Key Performance Indicators in Measuring PAIs & PLO Performance For Electrical Engineering Department Curriculum of Malaysian Polytechnics

(The role of KPIs to assess and improve the Outcomes-based Education)

By:

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Outcomes:

1. Identify Vision, Mission and KPI for Electrical Engineering Dept.
2. Recognize different types of KPI performance measures and the consequences of using different types.
3. Develop KPI for given goals.
4. Be able to constructively generate KPIs against its intended purpose with ethics.
Overview:

► NKRA
► ETP
► Stakeholders
► MQA
► OBE
What are Outcomes?

Consideration of Outcomes as achievements or changes in:

- Skill
- Knowledge
- Behavior
- Attitude
Why we deal with OBE?

OBE to hopefully achieve:

- Increase program effectiveness
- Inform decision-making
- Document completeness, successes and impacts of the polytechnics
- Increase graduate employability
- Increase polytechnics media image
- Increase community development by providing highly qualified graduates
- Help in correction actions and improvements
1. Programme educational objectives (PAIs) are developed from a number of sources including professional accreditation bodies, employer groups, the polytechnic educational principles and the professional experience of staff teaching in the discipline.

2. The programme outcomes (PLO) for a diploma and advanced diploma are clearly written statements about the knowledge, skills and attitudes of its graduates. It should link to the PAIs.

3. From these PO’s (CLO) the curriculum of the course is constructed, the subdivision of structure into units is made, and the outcomes specific to each of the units are derived.
Vision Statement

• How the organization wants to be perceived in the future – what success looks like.
• An expression of the desired end state
• Challenges everyone to reach for something significant – inspires a compelling future
• Provides a long-term focus for the entire organization
Mission Statement

• Captures the essence of why the organization exists – Who we are, what we do
• Explains the basic needs that you fulfill
• Expresses the core values of the organization
• Should be brief and to the point
• Easy to understand
• If possible, try to convey the unique nature of your organization and the role it plays that differentiates it from others
Examples: Mission and Vision Statements

**Intel**

Our *vision*, “Getting to a billion connected computers worldwide, millions of servers, and trillions of dollars of e-commerce”.

Intel’s core *mission*, “Is being the building block supplier to the Internet economy and spurring efforts to make the Internet more useful. Being connected is now at the center of people’s computing experience. We are helping to expand the capabilities of the PC platform and the Internet.”
Examples - Good and Bad Mission Statements

**NASA**
To Explore the Universe and Search for Life and to Inspire the Next Generation of Explorers

Does a good job of expressing the core values of the organization. Also conveys unique qualities about the organization.

**Walt Disney**
To Make People Happy

Too vague and unclear. Need more descriptive information about what makes the organization special.
OUTCOME BASED EDUCATION

Program Educational Objectives (PAIs)

Few years after Graduation – 4 to 5 years

Programme Learning Outcomes (PLO)

Upon graduation

Course Learning Outcomes (CLO)

Upon subject completion
Programme Aims (PAIs)

► What the programme is in preparing graduates for their career and professional accomplishments (*published*)?
► Consistent with institution missions (*evidence*)
► Involvement of constituents / stakeholders (*evidence*)
Programme Learning Outcomes (PLO)

- Expected to know and able to perform or attain by the time of graduation (skills, knowledge and behaviour/attitude)
Curriculum Learning Outcomes (CLO)

Outcomes that are expected from a certain subject and these are assessed and evaluated through various measurement tools.
MQA LEARNING OUTCOMES

1. Mastery of Body of Knowledge
2. Practical Skills
3. Social Accountability
4. Ethics, Shared Values & Professionalism
5. Scientific Method, Critical Thinking & Problem Solving
6. Communication Skills & Team Work
7. Information Management & Life Long Learning
8. Entrepreneurship
PLOs used for Electrical Engineering Dept.

1. Knowledge
2. Practical Skills
3. Social Accountability
4. Communication Skills
5. Team Work
6. Ethics, Professionalism
7. Critical Thinking & Problem Solving
8. Entrepreneurship
9. Life Long Learning

knowledge & practical skill

soft skills
## Programme Aims (PAI)

1. Knowledge, skills and attitude
2. Entrepreneurial skills and practice good work ethics
3. Continuously enhance their knowledge and skills
4. Communicate and interact
5. Team member

### Programme Learning Outcomes (PLO)

<table>
<thead>
<tr>
<th>No</th>
<th>Programme Learning Outcomes (PLO)</th>
<th>PAI1</th>
<th>PAI2</th>
<th>PAI3</th>
<th>PAI4</th>
<th>PAI5</th>
<th>LD1</th>
<th>LD2</th>
<th>LD3</th>
<th>LD4</th>
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<th>LD6</th>
<th>LD7</th>
<th>LD8</th>
<th>GSA1</th>
<th>GSA2</th>
<th>GSA3</th>
<th>GSA4</th>
<th>GSA5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Apply knowledge of mathematics, science and engineering fundamentals to well defined electrical and electronic engineering procedures and practices.</td>
<td>✓</td>
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<td>2.</td>
<td>Demonstrate practical skills which includes the ability to troubleshoot, repair and do maintenance work for electrical and electronic equipment with specialization in computer.</td>
<td>✓</td>
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<td>3.</td>
<td>Demonstrate awareness and consideration for societal, health, safety, legal and cultural issues and the consequent responsibilities.</td>
<td>✓</td>
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<td>4.</td>
<td>Communicate effectively with the engineering community and the society at large.</td>
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<td>5.</td>
<td>Work independently or as a team member successfully.</td>
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<td>6.</td>
<td>Demonstrate an understanding of professional ethics, responsibilities and norms of electrical and electronic engineering practices.</td>
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<td>7.</td>
<td>Apply creative and critical thinking in solving problems related to assigned tasks.</td>
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<td>8.</td>
<td>Recognize the need for entrepreneurship.</td>
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<td>9.</td>
<td>Recognize the need for professional development and engage in independent acquisition of new knowledge and skill.</td>
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RELATIONSHIPS BETWEEN CLO’S, PLO’S, PAI’S and COMPLIANCE TO THE STAKEHOLDERS

STAKEHOLDERS

- Regulatory/Professional Bodies
- KPT/MQA
- IHL requirements
- Industrires
- Students...

PROGRAMME AIM'S OBJECTIVES

- PAIs-1
- PAIs-2
- PAIs-3
- PAIs-4
- PAIs-5
- PLO-1
- PLO-2
- PLO-3
- PLO-4
- PLO-5

PROGRAMME LEARNING OUTCOMES

- Subject CLO-1
- Subject CLO-2
- Subject CLO-3
- Subject CLO-4
- Subject CLO-5

COURSE LEARNING OUTCOMES

- Subject CLO-1
- Subject CLO-2
- Subject CLO-3
- Subject CLO-4
- Subject CLO-5

Management support and commitment
OUTCOME-BASED EDUCATION
For EAC accreditation

Program
Outcomes

Program
Objectives

Course
Outcomes

Missions

Visions

Stakeholders

Alumni

Advisory committee

Assessment

CQI

Analysis

Analysis

Analysis
Continual Quality Improvement

Assessment and evaluation processes provide critical information to faculty (lecturers) and administrators on the effectiveness of the design, delivery, and direction of an educational program - CQI.

Improvements based on feedback from evaluations will close the system loop and the process will continue year after year.
Key Performance Indicators (KPI)
Performance indicators are measures that describe how well a program is achieving its objectives/outcomes.

Key Performance Indicators are quantifiable measurements, agreed to beforehand, that reflect the critical success factors of an organization. They will differ depending on the progress of organization.
Key Performance Indicators, also known as KPI or Key Success Indicators (KSI), help an organization define and measure progress toward organizational goals. Once an organization has analyzed its mission, identified all its stakeholders, and defined its goals, it needs a way to measure progress toward those goals.
Why are performance indicators important?

Performance indicators are at the heart of a performance monitoring system – they define the data to be collected to measure progress and enable actual results achieved over time to be compared with planned results (CSF).
Performance Measures

1. Percentage of...
2. Number of… (hours, times per month, donation, activities, km etc)
3. Frequency of …
4. Level of …
5. Total of …(score, costs, hours, ..)
6. Average
7. Grade
8. Ratio of
9. Degree of
OUTCOME BASED EDUCATION

VISION, MISSION

PAIs/PLO

CLO
What KPIs measure and help in?

- Measure the Progress in polytechnic activities
- Recognize the gap between planned and achieved goals
- Help in structuring of correction actions
1. A model for designing good KPI
KPI in the Planning Hierarchy

KPI may be thought of as essential elements of the overall planning and monitoring system.

They are derived from the JPP’s Vision and help track performance towards accomplishing the Mission.

A KPI is not a single component, but an integrated collection of components.
Designing Good KPIs

► **Outcomes**: what are we *trying to achieve*?
  - May be more than one indicator for each outcomes
  - Each outcomes will have strategies on how to achieve them

► **Indicators**: *what* are you going to measure?
  - used to assess the present state of progress and to suggest an appropriate course of action.

► **Measures**: *how* are you going to measure it?
  - can be qualitative or quantitative data related to inputs, processes or outputs.

► **Targets**: what is the *desired result*?
  - can be minima targets, stretch targets or a combination.

► **Results**: what have you *actually achieved*?
Constructing Good KPIs

- **Outcomes**
  - High Quality Teaching

- **Indicator (one of several)**
  - Student satisfaction with the teaching they experience

- **Measure**
  - Mean student response, per class, to the question, “overall, how satisfied are you with this lecturer?”
  - On a 1 to 5 Likert-type scale

- **Targets**
  - At least 3.5 on a 1 to 5 scale (where 5 is the best): OR
  - Best in class compared with benchmark partners
2. Conceptually understanding KPI
Why use KPIs?

- Key Performance Indicators help us to know whether we are succeeding in our mission.
- They are an important management tool for tracking progress against strategic goals.
- Working with KPIs encourages system thinking.
  - In most systems, 85% of problems can usually be attributed to the system and 15% to the individual.
- KPIs direct and prioritise behavior towards achievement of the vision, mission and outcomes.
There may be separate KPI for objectives and their associated strategies.

Provided that objectives are outcomes-based, and strategies support objectives, then:

- Lag KPI set
- Lead KPI set
3. Tools for critically analyzing KPI
Specific
Measurable
Aligned
Realistic
Timely
Ethical
Recorded
Other Tips for Good KPIs

1. Achieve/beyond the target.
2. Align them to standards.
3. Test them for validity and reliability.
4. Discuss and review them. Are they really key? Don’t overestimate their importance!
5. Differentiate between lag and lead indicators.
6. Benchmark them.
7. Do something with them. KPI should lead to change.
8. Keep them simple – but not too simple!
9. Balance focus on positive and negative news (i.e. opportunities for improvement).
Workshop Example
Indicators for Learning and Teaching

<table>
<thead>
<tr>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Students will learn to solve problems.</td>
</tr>
<tr>
<td>2. The program will be viable.</td>
</tr>
</tbody>
</table>

Example

- For each of these three outcomes, strategies are provided.
- KPIs are then constructed using the model: indicator → measure → target
- KPIs are then tested using SMARTER
**Outcome**

Students learn to solve problems

**Strategy**

- Design and deliver problem-based curriculum
- Indicator: courses include learning outcomes that relate to problem solving
- Measure: number of courses each semester with problem-solving learning outcomes included in institutional course guides
- Target: 100% of new courses; 100% of all courses by 2013

**SPECIFIC?**

Yes. The indicator is tightly focused on the single issue of courses design.

**MEASURABLE?**

Yes. The number of courses that comply can easily be counted.

**ALIGNED?**

Yes. The measure relates directly to the indicator; the target relates directly to the measure.

**REALISTIC?**

Yes. The KPI has been made realistic by separating new courses, which can implement the strategy directly, from existing courses, which will need to be changed.

**TIMELY?**

Yes. The measure is each semester, allowing for current data and trend data. The target is time-specific.

**ETHICAL?**

There are no obvious ethical concerns with collecting and using this aggregated information.

**RECORDED?**

The target implies that trend data will need to be kept and analysed until at least 2012.

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**Outcome**

Students learn to assess their own problem-solving abilities

**Strategy**

- Indicator: courses include learning outcomes that relate to problem solving
- Measure: student pass rates
- Target: 100% of new courses; 100% of all courses by 2013

**SPECIFIC?**

Yes. The indicator is tightly focused on the single issue of assessing student's problem-solving abilities.

**MEASURABLE?**

Yes. Student pass rates are easily measured.

**ALIGNED?**

Yes. The measure relates directly to the indicator; the target relates directly to the measure.

**REALISTIC?**

Yes. The target does not appear unachievable.

**TIMELY?**

Yes. The measure is each semester, allowing for current data and trend data. The target is time-specific.
<table>
<thead>
<tr>
<th>Objective</th>
<th>Strategy</th>
<th>KPIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program will attract the best students directly by direct marketing to school leavers.</td>
<td></td>
<td>Indicator: Student satisfaction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measure: (a) Student pass rates (b) Excellent program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Target: (a) 100% (b) All staff qualified</td>
</tr>
</tbody>
</table>

**Workshop Example #2**

**Indicators for Learning and Teaching**

**These are not SMARTER KPIs**

**Let’s improve them…**

- **ETHICAL?** No. This KPI implies that staff can be held accountable for ‘student satisfaction’ and the ‘excellence’ of the program and by virtue of their qualifications. The case for this is not justified here.

- **SPECIFIC?** No. ‘Student satisfaction’ is very broad. Satisfaction with exactly what?

- **ALIGNED?** No. Student satisfaction and student pass rates are not the same thing.

- **MEASURABLE?** Yes. Student pass rates are easily measured.

- **RECORDED?** There is no indication on how this KPI will be recorded, reported and stored.

- **ETHICAL?** Maybe not. The target of 100% may encourage staff to mark too softly.

- **ETHICAL?** No. This KPI implies that staff can be held accountable for ‘student satisfaction’ and the ‘excellence’ of the program and by virtue of their qualifications. The case for this is not justified here.
<table>
<thead>
<tr>
<th>Goal</th>
<th>Strategy</th>
<th>KPIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program will be viable.</td>
<td>Attract the best students by direct marketing of programs to school leavers.</td>
<td>Indicator: Student program preferences by academic performance.</td>
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<tr>
<td></td>
<td></td>
<td>Measure:</td>
</tr>
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<td>(a) Percentage of enrolled students who listed the program as their 1^{st} preference (via Admission Centre)</td>
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<tr>
<td></td>
<td></td>
<td>(b) Proportion of 1^{st} preference students in national top 10% by academic rank</td>
</tr>
</tbody>
</table>
## Workshop Activities

### Program Learning Outcomes (PLO)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Strategy</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply knowledge of mathematics, science and engineering fundamentals to well defined electrical and electronic engineering procedures and practices;</td>
<td>Progress Scheme identifies weak students for each curriculum programs, and promotes them to participate in student learning support activities.</td>
<td>Indicator: Student progress rates</td>
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<tr>
<td></td>
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<td>Measure: Percentage of students progressing to the next level of study without having to repeat any units; differentiated by those who participated in the Progress Scheme and those who didn’t.</td>
</tr>
<tr>
<td></td>
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<td>Target: Improvement trends over three years for six cohorts, but steeper for Progress Scheme students</td>
</tr>
</tbody>
</table>
## Workshop Activities
### Program Learning Outcomes (PLO)

<table>
<thead>
<tr>
<th>Goal</th>
<th>Strategy</th>
<th>KPIs</th>
</tr>
</thead>
</table>
| Recognise the need for professional development and engage in independent acquisition of new knowledge and skill. | Establish Industry Advisory Boards (IABs) for each program. Invite key employers to be members. | Indicator: Graduate employability rate  
Measure: % graduates in full time employment in the industry  
Target: above national average  
Indicator: Acceptance of program by industry  
Measure:  
(a) Professional accreditation of program by 2012  
(b) Positive feedback from employers and industry |
<table>
<thead>
<tr>
<th>Objective</th>
<th>Strategy</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have knowledge, skills and attitude that will allow them to make tangible contributions and meet new technical challenges.</td>
<td>Academic Advisors are available for career planning.</td>
<td>Indicator: Graduate recruitment by employment preference. Measure: Percentage of graduates in preferred employment within 12 months of graduating. Target: At least 50% graduates are semi-professional skills workers and 10% success entrepreneurs after 4 years graduation.</td>
</tr>
</tbody>
</table>
In Summary

• Introduction of KPIs represents a major step forwards.

• Enables HOD to understand where progress is being made towards achieving strategic Vision, Mission, PAIs and PLO and those areas which need to be addressed the KPIs.

• Development KPIs continues in response to JPP (Curriculum Division) requirements.
Questions & Discussion
Workshop

To prepare:

• Vision and Mission of Electrical Engineering Department For Malaysian Polytechnics under JPP.
• KPIs for PAIs, PLO and CLO.