IE Education in Indonesia

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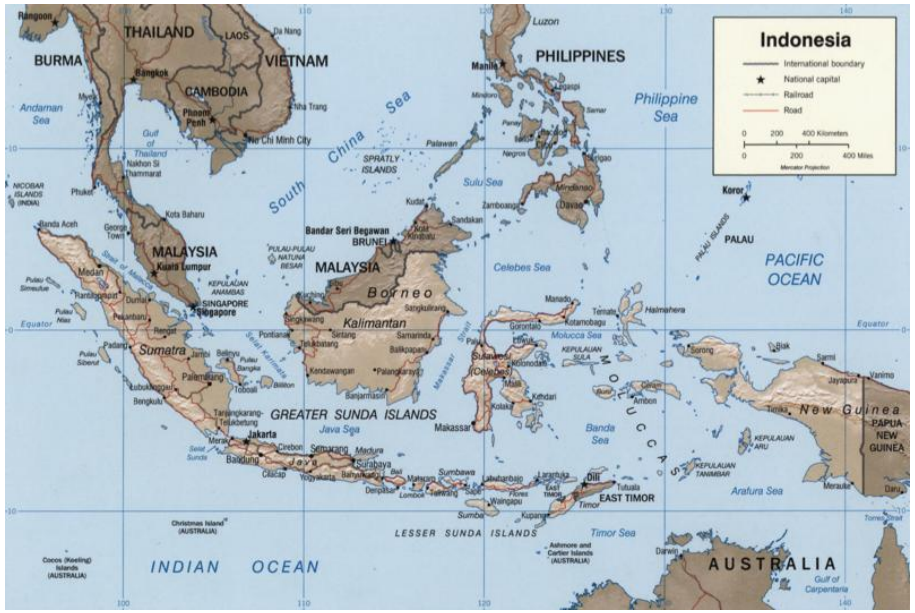
Republic of Indonesia



- Latitude 11°S and 6°N – Longitude 95 °E and 141°E
- 17,058 islands, more than 6000 are inhibited
- 300 ethnic group and 742 language & dialects

- Capital: Jakarta
- Language: Bahasa Indonesia
- Area: 1,919,400 km^2 – 7th in the world
- Population: 237.6 million
- GDP: US$ 928.274 billion
- GDP per Capita: US$ 3,797
- GDP Contributors
  - **Industry 46.4%**
  - **Services 38,6%**
  - Agriculture 14,2%

Higher Education Institutions in Indonesia: 3,268 Institutions

University (491) , Institute (61), Advanced Tertiary School (1,406)

- May offer undergraduate and post graduate programs
- If eligible could offer vocational and professional programs

Polytechnic (184), Academy (1,126), and Community College

- Focus on Vocational Programs
- If eligible could offer master and doctoral programs in Technology (applied science)

Higher Education Institutions in Indonesia

- Government owned Higher Education Institution (99)
  - 4,249 Study Programs
- Private Higher Education Institutions (3,169)
  - 11,993 Study Programs

Higher Education Institution in Indonesia

- 16,242 Study Programs
  - 9,888 Undergraduate Study Programs
  - 1,583 Engineering Undergraduate Study Programs
  - 220 IE Undergraduate Study Programs

IE Study Program:

13.9% of All Engineering Study Programs

BKSTI: Indonesian Association of IE Higher Education Institutions (IAIE)

- Rapid Growth of IE Study Programs has attracted many heads of study programs (departments) of IE
- Initiated in 1996:
  - Congress held at Bandung Institute of Technology
  - Attended by not less than 150 Head of IE Study Programs
  - The establishment of the Indonesia Assoc. of IE Higher Education Institutions
- Institutional Membership: Represented by Head of Study Program
- **Objective**: Improve quality and relevance of IE Education in Indonesia

IE in Bandung Institute of Technology

- Stage 1: 1958-1968
  - IE courses were taught in Mechanical Engineering Department;
- Stage 2: 1968-1973
  - Establishment of IE Department at BIT in 1971, a long process of nurturing
- Stage 3: 1973-1979
  - System Approach in IE Education, introduced to non-manufacturing
- Stage 4: 1979-1982
  - Establishment of Master and Doctoral Program
- Stage 5: 1982-1987
  - Manufacturing System as Platform of Education
- Stage 6: 1987-1993
  - 7 areas of specialization in manufacturing
- Stage 7: 1993-1998
  - 2 areas of specialization: Manufacturing System & Industrial Management
- Stage 8: 1998-2003
  - ABET criteria were introduced
- Stage 9: 2003-2008
  - No specific focus in undergraduate program and 7 groups in post graduate program
- Stage 10: 2008-2013
  - 5 groups in post graduate program

IE in Bandung Institute of Technology

2013-2018 Student Outcome:

a. an ability to apply knowledge of mathematics, science, and engineering to industrial engineering area.
b. an ability to design and conduct experiments, as well as to analyze and interpret data.
c. an ability to design a system, component, or process consist of people, materials, equipment, information, equipment, and energy to meet desired needs within realistic constraints
d. an ability to function on multidisciplinary or cross-cultural team.
e. an ability to identify, formulates, and solves industrial engineering problems.
f. an understanding of professional and ethical responsibility.
g. an ability to communicate effectively.
h. the broad education necessary to understand the impact of industrial engineering solutions in a global, economic, environmental, and societal context.
i. a recognition of the need for, and an ability to engage in life-long learning.
j. a knowledge of contemporary issues relevant to industrial engineering.
k. an ability to use the techniques, skills, and modern engineering tools necessary for industrial engineering practices.

IE in Bandung Institute of Technology

Integrated and Inter-Disciplinary Design Experience

Practices of the Integrated System Design

- Basic Engineering Design
- Work System Design
- Production System Design
- Enterprise System Design

Inter disciplinary Engineering Project

- Senior Students
- Work in Group of Students from Different Study Programs
- Solve Daily Life Problem
- Assessment: Students, Lecturer, Industrial Professional

Industrial Internship

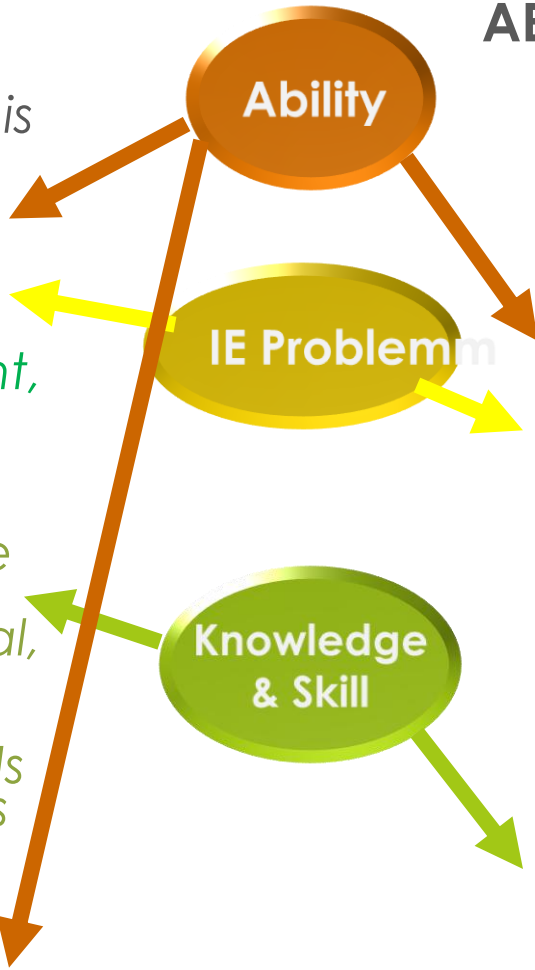
Final Project I & II

Industrial Engineering in Indonesia

IIE DEFINITION

"*Industrial Engineering is concerned with the* ***design, improvement, and installation*** *of integrated systems of people, materials, information, equipment, and energy.*

It draws upon specialized knowledge and skill in the mathematical, physical, and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems."

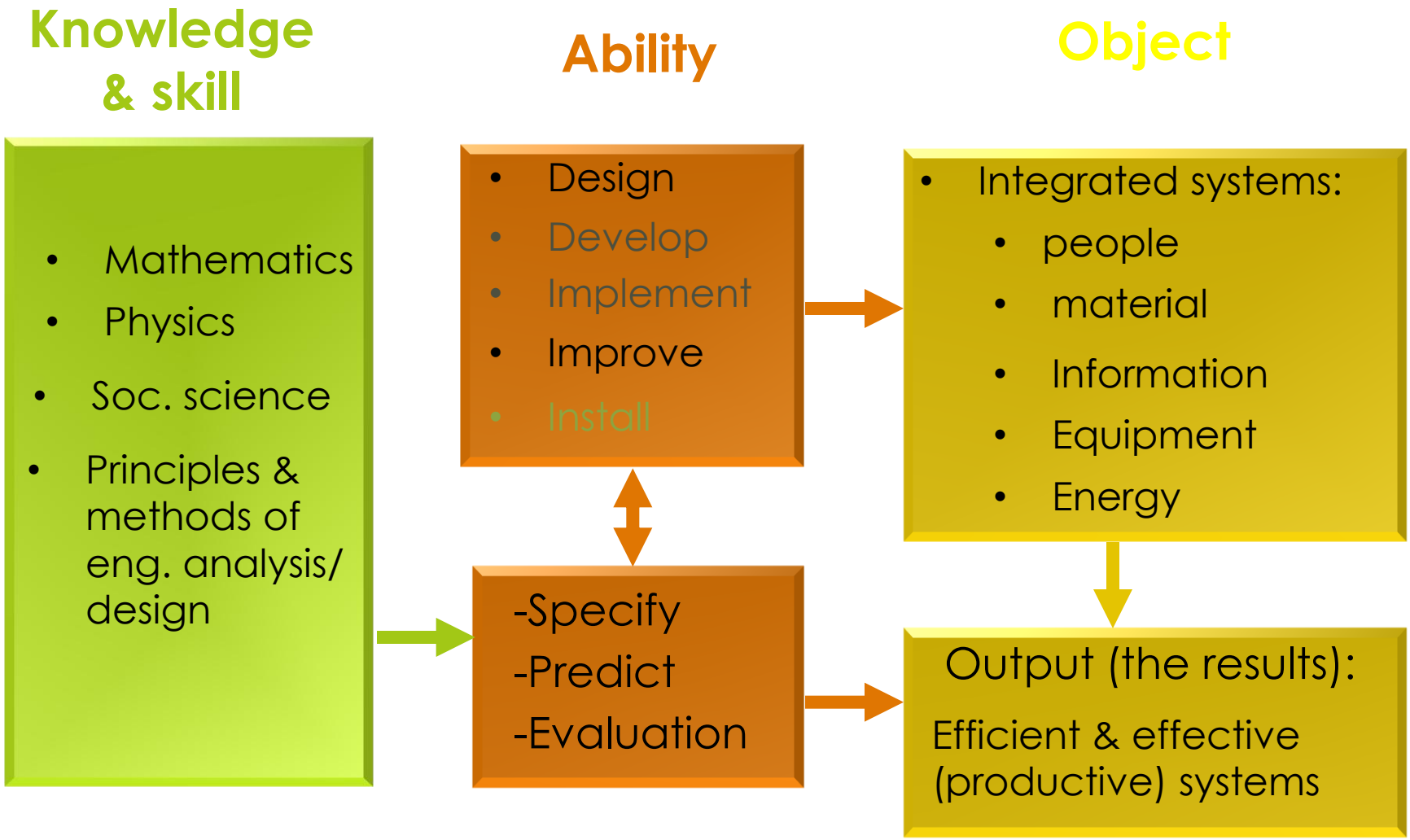


ABET CRITERIA

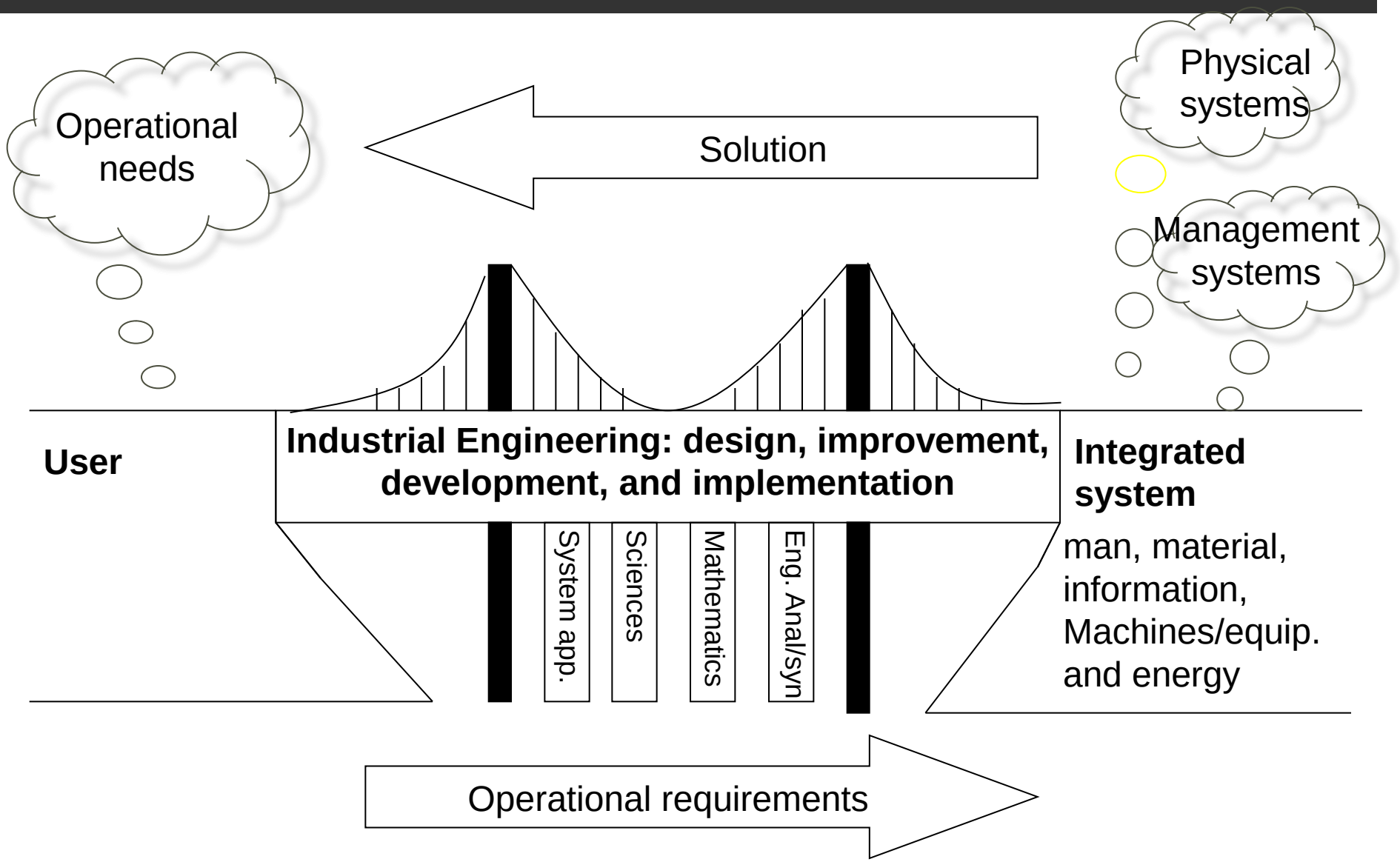
"*The program must demonstrate that graduates have the ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy.*

The program must include in-depth instruction to accomplish integration of systems using appropriate analytical, computational and experimental practices"

Industrial Engineering in Indonesia



Industrial Engineering in Indonesia



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- Broad/general definition of a system
  - Keywords: subsystems/*elements*, interaction/*interoperable*, and objectives/*specified outcome*
- The main concern of IE is not with the object but the methodology: **The *system approach***
- System (Wasson [2006]):

  "*An integrated set of interoperable elements, each with explicitly specified and bounded capabilities, working synergistically to perform value added processing to enable a user to satisfy mission-oriented operational needs in a prescribed operating environment with a specified outcome and probability of success.*"

- The *system approach*: how to solve a problem holistically, not isolated, integrated, synergistically

Industrial Engineering in Indonesia

- To educate people about IE (i.e. the system approach), we need a learning model
- 'Industrial' in 'Industrial Engineering' includes not only Manufacturing Systems but any other systems: hospital, airline, banking, construction, government
- The learning model: **a Manufacturing system**
- Why the Manufacturing System has been chosen as a learning model?

Industrial Engineering in Indonesia

- The reasons of choosing the Manufacturing System as a learning model
  - All subsystems of a manufacturing system could easily be recognized
  - A manufacturing system constitutes a visible (concrete, real) system
  - A manufacturing system is easy to be found in daily life
  - Manufacturing systems contribute to the national economy significantly

- The manufacturing system is considered as only a learning model. The graduates from an IE Department could choose their respective jobs at any system:
  - Using the system approach
  - Analogizing the chosen system to the manufacturing system: modeling process
- The IE graduates are more flexible in choosing jobs

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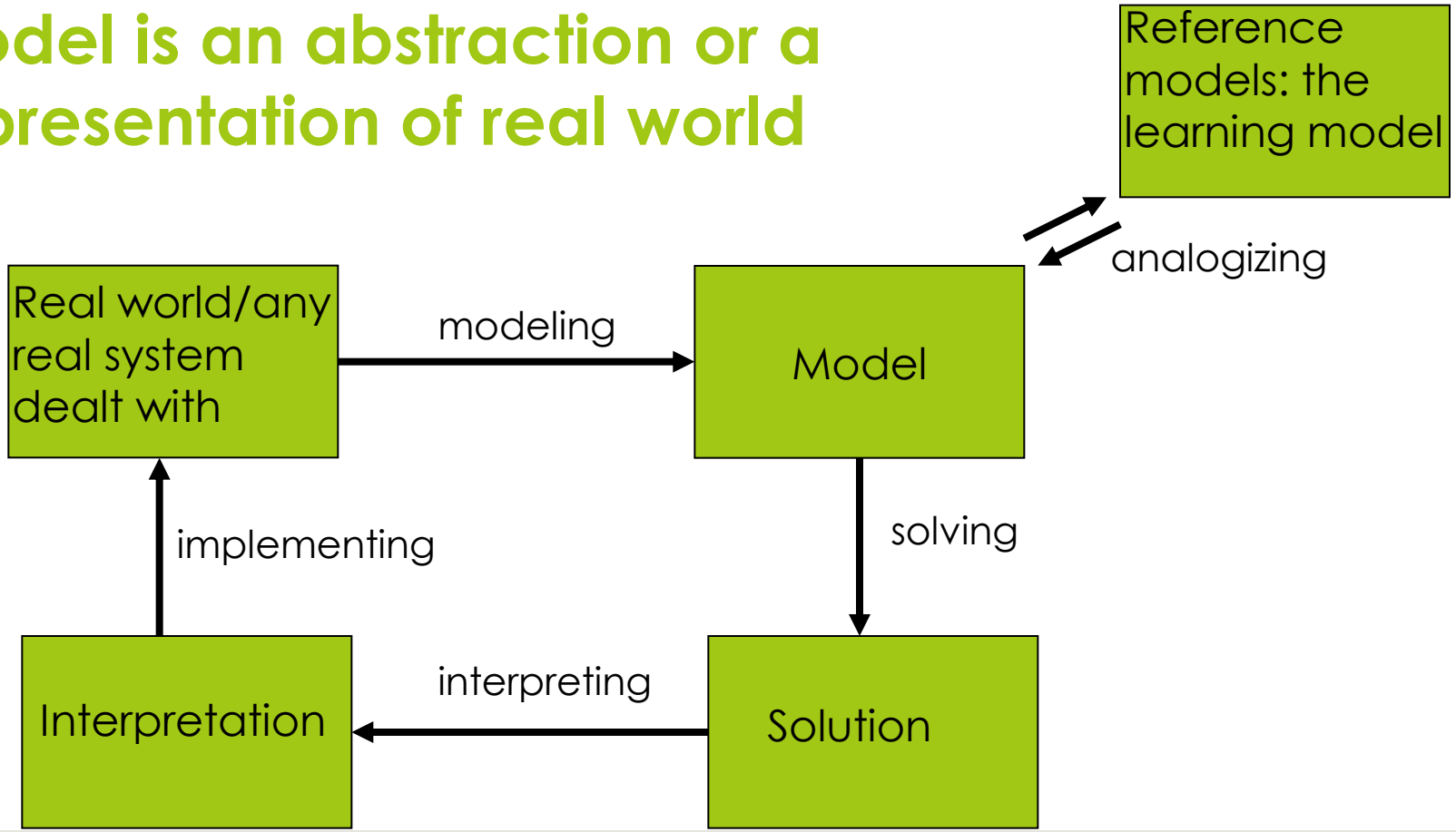
Model is an abstraction or a representation of real world



Indonesia National Qualification Framework

- **DGHE – 2004:**

  Design and implementation of a curriculum of a study program has to be based on competence

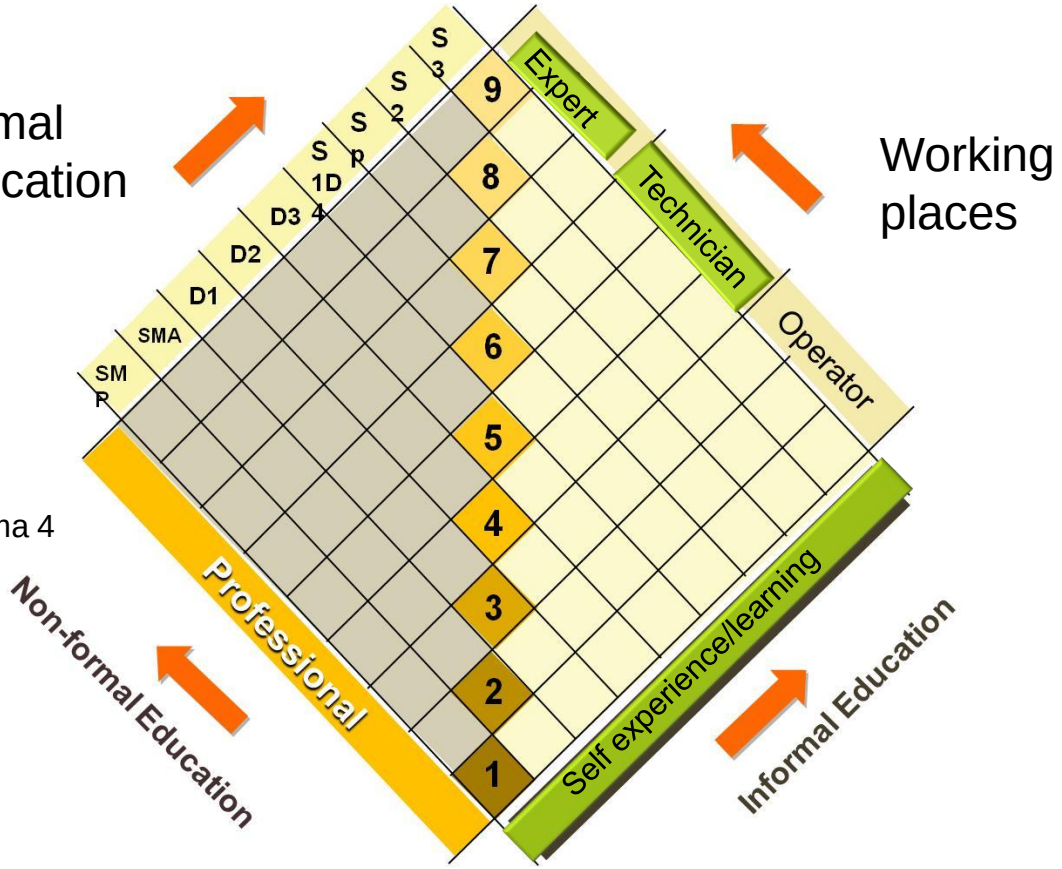
- **BKSTI – 2007:**

  Core IE curriculum – 92 credits (out of 144); the remaining credits (52 credits) for specialization

- **President Regulation No 8/2012:**

  INQF leveling competences acquired from formal, non-formal, informal education, and working experience

Indonesia National Qualification Framework



Note for formal education:
SMP: Junior high school
SMA: Senior high school
D1: Diploma1
D2: Diploma 2
D3: Diploma 3
S1/D4: Undergraduate level/Diploma 4
Sp: Specialist level
S2: Master level
S3: Doctorate level

Concluding Remarks

The methodology is the emphasis for solving any system

The characteristic of IE problems can be concluded as follow:

- Integrated systems of people, materials, information, equipment, and energy
- The problem has a single or multiple objectives that should be optimized under a number of constraints
- The problems could be unsolvable but commonly there is a unique or alternate solutions
- There are trade offs among feasible solutions

Thank You

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