SETNC 2013

The Direction and Future Challenges of Engineering Technology in Malaysia

by
BADHRULHISHAM BIN ABDUL AZIZ

Presentation Outlines

• Background
• National Agenda
• MBOT & Engineering Technology
• Initiatives at MTUN
• Initiatives at UMP
• 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

- HIGH INCOME
  Targets US$15,000-20,000 per capita by 2020
- SUSTAINABILITY
  Meets present needs without compromising future generations
- INCLUSIVENESS
  Enables all communities to fully benefit from the wealth of the Country
- People quality of life

The Goals

CHARACTERISTICS IN 2020
- MARKET LED
- WELL-GOVERNED
- REGIONALLY INTEGRATED
- ENTREPRENURIAL
- INNOVATIVE
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 RM41.5 billion

Source: Academia-Industry Consultative Council 8th Dec 2011
We cannot continue at the current pace unless we transform...

**Economic Transformation Programme**

1. **NKEAs (drivers)**
   - National Key Economic Areas

2. **SRIs (enablers)**
   - Strategic Reform Initiatives

**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  |  1990s  |  2000 onward
---|---|---
THEORY-ORIENTED; DESIGN AND RESEARCH-based | TRANSITION | PRACTICE-ORIENTED

Paper to Cabinet on setting up technical University colleges

Technical universities established

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TEVT is critical in the 10th Malaysia Plan

**Policy guidelines from the 10th Malaysian 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 ...
  - 6 new vocational schools will be established by 2015 ...
- Upgrading and Harmonising TVET Curriculum Quality in Line with Industry Requirements
  - Standard 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
  - A Centre for Instructor and Advanced Skills Training (CIAST) 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

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**Skilled workforce** defined as those with at least SKM 3 certificate, diploma, or degree certification
**Semi-skilled** defined as those with at least SKM 1 or 2 certification,
while **unskilled workers** have only SPM certification.

**40% target** is projected by Ministry of Human Resource, and a **50% target** committed to in the 10th Malaysian Plan.

**Source:** 10th Malaysian Plan
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></td>
<td></td>
<td>Malaysian Skills training curriculum exported abroad</td>
<td></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>

1 Number of students leaving the national education system could be higher, up to 80k

Source: MOHR

<table>
<thead>
<tr>
<th>MALAYSIA vs. DEVELOPED COUNTRIES IN TERM OF SKILL WORKERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Malaysia</td>
</tr>
<tr>
<td>Ireland</td>
</tr>
<tr>
<td>Australia</td>
</tr>
<tr>
<td>New Zealand</td>
</tr>
<tr>
<td>Finland</td>
</tr>
<tr>
<td>Singapore</td>
</tr>
</tbody>
</table>

Ref: Presentation Malaysian Society of Engineering Technologist (MSET) by Prof. Dr. Mustfheen Mohd Sa’ad, 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
FACTS AND FIGURES

33% skilled workers in industrial sector by 2015 [KSU KKR]

Development of 12 industry sectors in NKEA

SCORE (Sarawak): by 2030 requires 435,000 manpower; 52.2% skilled and semi-skilled; 70,000 engineering-related

3.3 millions NEW JOBS

- unskilled: 33%
- vocational/certificate: 22%
- diploma: 22%
- degree: 7%
- masters: 2%
- PhD: 3%
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)
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

RATIONALE
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
### 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 &amp; Technical Certificate</td>
<td>Junior Technician</td>
<td></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>

### ENGINEER AND ENGINEERING TECHNOLOGIST SPECTRUM

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
CASE STUDY
MTUN AND UMP

Malaysian Technical University Network (MTUN)
DNA OF MTUN

Problem Centered Learning

Applied Theory

Practical Oriented

Action & Experimental Learning

Teaching Factory

Malaysian Technical University Network (MTUN)

Gambang Campus
Kuantan, Pahang

Kuala Pahang Campus
Pekan, Pahang
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>TOTAL</td>
<td>922</td>
</tr>
</tbody>
</table>

45 PROGRAMS & ~ 7000 STUDENTS
IMPLEMENTATION OF ENGINEERING TECHNOLOGY AT UMP

1998 STARTED AS UTM PAHANG BRANCH
2002 ESTABLISHED AS KUKTEM
2007 REBRANDED TO UMP

TOTAL STAFF

<table>
<thead>
<tr>
<th>GROUP</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACADEMIC</td>
<td>590</td>
</tr>
<tr>
<td>LANGUAGE TEACHER &amp; TUTOR</td>
<td>49</td>
</tr>
<tr>
<td>MANAGEMENT &amp; PROFESSIONAL</td>
<td>223</td>
</tr>
<tr>
<td>SUPPORTING</td>
<td>723</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,585</strong></td>
</tr>
</tbody>
</table>

ACADEMIC STAFF WITH PhD
(not include Language Teacher & Tutor)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>ACADEMIC STAFF WITH PhD</th>
<th>TOTAL ACADEMIC STAFF</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>19</td>
<td>250</td>
<td>8%</td>
</tr>
<tr>
<td>2007</td>
<td>26</td>
<td>306</td>
<td>9%</td>
</tr>
<tr>
<td>2008</td>
<td>38</td>
<td>350</td>
<td>11%</td>
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<tr>
<td>2009</td>
<td>70</td>
<td>434</td>
<td>16%</td>
</tr>
<tr>
<td>2010</td>
<td>104</td>
<td>495</td>
<td>21%</td>
</tr>
<tr>
<td>2011</td>
<td>148</td>
<td>530</td>
<td>28%</td>
</tr>
<tr>
<td>2012</td>
<td>199</td>
<td>573</td>
<td>34%</td>
</tr>
<tr>
<td>2013</td>
<td>210</td>
<td>590</td>
<td>36%</td>
</tr>
</tbody>
</table>

Data as at 30 May 2013
Source: Jabatan Pendaftar
UNDERGRADUATE STUDENTS

<table>
<thead>
<tr>
<th>CODE</th>
<th>FACULTY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKKSA</td>
<td>FACULTY OF CHEMICAL &amp; NATURAL RESOURCES ENGINEERING</td>
<td>1,272</td>
</tr>
<tr>
<td>FKASA</td>
<td>FACULTY OF CIVIL ENGINEERING &amp; EARTH RESOURCES</td>
<td>1,069</td>
</tr>
<tr>
<td>FKEE</td>
<td>FACULTY OF ELECTRICAL &amp; ELECTRONICS ENGINEERING</td>
<td>1,029</td>
</tr>
<tr>
<td>FSKSMP</td>
<td>FACULTY OF COMPUTER SYSTEMS &amp; SOFTWARE ENGINEERING</td>
<td>1,050</td>
</tr>
<tr>
<td>FKM</td>
<td>FACULTY OF MECHANICAL ENGINEERING</td>
<td>1,127</td>
</tr>
<tr>
<td>FSTI</td>
<td>FACULTY OF INDUSTRIAL SCIENCES &amp; TECHNOLOGY</td>
<td>554</td>
</tr>
<tr>
<td>FKT</td>
<td>FACULTY OF MANUFACTURING ENGINEERING</td>
<td>475</td>
</tr>
<tr>
<td>FTEC</td>
<td>FACULTY OF TECHNOLOGY</td>
<td>903</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>7,479</td>
</tr>
</tbody>
</table>

Data as at 28 January 2013
Source: Institut Pengajian Siswazah (IPS)

MASTERS / PHD STUDENTS

MASTERS

- Course work: 87
- Research: 439
Total: 526

PHD

- Course work: 87
- Research: 439
Total: 305

Total: 831

Data as at 20 May 2013
Source: Institut Pengajian Siswazah (IPS)

DOCTOR OF PHILOSOPHY

- Doctor of Philosophy (Technology Management)
- Doctor of Philosophy (Computer Science)
- Doctor of Philosophy (Biotechnology)
- Doctor of Philosophy (Industrial Chemistry)
- Doctor of Philosophy (Chemistry)
- Doctor of Philosophy (Electrical)
- Doctor of Philosophy (Electronic)
- Doctor of Philosophy (Instrumentation)
- Doctor of Philosophy (Biological Sciences)
- Doctor of Philosophy (Manufacturing)
- Doctor of Philosophy (Automotive)
- Doctor of Philosophy (Construction)
- Doctor of Philosophy (Advanced Materials)

MASTERS OF ENGINEERING

- Master of Engineering (Electric)
- Master of Engineering (Electronics)
- Master of Engineering (Instrumentation)
- Master of Engineering (Chemistry)
- Master of Engineering (Bio-Process)
- Master of Engineering (Mechanical)
- Master of Engineering (Manufacturing)
- Master of Engineering (Civil)
- Master of Engineering (Construction)
- Master of Chemical Engineering with Entrepreneurship (Course Work)

MASTERS OF SCIENCE

- Master of Science (Computer)
- Master of Science (Software Engineering)
- Master of Science (Biotechnology)
- Master of Science (Industrial Chemistry)
- Master of Science (Advanced Materials)

MASTERS OF TECHNOLOGY MANAGEMENT

- Master of Technology Management (Industrial Safety & Health)
- Master of Technology Management (Human Capital Resources)
- Master of Technology Management (Project Management)
- Master of Technology Management (Operation Management)
- Master of Business Administration
VISION
To be a world-class Technological University.

MISSION
We provide high quality education, research and services in engineering and technology in a culture of creativity and innovation.

OBJECTIVE
1. To produce outstanding graduates by providing competitive engineering and technological programmes.
2. To spearhead cutting edge industry-relevant research initiatives.
3. To be a leading service provider to industries and community based on our niche and areas of expertise.
4. To be recognized as an institution for excellent management and work culture.

ENGINEERING TECHNOLOGY PROGRAMS

<table>
<thead>
<tr>
<th>Year</th>
<th>Program</th>
</tr>
</thead>
</table>
| 2012 | • MANUFACTURING ENGINEERING TECHNOLOGY  
• ELECTRICAL ENGINEERING TECHNOLOGY  
• MECHANICAL [energy & environment] ENGINEERING TECHNOLOGY |
| 2013 | • PHARMACEUTICAL ENGINEERING TECHNOLOGY |
| 2013 | • INFRASTRUCTURE MANAGEMENT ENGINEERING TECHNOLOGY |
WHY
ENGINEERING TECHNOLOGY PROGRAM

NIU
NORTHERN ILLINOIS UNIVERSITY

Academic Quality
- National Recognition of academic excellence
- World-renowned faculty who teach undergraduates
- Undergraduate research opportunities
- Exceptional resources of a major comprehensive university, including top-level facilities
- Student / Faculty ratio (17 students to 1 Professor)

Abundant Academic Option
- 6 Business program, including Accounting
- 4 Engineering Programs
- 8 Health Science Programs, including Nursing
- More than 70 Graduates Programs

THE CARNEGIE FOUNDATION for the ADVANCEMENT of TEACHING
COLLEGES

- College of Business
- College of Education
- College of Engineering and Engineering Technology
- College of Health and Human Sciences
- College of Law
- College of Liberal Arts and Sciences
- College of Visual and Performing Arts

Ref: http://www.niu.edu/academics/departments.shtml

RECOGNITIONS

Nationally recognized for community services

Ranked in top 100 universities

Academic Prestige

NiU
Northern Illinois University

College of Engineering and Engineering Technology

- The undergraduate programs in electrical engineering, industrial and systems engineering, and mechanical engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

- In the technology program, the emphases in electrical engineering technology and manufacturing engineering technology are accredited by the Technology Accreditation Commission of ABET, and the emphasis in industrial technology is accredited by the National Association of Industrial Technology.
Opportunities

- Branding
- Competitive

- Washington Accord
- World Recognition

- Student Exchange
- Staff Attachment

- Fellowship Program

Companies that employ NIU's Eng Tech graduates
The Process

### Process Flow of Collaboration Procedures

- **Identify Institution**
  - 2010

- **Prepare LoI for Collaboration**
  - 17-24 April 2011

- **Prepare paper work for approval:**
  - JKTS (Standing Committee)
  - Senate
  - May 2011

- **Prepare paper work for approval:**
  - JKTS (Standing Committee)
  - Senate
  - May 2011

- **Get approval from:**
  - MQA
  - MoHE
  - Dec 2011

- **Working on curriculum**
  - 2011

- **Implementation**
  - BTE
  - BTM
  - BTV
  - Sep 2012

- **Discussion and Negotiation**
  - May 2011

- **MoU Signing**
  - May 2011
DISCUSSION AND NEGOTIATION

Materializing Memorandum of Understanding (MoU) with Northern Illinois University (NIU) on May 20, 2011
Implementation

• Bachelor of Engineering Technology (Electrical) with Honors.

• Bachelor of Engineering Technology (Manufacturing) with Honors.

• Bachelor of Engineering Technology (Energy & Environmental) with Honors.

Engineering Technology Initiatives

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

Challenges
# Awareness

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

## Perception
- Future Students and their Parents

## Presence
- Very few graduates in the market

## Availability
- Started in UniKL
- Just recently established in MTUN

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## 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</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sydney</td>
</tr>
<tr>
<td>Australia</td>
<td>Institution of Engineers Australia (IEA)</td>
<td>All Engineering fields</td>
<td>Sydney</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Washington</td>
</tr>
<tr>
<td>Ireland</td>
<td>Engineers Ireland</td>
<td>All Engineering fields and ICT</td>
<td>Washington</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sydney Dublin</td>
</tr>
</tbody>
</table>
3 Funding

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

- Government Fund:
  - Limited funding
  - Delay or uncertain

4 Implementation

- Programs:
  - Searching for suitable programs
  - Dealing with host institutions

- Delivery:
  - Curriculum
  - Teaching materials

- Manpower:
  - Lecturers and Technicians
  - Industrial Experience

- Students:
  - Promotion, Application and Selection
5 Buying In

**STAKEHOLDERS**
- Society
- Industry
- Students

**SHAREHOLDERS**
- Government
- Ministry

6 Accreditation

**Program Accreditation**
- **ABET**
  - Documentation
  - Academic Audit
- **MQA**
  - Documentation
  - Academic Audit
- **MBOT**
  - Documentation
  - Academic Audit