Elements of a professional framework for technology development and innovation

CAST INTERNATIONAL FORUM

Micaela dos Ramos CEng
Isaac Aligbeh

Beijing 22 November 2018

Engineer your career • Improve our society
An engineer’s career is never straightforward, but their professional development should be.
Importance of Professional Development

Due to the speed of technological progress and advancements, it is more important than ever that engineers are constantly learning and professionally developing themselves. This includes:

- The theoretical knowledge of new and advancing technology in their workfields and others’
- New applications, methods, processes, and systems
- Sustainability and ethics
- Development of professional skills as well as technical knowledge.

Learning and opportunities to learn do not stop at graduation, but the structure for learning does.
CHALLENGES (1/2)

What are today’s challenges in the engineering sector?

• very rapid technology development

• increasing multi-faceted problems that need a multi-disciplinary approach

• complex projects requiring strong leadership, excellent project management and quality control

• issues with safety, sustainability and professional ethics
In all technical sectors transformations are taking place, in terms of knowledge, issues and roles.

Young professionals have difficulty in acquiring the skillset to grow to more senior positions.

Current pool of engineers may (partially) not have the desired skill set that is needed to take on current and future ambitions; this may be the case both on company level as well as on national level.

**What are today’s challenges in the engineering sector?**
To help deal with the challenges and foster technology development and innovation from 3 perspectives:

• **Personal**: the individual engineer

• **Industry**: advancement for individual companies and for sectors as a whole (e.g. building, infrastructure, mobility, high tech, process industry etc.)

• **Society**: to serve the public and the public interest
ADVANTAGES OF FRAMEWORK

• Support through different career stages, jobs, companies and roles.

• Advancement of technical knowledge while broadening professional skills.

• Engineers can identify areas that they are strong in or may need more development. Therefore they can set goals and advance quicker.

• More focussed learning

• Promotes innovation and creativity

• Gives context to both formal and non-formal learning, across multiple disciplines

• Company and industry benefits by giving alignment on strategy
Focus on the requirements necessary to sustain engineers who serve our societies and are excellent, innovative, uphold high ethical standards and a sustainable development.
COMPETENCE AREAS

KIVI’s 5 core competence areas.

A. Knowledge & understanding of Engineering
Focuses on your engineering knowledge and technical language.

B. Design & development of processes, systems, services or products

C. Leadership, responsibility & management
Focuses on other professional and soft skills.

D. Communication & interpersonal skills

E. Professional commitment
## COMPETENCES

These 5 core-competence areas are broken down into 18 sub-competencies.

<table>
<thead>
<tr>
<th>COMPETENCE A</th>
<th>COMPETENCE B</th>
<th>COMPETENCE C</th>
<th>COMPETENCE D</th>
<th>COMPETENCE E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and understanding of engineering</td>
<td>Design, develop and create innovative products, systems, processes or services</td>
<td>Leadership, responsibility &amp; management</td>
<td>Stakeholders, communication &amp; interpersonal skills</td>
<td>Professional commitment</td>
</tr>
</tbody>
</table>

### A1: Extend your theoretical knowledge of new and advancing technology.

### A2: Contribute to the development of the theory of engineering technology.

### B1: Identify potential projects and opportunities.

### B2: Conduct appropriate research, and undertake design and development of new and creative engineering solutions.

### B3: Manage implementation of design solutions, and evaluate their effectiveness.

### B4: Exercise sound judgement when stakes are conflicting or knowledge is incomplete.

### C1: Plan for effective project implementation.

### C2: Budget, organise, direct and control tasks, people and resources.

### C3: Lead teams and develop staff to meet changing technical and managerial needs.

### C4: Bring about continuous improvement through quality management.

### C5: Be a leader within your work field and society.

### D1: Identify all stakeholders and communicate with others at all levels.

### D2: Present and discuss proposals.

### D3: Demonstrate personal and social skills, including the ability to work in teams.

### E1: Demonstrate ethical behaviour and comply with relevant legal and regulatory requirements.

### E2: Design, manage and apply safe systems of work.

### E3: Undertake engineering activities in a way that contributes to sustainable development and a circular economy.

### E4: Demonstrate your development strategy and how you plan to carry out and record CPD in order to maintain and enhance all competences A-E.
PROFESSIONAL REGISTRATION

THE CHARTERED ENGINEER STANDARD

KIVI offers two professional titles:

Chartered Engineer (CEng)  Incorporated Engineer (IEng)

Provides an internationally recognised qualification, based on a high quality standard and commitment to ethics and to continuous professional development.

• Degree required
• Minimum 5 years work experience
• Portfolio assessment
• 90 minute Professional Review Interview
• Mandatory CPD

https://www.kivi.nl/chartered

Chartership pins
Formal education and courses through university and research institutions
Non-formal learning at company
Industry-academia research projects
Peer-to-peer interaction within and outside sector
Coaching of young engineers and students

The Professional framework assures that development is coherent, holistic and well-rounded

Key aim is to pursue excellence and innovation on a personal, company and industry level, and improve society
THE ONLINE PROFESSIONAL DEVELOPMENT TOOL (OPD)

MAIN FUNCTIONS:

- Professional Planning
- Analysis and Strategy
- Portfolio Development
- Reports for yourself, mentors and employers
- Professional Registration
- CPD Tracking
PLAN STRUCTURE

Supports competence based reflective learning and align personal goals with company strategy.
REPORTING AND ANALYSIS

**ZELFBEoordeling 2017**

**DATA**
- **Plan:** Development plan 2017 Project Bridge: Competence C, D, E
- **Status:** To Do, In progress
- **Labels:** No labels
- **Dates:** All dates

**TAKS**
- **TO DO:** 2 tasks
- **IN PROGRESS:** 8 tasks
- **COMPLETE:** 22 tasks

**COMPETENCE AREAS**

<table>
<thead>
<tr>
<th>Area</th>
<th>HOURS</th>
<th>TASKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Knowledge and understanding of engineering</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>B. Design, develop and create products, systems, processes or services</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>C. Leadership, responsibility &amp; management</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>D. Communication &amp; Interpersonal skills</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>E. Professional commitment</td>
<td>20</td>
<td>4</td>
</tr>
</tbody>
</table>

**TOTAL:** 132 tasks

**LABELS**
- Bridge projects: 4/13 hours
- Bridge projects: 4/13 hours
- Bridge projects: 4/13 hours

**TRACK COMPETENCE OVER TIME**

- Graph showing hours for each competence area over different date ranges.
ASSESSMENT PROCESS

THE CHARTERED ENGINEER STRUCTURE

Portfolio progress

COMPETENCE A
Knowledge and understanding of engineering
A1: IN PROGRESS
A2: COMPLETED
A3: IN PROGRESS

COMPETENCE B
Design, develop, and create products, systems, processes and services
B1: TO DO
B2: IN PROGRESS
B3: TO DO
B4: TO DO

COMPETENCE C
Leadership, responsibility and management
C1: COMPLETED
C2: IN PROGRESS
C3: COMPLETED
C4: COMPLETED
C5: COMPLETED

COMPETENCE D
Communication and interpersonal skills
D1: COMPLETED
D2: COMPLETED
D3: TO DO

COMPETENCE E
Professional commitment
E1: COMPLETED
E2: TO DO
E3: TO DO
E4: TO DO
PLANNING AND CPD TRACKING

The Chartered Engineer Structure

CPD Record
March 2017-March 2019

To Do
- Labore et dolore magna aliqua
- Ut enim ad minim veniam
- Sed ut perspiciatis

In Progress
- Consectetur adipiscing elit
- Sed do eiusmod tempor incididunt

Completed
- At vero eos et accusamus
  Completed: October 07
- Lorem Ipsum
  Completed: October 07
- Temporibus autem quibusdam
  Completed: October 07
- Dolor sit amet
  Completed: October 07

Competence points

8/100 POINTS

DONE
- 2
- 0
- 3
- 3

TO GO
- 38
- 10
- 7
- 12
THE OPD AND COMMUNITY

Since launching the OPD Tool:

**Government**
- Has requested the OPD Tool to be used across multiple sectors.

**Industry**
- Companies using the professional competences and the OPD Tool as a professional development path for their employees.
- Industry sectors using the professional competences and the OPD Tool for the advancement of the sector and the competence of their engineers.

**Universities**
- Students using the OPD Tool to prepare them for professional practice.
- Competence and outcome-based approach being incorporated into curriculum.
KEY ELEMENTS TO INNOVATION AND SUCCESS

- an eco-system between engineers from companies, government, with academia and students also involved;

- a framework for the continued learning path from students to professionals throughout their career, supporting all different roles and career stages;

- recognition to those who meet and keep a high professional standard through formal professional titles;

- an online support system to support individual learning and development as well as the overall process and structure;
MUTUAL RECOGNITION

- High end professional development framework
- with codified professional titles
- And a robust process in line with today’s digitization needs
- With analysis and reporting output
- Involving industry, government and academia
- Is an excellent base for mutual recognition between different countries
An engineer’s career is never straightforward, but their professional development should be.