  - A Board of Technologists Malaysia will be established
  - Malaysia-Japan International Institute of Technology will be established as an independent institute

- Developing Highly Effective Instructors
  - Highly experienced industry personnel...to become instructors...
  - Part-time working arrangements will be expanded...
  - Centre for Instructor and Advanced Skills Training (CIAS) will be expanded...
  - A new centre for instructor skills training will be developed to add a further training capacity of 800 instructors each year

- Streamlining Delivery of TVET
  - The current funding approach of TVET will be reviewed...provide financial assistance to students to study at Malaysian Skills Certificate Level 3
  - The performance rating of TVET institutions will be utilized when making decisions for buying places...in private TVET institutions
  - A total of RM 150 million will be set aside to train 20,000 school dropouts during the Plan period

On the supply side, there is also a significant pool of students for expansion of TVET

<table>
<thead>
<tr>
<th>Segment</th>
<th>Size Today Thousands</th>
<th>Segment description</th>
<th>Projected capture rate in 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic education dropouts</td>
<td>301</td>
<td>Basic education dropouts, i.e. students leaving school prior to taking SPM</td>
<td>50%</td>
</tr>
<tr>
<td>SPM leavers directly entering workforce</td>
<td>100</td>
<td>Unskilled workers entering workforce without further qualifications, out of which 40k have no SPM credits</td>
<td>30%</td>
</tr>
<tr>
<td>Foreign students</td>
<td>0.2</td>
<td>Foreign students coming to Malaysia for Skills Training</td>
<td>16,000</td>
</tr>
<tr>
<td>Lifelong learning for unskilled and semi-skilled workforce</td>
<td>8,400</td>
<td>Upskilling of those already in workforce</td>
<td>20%</td>
</tr>
<tr>
<td>Higher level SKM 3 and 4</td>
<td>40</td>
<td>SKM 1 and 2 holders who do not currently go on to pursue SKM 3 and 4</td>
<td>50%</td>
</tr>
</tbody>
</table>

Note: Skilled workforce defined as those with at least SKM 3 certificate, diplomas, or degree certification; semi-skilled defined as those with at least SKM 1 or 2 certification, while unskilled workers have only SPM certification. A 40% target is projected by Ministry of Human Resource, and a 50% target committed to in the 10th Malaysia Plan. The 40% target is different from 10th Malaysia Plan published targets of 50%.

Source: 10th Malaysia Plan
Komposisi Tenaga kerja mengikut kluster Pekerjaan (%) 2008

<table>
<thead>
<tr>
<th>Kluster</th>
<th>Malaysia</th>
<th>Ireland</th>
<th>Australia</th>
<th>New Zealand</th>
<th>Finland</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled</td>
<td>25.9</td>
<td>24.4</td>
<td>12.9</td>
<td>25.0</td>
<td>11.8</td>
<td>24.4</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>38.9</td>
<td>30.9</td>
<td>28.3</td>
<td>43.1</td>
<td>44.5</td>
<td>52.8</td>
</tr>
<tr>
<td>Unskilled</td>
<td>11.8</td>
<td>2.9</td>
<td>18.3</td>
<td>5.6</td>
<td>8.0</td>
<td>7.0</td>
</tr>
</tbody>
</table>

Ref: Presentation Malaysian Society of Engineering Technologist (MSET) by Prof. Dr. Mohd Mat Su’ud, UniKL.

FACTS AND FIGURES

40,000 skilled workers needed by 2015 in oil and gas [KSM 2013];

RM 3.7 billion budget 2013 technical and vocational [KPM];

Australia ~ AUD 2 billion annually to provide skilled workers;
## FACTS AND FIGURES

40% or 1.3 millions skilled worker needed by 2020 for Malaysia to be high income nation.

In Malaysia, 10% joined vocational and technical after high school whereas in German, Finland and Austria 50 – 80%.

By 2020, 1.3 million workers TVET; ~ 700,000 diploma holders from polytechnic and other institutions.

<table>
<thead>
<tr>
<th>FACTS AND FIGURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>33% skilled workers in industrial sector by 2015 [KSU KKR]</td>
</tr>
<tr>
<td>Development of 12 industry sectors in NKEA</td>
</tr>
<tr>
<td>SCORE (Sarawak) : by 2030 requires 435,000 manpower; 52.2% skilled and semi-skilled; 70,000 engineering-related</td>
</tr>
</tbody>
</table>
3.3 millions NEW JOBS

ENGINEERING VS ENGINEERING TECHNOLOGY
JOB SCOPE OF AN ENGINEER?

JOB SCOPE OF AN ENGINEERING TECHNOLOGIST?
In order to distinguish between engineering and engineering technology, a technological spectrum is used to illustrate the differences. Generally, in an organization, engineers would most likely work in the design and development fields while technologists, technicians and craftsmen would be more inclined to work in manufacturing and production line. The engineers role are more towards the left of the spectrum while the technologists are more towards the right of the spectrum although the main activities of both engineers and technologist are in the center of the spectrum.

Source: Cheshier, 1998
Accreditation Board for Engineering and Technology [ABET] describes the difference between engineering and engineering technology as

"Engineering and technology are separate, but intimately related professions"

ENG VS ENG TECH [ABET]

- Engineering undergraduate programs include more mathematics work and higher level mathematics than technology programs.
- Engineering undergraduate programs often focus on theory, while technology programs usually focus on application.
- Once they enter the workforce, engineering graduates typically spend their time planning, while engineering technology graduates spend their time making plans work.
ENG VS ENG TECH [ABET] .... cont.

• At ABET, engineering and engineering technology programs are evaluated and accredited by two separate accreditation commissions using two separate sets of accreditation criteria.
• Graduates from engineering programs are called engineers, while graduates of technology programs are often called technologists.
• Graduates from engineering technology programs are often hired as engineers.

ENG vs ENG TECH
[based on Washington vs Sydney Accord]

<table>
<thead>
<tr>
<th>... for Washington Accord Graduate</th>
<th>... for Sydney Accord Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.</td>
<td>Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to defined and applied engineering procedures, processes, systems or methodologies.</td>
</tr>
</tbody>
</table>
### RANGE OF PROBLEM SOLVING

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Complex Problems</th>
<th>Broadly-defined Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Preamble</td>
<td>Engineering problems which cannot be resolved without in-depth engineering knowledge, much of which is at, or informed by, the forefront of the professional discipline, and have some or all of the following characteristics:</td>
<td>Engineering problems which cannot be pursued without a coherent and detailed knowledge of defined aspects of a professional discipline with a strong emphasis on the application of developed technology, and have the following characteristics:</td>
</tr>
<tr>
<td>2 Range of conflicting requirements</td>
<td>Involve wide-ranging or conflicting technical, engineering and other issues</td>
<td>Involve a variety of factors which may impose conflicting constraints</td>
</tr>
<tr>
<td>3 Depth of analysis required</td>
<td>Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models</td>
<td>Can be solved by application of well-proven analysis techniques</td>
</tr>
<tr>
<td>4 Depth of knowledge required</td>
<td>Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach</td>
<td>Requires a detailed knowledge of principles and applied procedures and methodologies in defined aspects of a professional discipline with a strong emphasis on the application of developed technology and the attainment of know-how, often within a multidisciplinary engineering environment</td>
</tr>
<tr>
<td>5 Familiarity of issues</td>
<td>Involve infrequently encountered issues belonging to families of familiar problems which are solved in well-accepted ways</td>
<td></td>
</tr>
<tr>
<td>6 Extent of applicable codes</td>
<td>Are outside problems encompassed by standards and codes of practice for professional engineering</td>
<td>May be partially outside those encompassed by standards or codes of practice</td>
</tr>
<tr>
<td>7 Extent of stakeholder involvement and level of conflicting requirements</td>
<td>Involve diverse groups of stakeholders with widely varying needs</td>
<td>Involve several groups of stakeholders with differing and occasionally conflicting needs</td>
</tr>
<tr>
<td>8 Consequences</td>
<td>Have significant consequences in a range of contexts</td>
<td>Have consequences which are important locally, but may extend more widely</td>
</tr>
<tr>
<td>9 Interdependence</td>
<td>Are high level problems including many component parts or sub-problems</td>
<td>Are parts of, or systems within complex engineering problems</td>
</tr>
</tbody>
</table>

### RANGE OF ENG. ACTIVITIES

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Complex Activities</th>
<th>Broadly-defined Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Preamble</td>
<td>Complex activities means (engineering) activities or projects that have some or all of the following characteristics:</td>
<td>Broadly defined activities means (engineering) activities or projects that have some or all of the following characteristics:</td>
</tr>
<tr>
<td>2 Range of resources</td>
<td>Involve the use of diverse resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)</td>
<td>Involve a variety of resources (and for this purpose resources includes people, money, equipment, materials, information and technologies)</td>
</tr>
<tr>
<td>3 Level of interactions</td>
<td>Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues,</td>
<td>Require resolution of occasional interactions between technical, engineering and other issues, of which few are conflicting</td>
</tr>
<tr>
<td>4 Innovation</td>
<td>Involve creative use of engineering principles and research-based knowledge in novel ways.</td>
<td>Involve the use of new materials, techniques or processes in non-standard ways</td>
</tr>
<tr>
<td>5 Consequences to society and the environment</td>
<td>Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation</td>
<td>Have reasonably predictable consequences that are most important locally, but may extend more widely</td>
</tr>
<tr>
<td>6 Familiarity</td>
<td>Can extend beyond previous experiences by applying principles-based approaches</td>
<td>Require a knowledge of normal operating procedures and processes</td>
</tr>
</tbody>
</table>
### KNOWLEDGE PROFILE

A Washington Accord programme provides:

- A systematic, theory-based understanding of the natural sciences applicable to the discipline (e.g. calculus-based physics)
- Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline
- A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
- Knowledge that supports engineering design in a practice area
- Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
- Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability
- Engagement with selected knowledge in the research literature of the discipline

A programme that builds this type of knowledge and develops the attributes listed below is typically achieved in 4 to 5 years of study, depending on the level of students at entry.

A Sydney Accord programme provides:

- A systematic, theory-based understanding of the natural sciences applicable to the sub-discipline
- Conceptually-based mathematics, numerical analysis, statistics and aspects of computer and information science to support analysis and use of models applicable to the sub-discipline
- A systematic, theory-based formulation of engineering fundamentals required in an accepted sub-discipline
- Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline: much is at the forefront of the discipline
- Knowledge that supports engineering design using the technologies of a practice area
- Knowledge of engineering technologies applicable in the sub-discipline
- Comprehension of the role of technology in society and identified issues in applying engineering technology: ethics and impacts: economic, social, environmental and sustainability
- Engagement with the technological literature of the discipline

A programme that builds this type of knowledge and develops the attributes listed below is typically achieved in 3 to 4 years of study, depending on the level of students at entry.

### GRADUATE ATTRIBUTE PROFILES

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Washington Accord</th>
<th>Sydney Accord</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Engineering Knowledge</strong></td>
<td>Broad depth of education and type of knowledge, both theoretical and practical.</td>
<td>Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.</td>
</tr>
<tr>
<td>2. <strong>Problem Analysis</strong></td>
<td>Complexity of analysis</td>
<td>Identify, formulate, research literature and analyse complex engineering problems.</td>
</tr>
<tr>
<td>3. <strong>Design/development of solutions</strong></td>
<td>Breadth and uniqueness of engineering problems, i.e. the extent to which problems are original and to which solutions have previously been identified or modified.</td>
<td>Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.</td>
</tr>
<tr>
<td>4. <strong>Investigation</strong></td>
<td>Breadth and depth of investigation and experimentation</td>
<td>Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.</td>
</tr>
<tr>
<td>5. <strong>Modern Tool Usage</strong></td>
<td>Level of understanding of the appropriateness of the tool</td>
<td>Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations.</td>
</tr>
</tbody>
</table>
### GRADUATE ATTRIBUTE PROFILES

<table>
<thead>
<tr>
<th>Differentiating Characteristic</th>
<th>for Washington Accord Graduate</th>
<th>for Sydney Accord Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6. The Engineer and Society</strong></td>
<td>Level of knowledge and responsibility</td>
<td>Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.</td>
</tr>
<tr>
<td><strong>7. Environment and Sustainability</strong></td>
<td>Type of solutions.</td>
<td>Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.</td>
</tr>
<tr>
<td><strong>8. Ethics</strong></td>
<td>Understanding and level of practice</td>
<td>Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.</td>
</tr>
<tr>
<td><strong>9. Individual and Team work</strong></td>
<td>Role in and diversity of team</td>
<td>Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.</td>
</tr>
<tr>
<td><strong>10. Communication</strong></td>
<td>Level of communication according to type of activities performed</td>
<td>Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</td>
</tr>
<tr>
<td><strong>11. Project Management and Finance</strong></td>
<td>Level of management required for different types of activity</td>
<td>Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.</td>
</tr>
<tr>
<td><strong>12. Life-long learning</strong></td>
<td>Preparation for and depth of continuing learning</td>
<td>Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.</td>
</tr>
</tbody>
</table>

### PROFESSIONAL COMPETENCY PROFILES

<table>
<thead>
<tr>
<th>Differentiating Characteristic</th>
<th>Professional Engineer</th>
<th>Engineering Technologist</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Comprehend and apply universal knowledge</strong></td>
<td>Breadth and depth of education and type of knowledge</td>
<td>Comprehend and apply advanced knowledge of the widely-applied principles underpinning good practice</td>
</tr>
<tr>
<td><strong>2. Comprehend and apply local knowledge</strong></td>
<td>Type of local knowledge</td>
<td>Comprehend and apply advanced knowledge of the widely-applied principles underpinning good practice specific to the jurisdiction in which he/she practices.</td>
</tr>
<tr>
<td><strong>3. Problem analysis</strong></td>
<td>Complexity of analysis</td>
<td>Define, investigate and analyse complex problems</td>
</tr>
<tr>
<td><strong>4. Design and development of solutions</strong></td>
<td>Nature of the problem and uniqueness of the solution</td>
<td>Design or develop solutions to complex problems</td>
</tr>
<tr>
<td><strong>5. Evaluation</strong></td>
<td>Type of activity</td>
<td>Evaluate the outcomes and impacts of complex activities</td>
</tr>
<tr>
<td><strong>6. Protection of society</strong></td>
<td>Types of activity and responsibility to public</td>
<td>Recognise the reasonably foreseeable social, cultural and environmental effects of complex activities generally, and have regard to the need for sustainability; recognise that the protection of society is the highest priority</td>
</tr>
<tr>
<td><strong>7. Legal and regulatory</strong></td>
<td>No differentiation in this characteristic</td>
<td>Meet all legal and regulatory requirements and protect public health and safety in the course of his or her activities</td>
</tr>
</tbody>
</table>
### PROFESSIONAL COMPETENCY PROFILES

<table>
<thead>
<tr>
<th><strong>Differentiating Characteristic</strong></th>
<th><strong>Professional Engineer</strong></th>
<th><strong>Engineering Technologist</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Ethics</td>
<td>Conduct his or her activities ethically</td>
<td>Conduct his or her activities ethically</td>
</tr>
<tr>
<td>9. Manage engineering activities</td>
<td>Manage part or all of one or more complex activities</td>
<td>Manage part or all of one or more broadly-defined activities</td>
</tr>
<tr>
<td>10. Communication</td>
<td>Communicate clearly with others in the course of his or her activities</td>
<td>Communicate clearly with others in the course of his or her activities</td>
</tr>
<tr>
<td>11. Lifelong learning</td>
<td>Undertake CPD activities sufficient to maintain and extend his or her competence</td>
<td>Undertake CPD activities sufficient to maintain and extend his or her competence</td>
</tr>
<tr>
<td>12. Judgement</td>
<td>Recognize complexity and assess alternatives in light of competing requirements and incomplete knowledge. Exercise sound judgement in the course of his or her complex activities</td>
<td>Choose appropriate technologies to deal with broadly defined problems. Exercise sound judgement in the course of his or her broadly-defined activities</td>
</tr>
<tr>
<td>13. Responsibility for decisions</td>
<td>Be responsible for making decisions on part or all of complex activities</td>
<td>Be responsible for making decisions on part or all of one or more broadly defined activities</td>
</tr>
</tbody>
</table>

![Engineering Accreditation Department](chart.png)
Pathways for Engineering Technology Academic Qualification (Abang Abdullah 2009)

Academic Route to Professional Status

Professional Engineer (PEng)

Professional Engineering Technologist (PEngT)

PEng Training 3 YR

PEngT Training 3 YR

MSc

B.Eng 4 YR

B.Eng 3 YR

B.Eng Tech 4 YR

Tech Dip 3 YR

Tech Cert 2 YR

SPM

STPM / Mat 2/1 YR

7 years Formation

K11

K12/13

K14/15

K17

K20

Professional Engineering Technologist (PEngT)

Professional Engineer (PEng)

Register as Professional Engineering Technologist (PEngT)

Register as Graduate Engineering Technologist

Engineering Technology Accreditation Council (ETAC)

BEngTech

Register as Professional Engineering (PEng)

Register as Graduate Engineer

Engineering Accreditation Council (EAC)

BEng
MBOT will enhance the career path of TEVT graduates

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>NA</td>
<td>NA</td>
<td>Doctorate</td>
<td>Principal Technologist / Executive</td>
</tr>
<tr>
<td>7</td>
<td>NA</td>
<td>NA</td>
<td>Masters</td>
<td>Senior Technologist / Executive</td>
</tr>
<tr>
<td>6</td>
<td>NA</td>
<td>NA</td>
<td>Bachelors</td>
<td>Technologist / Executive</td>
</tr>
<tr>
<td>5</td>
<td>Advanced Diploma</td>
<td>Advanced Diploma</td>
<td>Advanced Diploma</td>
<td>Senior Technician</td>
</tr>
<tr>
<td>4</td>
<td>Diploma</td>
<td>Diploma</td>
<td>Diploma</td>
<td>Technician</td>
</tr>
<tr>
<td>3</td>
<td>Skills Certificate 3</td>
<td>Vocational Technical Certificate</td>
<td></td>
<td>Junior Technician</td>
</tr>
<tr>
<td>2</td>
<td>Skills Certificate 2</td>
<td></td>
<td></td>
<td>Senior Operator</td>
</tr>
<tr>
<td>1</td>
<td>Skills Certificate 1</td>
<td></td>
<td></td>
<td>Operator</td>
</tr>
</tbody>
</table>

New Issue in Engineering Technology

- About 80% of working field in engineering needs engineering technologist
- Out of 100,000 engineers, 80,000 doing engineering technologist work
- Government aims to produce 60,000 Technologists by 2020
- MTUN is responsible to produce Technologists
The Establishment of Malaysia Board of Technologists (MBOT)

CURRENT STATUS ON TECHNOLOGIST AND TECHNICIANS 2014 BILL

PASSED IN DEWAN RAKYAT → 2 APRIL 2015

PASSED IN DEWAN NEGARA → 23 APRIL 2015

GAZETTED 30 DAYS FROM 23 APRIL 2015
**Policy decisions on the establishment of MBOT**

- **10th Malaysia Plan**
  - Accelerate the recognition of TEVT certifications through the establishment of MBOT

- **Cabinet Committee on HCD (JKMPMI) No. 3/2010 (20 August 2010)**
  - Recommend the establishment of MBOT to recognise and certify technologist as a profession to increase the pool of skilled workforce required to attain a high income economy

- **Cabinet Decision (29 September 2010)**
  - Endorse the decision of Cabinet Committee on HCD to establish MBOT

- **Cabinet Committee on HCD (JKMPMI) No.1/2011 (8 March 2011)**
  - Expedite the establishment of MBOT to recognise TEVT graduates

---

**Key Functions of MBOT**

- **Accredit technology and Technical Programme in IHL / TEVT Institution**
- **Regulate the conduct and ethics of technologist and technicians**
- **Promote education and training (professional programme)**
- **Assess and approve / reject applications for registration**
- **Establish accreditation councils (eg. ETAC and SAC)**
**Ministry of Science, Technology and Innovation**

### RATIONALE FOR MBOT

#### To elevate the standing and recognition of Technologists and Technicians
- Technologists and technicians are currently not recognised and certified as professionals by any professional body.
- Technologists and technicians will be accorded international recognition through membership of MBOT in various international accords.
- Institutions will be motivated to offer technology and TEVT programmes.

#### To increase the pool of skilled workforce required to attain a high income economy
- Only 28% of the total workforce is employed in the higher skilled jobs category reflecting a huge pool of unskilled workforce.
- Potential pool of 100,000 students (22% of total students enter the workforce after SPM) who are technically inclined.
- Of the total 3.3 million jobs to be created under ETP by 2020, 700,000 jobs require skilled workforce with diploma in TEVT.

#### To improve public perception of TEVT and attract more students
- On average, 10% of students enroll in TEVT institutions annually (low compared to 44% in OECD countries) reflecting the unattractiveness of TEVT.
- 38 diploma / advanced diploma engineering and technology courses offered by 30 polytechnics will be accredited.
- 30% of the 5,639 skills programmes that are technical-based will be accredited.
- More students will be motivated to enroll in TEVT.

#### To protect public safety and health through...
- Quality assurance (qualification, accreditation, training).
- License professional technologists / certified technicians to offer professional technology and technical services.
- Regulate code of conduct and ethics of technologists and technicians.

---

### PROBLEMS

- **Technologists are not recognised as a profession in Malaysia**: (estimated 384,300 technologists will be produced by 2020)
- **Limited career path for graduates in skills**: because the programmes are not recognised.
- **Engineering Technology Programmes offered by Higher Education Institutions are not accredited by any professional bodies in Malaysia**
- **911 training centres offer 5,639 skills training programmes but they are not recognised**
- **300,000 technicians produced by polytechnics in Malaysia are not accredited by any professional bodies in Malaysia**

**MBOT will solve these long overdue problems...**
MBOT WILL PRODUCE THESE OUTPUTS...

<table>
<thead>
<tr>
<th>TEVT</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More than <strong>300,000</strong> technicians will be registered</td>
<td>• <strong>5,639</strong> accredited programmes (certificate / diploma / advanced diploma) will be recognised</td>
</tr>
</tbody>
</table>

Engineering Technology

• **44** new engineering technology programmes and **124** existing ones will be accredited
• **384,300** new technologists will be registered by 2020

 TECHNOLOGISTS AND TECHNICIANS BILL 2014

2. In this Act, unless the context otherwise requires —

• “**technologist**” means a person who involves in the application and adaptation of technology that requires principles, methods and techniques appropriate to the field of technology with the exception of those who are already registered under any other Acts as in appendix; (BEM, BOA, BQSM,..)

• “**Professional Technologist**” means a person registered under subsection 19(4);

• “**Graduate Technologist**” means a person registered under subsection 19(2);
PROFESSIONAL TECHNOLOGIST IN THE BILL

17. No person shall, unless he is a Professional Technologist –

(a) approve and certify the manner or conduct of technology services to be carried out;

be entitled to describe himself or hold himself out under any name, style or title –

bearing the words “Professional Technologist” or the equivalent in any other language;

bearing any other word whatsoever in any language which may reasonably be construed to imply that he is a Professional Technologist;

using the abbreviated title “Ts.” for Professional Technologist before his name with the approval of the Board; or

using the abbreviation “P.Tech” for Professional Technologist and his specialisation after his name with the approval of the Board;

Registration of Graduate Technologist and Professional Technologist

19. (1) A person who holds a degree in technology or a technical-related programme which is recognised by the Board may apply to be registered as a Graduate Technologist upon payment of the prescribed fee.

(2) Upon application made under subsection (1), and based on the criteria as may be determined by the Board, the Board may approve the application to be registered as a Graduate Technologist.

(3) A Graduate Technologist registered under subsection (2) who has –

obtained the practical experience as may be determined by the Board;

paid the prescribed fee; and

complied with all the criteria to be determined by the Board,

may apply to be registered as a Professional Technologist.

(4) Upon application made under subsection (3), and based on the criteria as may be determined by the Board, the Board may approve the registration of a Graduate Technologist as a Professional Technologist.
ENGINEERING TECHNOLOGY IN MTUN

Malaysian Technical University Network (MTUN)
DNA OF MTUN

Problem Centered Learning

Applied Theory

Practical Oriented

Action & Experimental Learning

Teaching Factory

Implementation for Engineering Technology Program at MTUN
## ESTIMATED BUDGET FOR ENGINEERING TECHNOLOGY PROGRAM IN MTUN

### 2013-2015

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TOTAL [RM MILLIONS]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>272</td>
</tr>
<tr>
<td>2014</td>
<td>285</td>
</tr>
<tr>
<td>2015</td>
<td>365</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>922</strong></td>
</tr>
</tbody>
</table>

### Challenges and Future of ENGINEERING TECHNOLOGY

- 45 PROGRAMS
- ~7000 STUDENTS
Engineering Technology Initiatives

Challenges

- Awareness
- Right Model
- Funding
- Implementation
- Buying in
- Accreditation

1 Awareness

- Engineering vs. Engineering Technology
  - Terminology
  - Functions and Roles

- Perception
  - Future Students and their Parents

- Presence
  - Few graduates in the market

- Availability
  - Started in UniKL
  - Just recently established in MTUN
### The Right Model

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>BOARD</th>
<th>SCOPE</th>
<th>ACCORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>Board of Engineers Malaysia (BEM)</td>
<td>Engineering Programme</td>
<td>Washington</td>
</tr>
<tr>
<td>UK</td>
<td>Engineering Council (EC)</td>
<td>Engineering, Technology, Construction &amp; Build Environment</td>
<td>Washington</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sydney, Dublin</td>
</tr>
<tr>
<td>Canada</td>
<td>Canadian Council of Technicians &amp; Technologists (CCTT)</td>
<td>Bioscience, Building, Chemical, Civil, Electrical, Electronic, Forestry, Geomatics, Instrumentation, Industrial, Information Technology, Mechanical, Petroleum &amp; Geosciences</td>
<td>Sydney, Dublin</td>
</tr>
<tr>
<td>USA</td>
<td>Accreditation Board for Engineering and Technology (ABET)</td>
<td>Education in Applied Science, Computing, Engineering and Technology</td>
<td>Washington, Sydney</td>
</tr>
<tr>
<td>Australia</td>
<td>Institution of Engineers Australia (IEA)</td>
<td>All Engineering fields</td>
<td>Sydney, Washington</td>
</tr>
<tr>
<td>Ireland</td>
<td>Engineers Ireland</td>
<td>All Engineering fields and ICT</td>
<td>Sydney, Dublin</td>
</tr>
</tbody>
</table>

### Funding

- **Univ has to bear the cost for**
  - Curriculum development
  - Administrative works

- **Government Fund**
  - Limited funding
  - Delay or uncertain
4 Implementation

- Searching for suitable programs
- Dealing with host institutions

Programs

- Curriculum
- Teaching materials

Delivery

- Lecturers and Technicians
- Industrial Experience

Manpower

- Promotion, Application and Selection

Students

5 Buying In

STAKEHOLDERS

- society
- industry

SHAREHOLDERS

- government

- students

- ministry
Accreditation

WAYFORWARD

Malaysia 2020

Engineering Technology

Recognition & Acceptance
Bench Marking
Focus
Quality