ENGINEERING
Professional Development

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Mechanical and Aerospace Engineering

ENG190 W'13
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(III)

Resume of classes (I) & (II)

(I)

The Professional Engineer
Science and Engineering
ABET Accreditation
Engineering Challenges
Inventors and Inventions

(II)

Creativity in Engineering
Technical Design
Brainstorming
Team Work
Free Exchange of Ideas

Agenda (III)

Regulation and License in Engineering

The Process of Registration

Corporate Practice

Industrial Exemption

Management

Graduate Engineer & Professional Engineer

A **Graduate Engineer** is anyone holding a degree in Engineering from an accredited four-year university program, but is not licensed to practice or offer services to the public.

Unlicensed Engineers in a particular state can still work in that state as employees for a company **as long as** they work under a licensed supervisor.

This is allowed under the **Industrial Exemption Clause.**

Regulation and License in Engineering (I)

- Is established by various jurisdictions around the world **to protect** the safety, well-being and other interests of the **general public**.

- Registration and Licensure of Professional Engineers and Engineering Practices are performed by **the individual states.**

Regulation and License in Engineering (II)

- In most juridistictions only Registered or Licensed Engineers are permitted **to use the title Engineer** or practice Engineering.

- A Licensed Engineer has the authority to take legal responsibility for Engineering work

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Regulation and License in Engineering (III)

Regulations may require that **only a Licensed** Engineer can **sign, seal, or stamp** technical documentation such as:

- Reports
- Engineering Drawings & Calculations
- Estimates & Evaluations
- Carry out design, analysis, or services
- Supervision or maintenance of Engineering Work/Process/Project

Regulation and License in Engineering (IV)

In cases where **public safety** is concerned, the Engineer should be a **Registered Engineer** irrespective of whether he/she is:

- Self-Practicing
- A Consulting Engineer
- Employed by a Firm, Company, or the Government

Public Case for Registration

Protection of the public was the justification for the passage of the **first registration law**.

Still the only justification for having such law.

Utah Court of Law on Registration

- *"It has been recognized …that there are some **professions and occupations which require special skill**, learning, and experience with respect to which the public ordinarily does not have sufficient **knowledge to determine the qualifications of the practitioner**. The layman should be able to request such services with some degree of assurance that those holding themselves out to perform them **are qualified to do so**….."*

(*) This subject is covered in *Engineers and Their Profession*, Kemper and Sanders, Chapter 9

Professional Registration (I)

The first registration law was adopted by the state of Wyoming in 1907.

Registration law was **passed to protect the public** from a flood of persons of doubtful qualifications representing themselves as engineers on issues connected with water-resource developments.

Today all 50 states have adopted a Professional Engineering licensure status.

(*) This subject is covered in *Engineers and Their Profession*, Kemper and Sanders, Chapter 9

Professional Registration (II)

- There are **differences** in the requirements for registration in different states.

- Proposals have been submitted for a **national registration**, but without success, because it is a *constitutional right reserved by the states*.

- There are approximately over one million Registered Professional Engineers in the United States.

The Process of Registration (I)

Licensing procedure varies but the general process is:

1) **Graduate from an ABET accredited** four-year College or University program (e.g. BE, BS(Eng), etc)
2) Complete a standard **Fundamentals of Engineering (FE)** written examination, testing applicants on breath of understanding of.
   a) basic engineering principles, plus.
   b) some elements of an engineering specialty.

These two steps are sufficient to qualify as a

Engineer-In-Training (EIT) or Engineer Intern (EI).

The Process of Registration (II)

3) Accumulate a certain amount of **engineering experience.** In most states the requirement is four years.

4) Complete a written **Principles and Practice in Engineering (PE)** examination, testing the applicant's skills in a chosen discipline (e.g. civil, electrical, industrial, mechanical, etc.), as well as **Engineering ethics**.

The Process of Registration (III)

The **FE and PE** examinations are both administered by the **National Council of Examiners for Engineering and Surveying (NCEES)**.

All 50 states and the District of Columbia have engineering boards that are represented by the NCEES.

Special Situations

- For individuals with **several years of credible experience** it is possible to bypass Steps 2 and 4 (both FE and PE exams waved)

- Some states also **have state-specific examinations**. In **California, Civil Engineers** must take two **state-specific** additional exams in **Land Surveying** and **Earthquake Engineering**.

Special Situations: Corporate Practice

Many states **allow corporations** to engage in engineering under the status of **Corporate Practice.**

This may be approved provided that:

A) At least one director or officer is registered.

B) All corporate personnel functioning as professional engineers are registered.

C) The corporation receives a certificate of authorization from the board of registration.

If the company of employment does not satisfy all the requirements of corporate practice, then Engineers could find themselves in trouble.

Special Situations : Industrial Exemption (I)

A) In many states, engineers who **work in industry** providing engineering services are exempt from licensure requirements under the

Industrial Exemption.

B) Since regulations of the practice of Engineering is performed by the individual states, areas of Engineering involved in **interstate commerce** are essentially unregulated.

- These areas include much of Mechanical, Aerospace, and Chemical Engineering.

(*) National Society of Professional Engineers (NSPE), www.nspe.org

Special Situations : Industrial Exemption (II)

- The **Industrial Exemption** enables Engineers to design products that are sold outside the state where they are designed and manufactured.

(%)

- Due to the industrial exemption many non-professional engineers are given titles such as:

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  - Production Engineers (Plant Engineers)
  - Testing Engineers
  - Project Engineers
  - Systems Engineers
  - Network Engineers
  - Sales Engineers
  - etc.

Personal Case for Registration (I)

Despite the problems and inconsistencies in registration, there are compelling reasons why every engineer should become registered **as quickly as possible after graduation.**

Personal Case for Registration (II)

1) **Protection against future legislation** that may make it more difficult to become a Registered Professional Engineer.

2) No one can foresee the future course of one's own career. **Opportunities might arise** for which registration is required.

3) A **court of law may not recognize** an individual as an engineer unless he or she is registered. For example, to testify as an expert witness.

Personal Case for Registration (III)

4) Many companies believe it is desirable for members of their engineering management to be registered; hence registration could be an **aid in promotions**, or even being **accepted for the job** in the first place.
5) Registration is increasingly regarded by employers as an **indicator of technical competence**.
6) I**nternational mobility**: As international trade barriers are being lifted, (such as with the North American Free Trade Act (NAFTA)), registered Engineers have more doors open to them to work internationally.

Continuing Professional Competency

A major issue in engineering registration **concerns license renewal.**

Should an engineer be require to undertake a certain minimum amount of continuing education or other professional development to obtain a license renewal?

This issue **is still unresolved** in the Engineering community.

The American Society of Civil Engineers (ASCE) has opposed mandatory continuing professional competence requirements.

Management

Pros & Cons of Management as a job

Engineering is Management

Management

Levels of Management:

Executive: Chairman of the Board, President, and
Vice-President: - of Manufacturing
- of Engineering
- of Marketing
- of Finance
- etc.

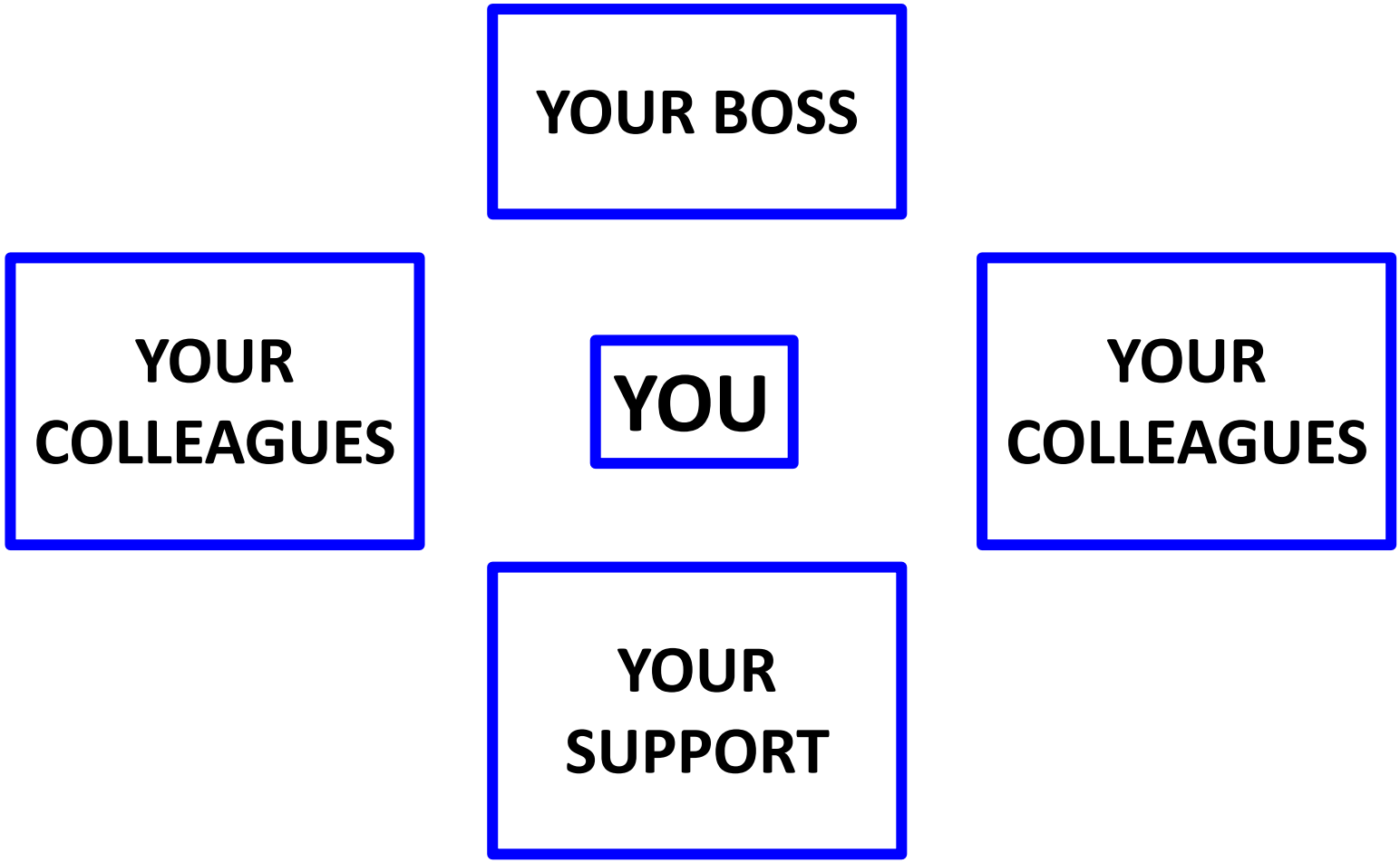
Manager: Plant Manager, Chief Engineer, Director of Engineering, General Sales Manager, Personnel Manager, etc.

Superintendent: Chief Project Engineer, etc.

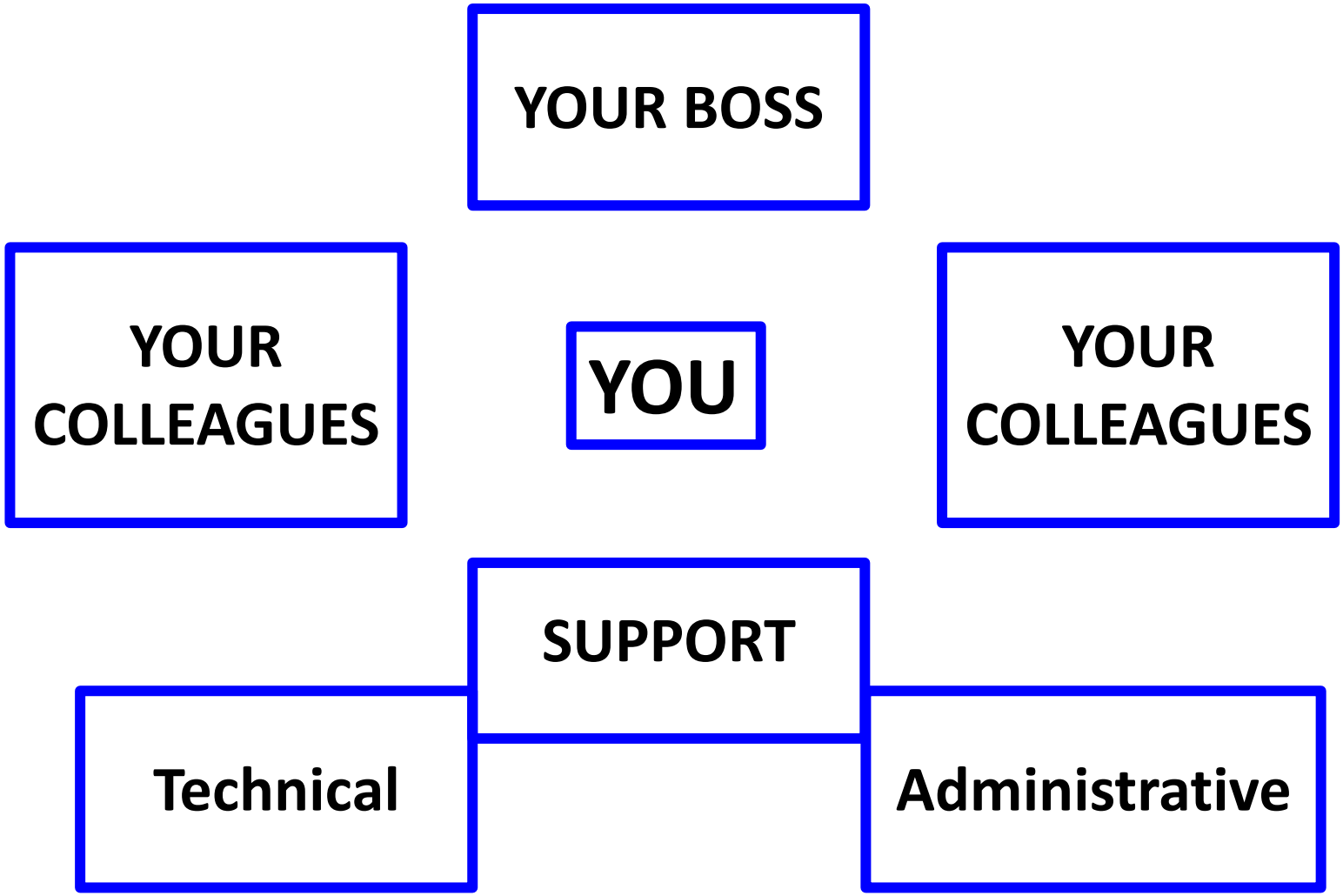
Supervisor: Project Engineer, Office Manager, etc.

(**Engineers and Their Profession*, Kemper and Sanders, Chapter 10

The Essential Org Chart



The Essential Org Chart



The Technical Support

Scientist: (Ph.D) (B.S., M.S. typically not sufficient)

Engineer: (Degree with ABET accreditation is desirable)

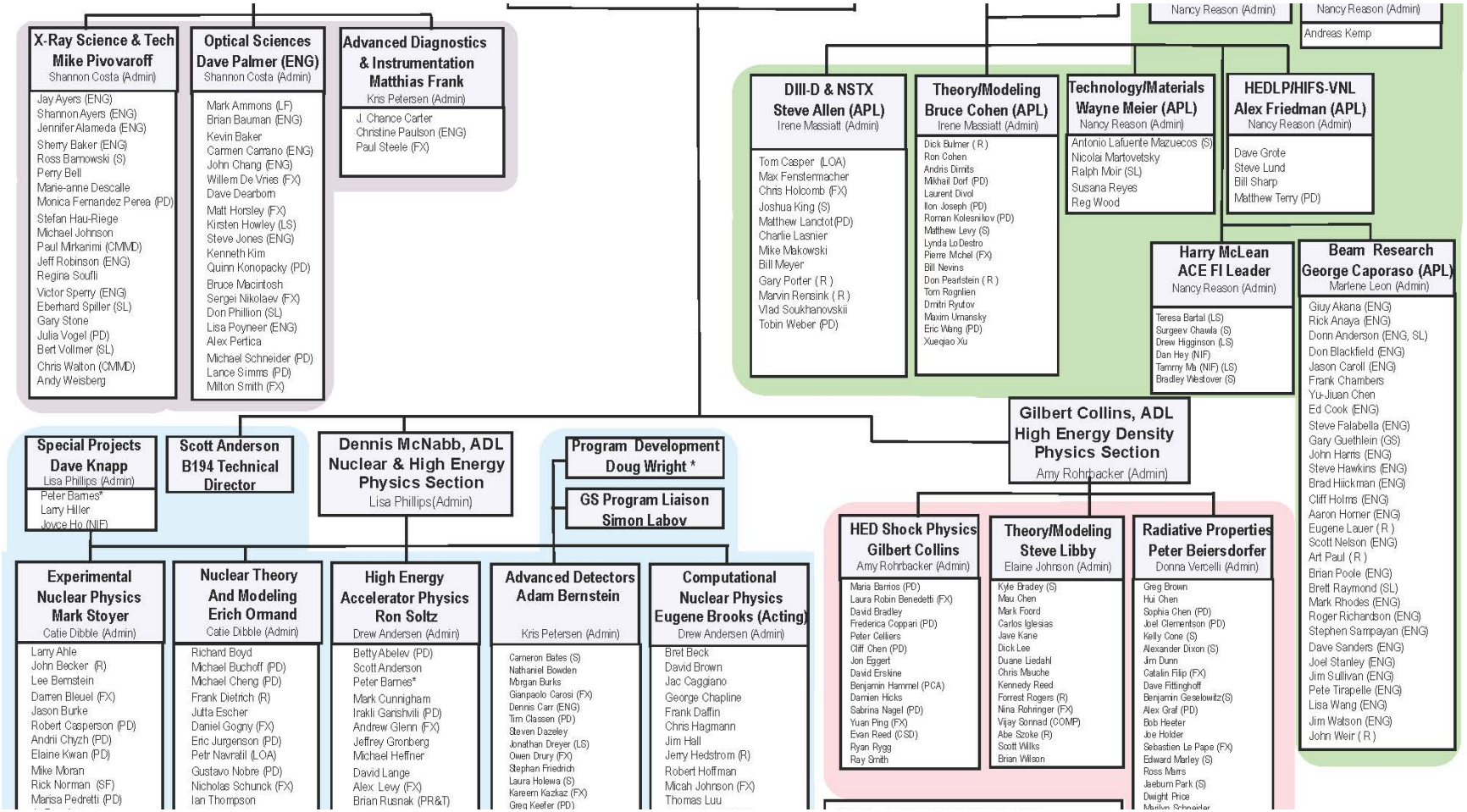
Engineering Technologist: (B.S. in Engineering Technology)

Technician: (Engineering Technology program for 2 years)

(Drafting, Inspection, Installation, Experimental Assembly)

Craftsperson: Indispensable in all experimental areas (e.g. mechanic, electrician)

~ 10% of a Org Chart



Examples of Engineering Org Charts

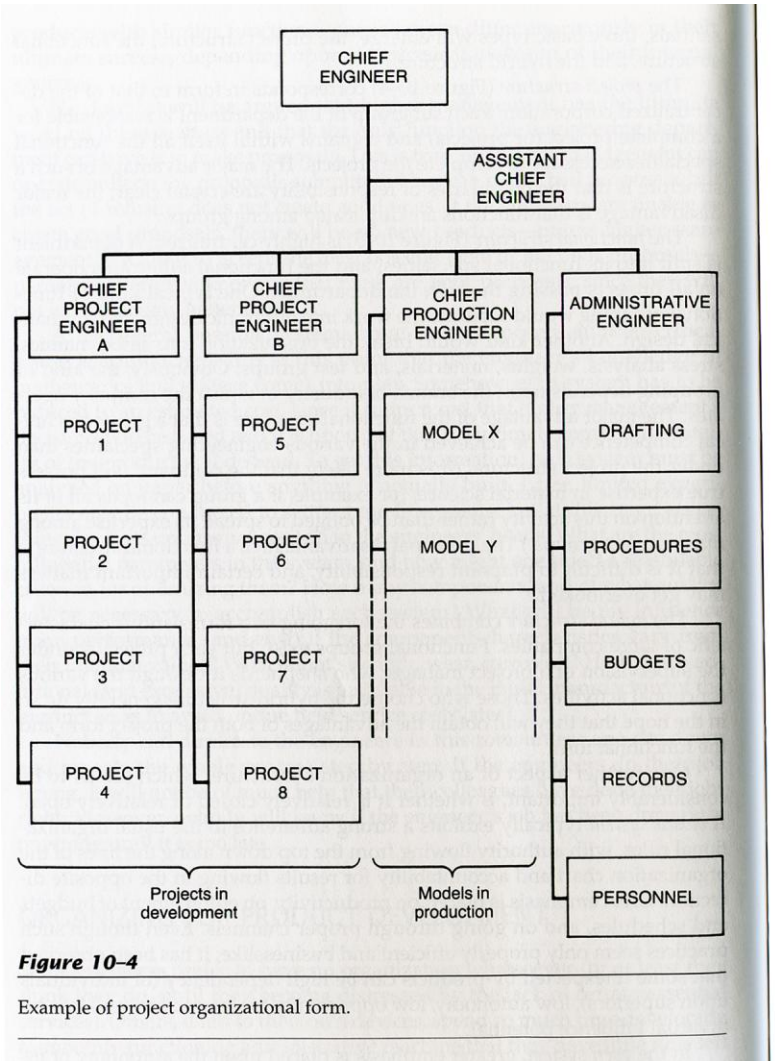


Figure 10–4

Example of project organizational form.

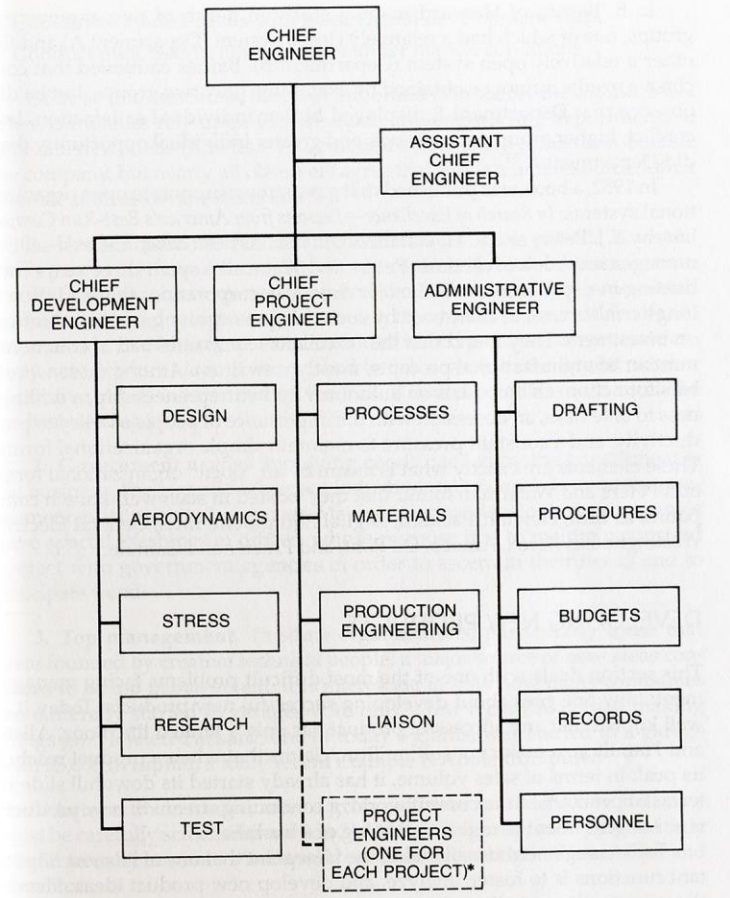


Figure 10–5

Example of functional organizational form. *If there are no project engineers (block in dotted outline), the organizational form is known as "functional." If there is a project engineer for each project, the organizational form is known as "hybrid."

Engineers and Their Profession, Kemper and Sanders

“Life after UCDavis”

Defining goals : Professional and Personal

Deciding on a Specialty within an Engineering Field

Clear idea of motivation and goals

Type of job

Professional Outlook

Industry

Government

Academia/Teaching

Consulting

Management

Graduate Studies

Preparing Yourself

Preparing CV and Bio

Approaches

(letters, phone calls, internet, personal contacts)

What to do after a door is opened, (e.g. Interview, etc).

The Work Place : Things to be Expected

Relationship: Vertical and Horizontal

Confidentiality

Need to know

Verbal reports : “The Elevator Reports ”

Lessons learned

Working Environment

Working meetings

Standing meetings

Team Work (already discussed)

Brainstorming Sessions (already discussed)

Working from home (NYT article)(*)

(*) *"Yahoo Orders Home Workers Back to the Office"*, New York Times, February 26, 2013

Putting Things Together

Misunderstanding of

Positive and Negative Feedbacks

Keeping on an even keel!

Relevant WEB Sites

National Council of Examiners for Engineering and Surveying — www.ncees.org

Accreditation Board for Engineering And Technology (ABET) — www.abet.org

National Society of Professional Engineers — www.nspec.org