UNIVERSITY-INDUSTRY COLLABORATION IN CURRICULUM DEVELOPMENT

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OUTLINE OF PRESENTATION

1. Why University-industry collaboration in curriculum development?

2. Role of stakeholder in the Quality Assurance Code of practice

3. University-industry collaboration: an example from Engineering

4. Strategies towards establishing a sustainable university-industry relationship
Why University – Industry Collaboration?

**University is about educating an individual to:**
- Acquire knowledge and skills
- Use the knowledge and skills to solve problems and make decisions based on scientific, ethical and moral principles
- Be socially responsive and willing to participate in change
- Be lifelong learners who will continually update and broaden their knowledge for the good of humanity

Knowledge and skills acquired must also be relevant to specific contexts or needs of specific stakeholders – real life experiences
Stakeholders in QA Guidelines

- Students
- Parents
- Government
- other employers
- Industry
- Profession
- Public at large
Why University – Industry Collaboration?

Advantages to university

Improved quality of educational programs

- Curriculum development: relevance of learning outcomes, content, methods of teaching and learning methods as well as student assessment
- Curriculum delivery: real life experiences through industrial attachment, internship, hands-on training, field projects
- Supervisors: teacher practitioners, faculty attachment to industry
- Educational Resources: state of the art training facilities such as laboratories, workshops, manufacturing plants
- Program evaluation: immediate feedback on adequacy, long term on graduate performance; development of new courses

Research collaboration & attracting funding

- Bench to industry and vice versa (translational research)

Student outcomes

- Better employment opportunities, through sustained relationship
Why University – Industry Collaboration?

**Advantages to industry:**
- Better trained graduates
- Identify & recruit graduates with best fit
- Technology transfer, innovation to marketplace
- Solution to industry problems

Mutual benefits: enhanced image of both university and the industrial entity
Levels of engagement of stakeholders

- Ministry level (captains of industry)
- University level (captains of industry)
- Faculty level (sectoral)
- Department/program level (sectoral/discipline)

Strengthening the inclusive, participatory and representative approach

In line with the governance imperative for transparency, objectivity & fairness
Role of stakeholders in QA code of practice

- Development of
  - Vision, mission & goals
  - Learning outcomes & curriculum design
- Curriculum implementation
- Curriculum evaluation
- Job placement
- Research & postgraduate linkages
- Provision of resources
- Participation in QA audit and program accreditation
UNIVERSITY-INDUSTRY COLLABORATION CONTINUUM

Level of engagement activities

Awareness
- Career Talks
- Interviews
- Career Fair

Involvement
- Industrial Affiliation
- Advisory Program
- Internship
- Attachments
- Research Grants

Support
- Curriculum Development
- Support/Funding
- Workshops/Seminars
- Student sponsorship
- Guest speakers/lectures

Sponsorship
- Undergraduate and graduate sponsorship
- Collaborative research
- Outreach Programmes

Strategic partners
- Joint partnership
- Gifts/Facilities
- Business ventures
- R&D solutions
- Curriculum development and evaluation

Traditional Engagement

Holistic engagement

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Example of University –Industry collaboration:
Faculty of Engineering, UKM

Adoption of an outcome based curriculum with a practice-based approach

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>PRACTICE BASED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering knowledge</td>
<td>Hands-on educational experience that emphasises interdependency between</td>
</tr>
<tr>
<td>Practical skills</td>
<td>theory (e.g design) &amp; application (e.g manufacturing/product realisation) in a</td>
</tr>
<tr>
<td>Ethics</td>
<td>business environment</td>
</tr>
<tr>
<td>Social accountability</td>
<td>Use of state of the art facilities</td>
</tr>
<tr>
<td>Communication &amp; team work</td>
<td></td>
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<tr>
<td>Problem solving &amp; decision-making</td>
<td></td>
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<tr>
<td>Information management &amp; life long learning</td>
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<tr>
<td>Managerial &amp; entrepreneurial skills</td>
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</tbody>
</table>
Requirements

- Clear understanding of the responsibilities and tasks graduates will be performing in engineering practice
- Appropriate balance between theoretical/analytical and practical knowledge (hands-on)
- Understanding of the workplace culture (e.g. team work, project management, ethics)

symbiotic university-industry relationship
Curriculum Development in the Faculty of Engineering UKM

- EDUCATIONAL OBJECTIVES
- PROGRAM LEARNING OUTCOMES
- CURRICULUM DESIGN
- CURRICULUM DELIVERY
- EVALUATION
- FACULTY MISSION
- RESEARCH & INNOVATION
- SERVICE TO COMMUNITY
- ADVISORY BOARD WITH INDUSTRY REPRESENTATION

- FACULTY BOARD
- CURRICULUM COMMITTEE
- PROGRAM COORDINATOR
- SELECTION OF TRAINING SITES
- STUDENT SUPERVISION
- STUDENT ASSESSMENT

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Examples of collaboration

- **Industrial attachment** - Two months at Malaysian and global companies.
  - Building ability in communication, teamwork, business issues, project management, and rapport with the industry.

- "An Introduction to Engineering" course – lectures by industry practitioners – in various fields of engineering.

- **Visits to industry** - All final year courses

- **Problem based learning** using real life problems from industry from 2\textsuperscript{nd}-4\textsuperscript{th} year
Spin-offs

- **Real life problems for research**

- **Faculty R&D&C activities involving industry**

- **Provision of facilities** — e.g. sponsored laboratory (IMEN - Micro and Nanoelectronic Engineering Institute) & test equipment (e.g. cars).
Spin-offs

- **Short courses and seminars** for industry to promote the facilities, expertise available in the Faculty & matchmaking of innovation with industry needs.

- Selected to lead development of standards and a manual for accreditation of engineering programs by the Engineering Accreditation Council
### Research spin-offs

<table>
<thead>
<tr>
<th>Industry Partners</th>
<th>Product collaboration with UKM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proton Berhad</strong></td>
<td>1. CNG/DI Cylinder Head</td>
</tr>
<tr>
<td></td>
<td>2. CNG/DI Piston</td>
</tr>
<tr>
<td></td>
<td>3. 1.6 liter 4-stroke 4-cylinder CNG/DI T-prototype engine</td>
</tr>
<tr>
<td></td>
<td>4. Fuel Cell Vehicle</td>
</tr>
<tr>
<td></td>
<td>5. Fuel Cell Hybrid Vehicle</td>
</tr>
<tr>
<td></td>
<td>6. Fuel Cell Engine</td>
</tr>
<tr>
<td><strong>AIC Semiconductor Sdn. Bhd.</strong></td>
<td>Development 3D Package Semiconductor</td>
</tr>
<tr>
<td><strong>ON Semiconductor</strong></td>
<td>Study of Under Bump Metallurgy (UBM) Materials in Area Array Packaging</td>
</tr>
<tr>
<td>Company</td>
<td>Project Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
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<tr>
<td>Intelligent Power System</td>
<td>Fuel Cell Power Plant for Automobile Application</td>
</tr>
<tr>
<td>IJM Construction Sdn. Bhd.</td>
<td>Acoustic consultants for the Putrajaya Convention Centre</td>
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Key Factors for Successful University-Industry Collaboration

**U-I partnership is essential component of the Strategic Plan:**

- Commitment to work towards common goals and mutual interests.
- Clear deliverables & expectations (e.g. recruitment of graduates, internship, research collaboration, commercial ventures)
- Must be willing to reassess and revise goals and strategies regularly.

**Understanding each other’s work culture:**

- University leadership - aware of constraints imposed on industry (e.g. government regulations, shareholders interest)
- Industry leaders must appreciate the primary mission of university & constraints of an academic unit (e.g. response time not as fast)
Key Factors for Successful University- Industry Collaboration

- Identification of “champions” and assignment of contact person(s):
  - Both assign contact person(s) who are committed to U-I partnership - continuity and clarity of collaboration, confidence building
  - Establishment of specific units e.g Univ-industry partnership, innovation unit, commercialisation unit

- Involvement at all levels:
  - Not just some departments but whole management, operational staff & students → Sustainable relationship

- Multiple and diverse collaborative activities:
  - Internships (both for students and faculty),
  - Faculty development programme
  - Research
  - Curriculum development

- Maintain open communication to reinforce trust
  - Discussion of issues, suggestions, plans etc
University-Industry collaboration is one dimension of sustainable education – suitable for market & progressive

The strategic plan must also include other dimensions:

- Lifelong Learning skills & opportunities
- Interdisciplinary Approaches
- System Thinking
  - problem solving, conflict resolution, consensus building, information management, interpersonal expression, critical and creative thinking
- Partnerships with the broader community
- Multicultural Perspectives – actual people in the community
- Empowerment of students
6. Conclusion

Rewards

- Graduate students who are well prepared for professional work.
- Additional funds for research and development through grants.
- Recruitment of additional students and faculty.
- New workshops and seminars.
- Business ventures.
- Reduce cost in training,
- Coordinated research to support product line.
- Business ventures collaboration and partnership with federal government agencies and other corporations.
- Faculty and curriculum development, and
- Developing long-term science and technology pipeline for Malaysia

* Success of AI relationship - Trust and Continuous Fostering by key individuals at each organization*
Terima Kasih • Thank You