Mentoring Articles
for Industrial & Systems Engineers

by: Steve Snelling

Industrial Engineering – Mentoring Articles Book

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Introduction

This book is intended for Industrial & Systems Engineers (ISEs): Students, Young Professionals, and any working ISEs that may be serving as volunteer mentors or project coaches.

It contains Mentoring, Career Planning, Job Search, Project Management, and other categories of articles, all written by the author.

The categories of articles (in order):

Note:

- Each of the 8 Chapters starts with its own table of contents, indicating the page number for each article.
- The last article in each Chapter (plus 1 page), is the page number of the start of the next Chapter, etc.

Some tips on reading a long file on-screen in *Adobe Acrobat Reader*:

- At the initial landing page, when you first open the file, click on the *right-arrow* on the right side, middle of the page, to hide all the Adobe editing commands.
- At the top menu bar is the page numbers, if you overtype the *page number* with the page # you want to go to and hit *Enter*, it will go directly to that page.
- Use a scroll-wheel (on a mouse) or the *down-arrow* on your keyboard, to scroll down to the article you want to read.
- The *home* key on your keyboard takes you back to the beginning of the file; and the *end* key takes you to the last page of the file.

Chapter 1 – Job Search

Planning for Success in Your Job Search

RESUME

Craft a resume that highlights your accomplishments relevant to the role for which you are applying. Don't overload on details; instead, make your resume easy to skim. Follow these tips to make it through the first round of applicant reviews, where hiring managers discard up to 80% of resumes.

- Frame your resume around what you want to talk about in the interview.
- Give interviewers enough information about each item on your resume so they can ask questions about your experience - otherwise delete the topic.
- Focus on your accomplishments and highlight significant events, not just a history of where you've been.
- Don't put too much detail about any one job on the front page of the resume.
- Don't use too much technical jargon.
- Use wide margins and don't fill the page with dense text. Use bullets and make the resume easy to scan read.
- Add a "Publications and Presentations" section to your resume, if applicable.
- Add a brief "Hobbies & Interests" section to your resume. (Give the interviewer non-work related topics to talk about; you may have a common interest).

JOB SEARCH

Approach your job search with a clear plan and goal in mind, and follow your plan to a successful conclusion.

- Stay focused on what you really want to do.
- Make your next job something that you want to stay at for quite a while, interview for a job only if you anticipate staying for several years.
- Don't get into a "grass is always greener" mindset. If you aren't sure what you want to do, do your research and think about it, then return to your job search more focused.
- Temper what you really want to do with your available options.
- Focus on a few organizations or companies at a time.
- Thoroughly research the companies or organizations you are interested in.
- Keep records of the people with whom you communicate and by when you need to respond to them.
- Use your references and other contacts to find job leads. Be specific in explaining what you are looking for, and express your sense of urgency. Follow up until you get the job you want, and let them know when you get a job.

JOB INTERVIEW

Prepare thoroughly for your job interview by learning about the company and the position. Rehearse how you will convince the interviewers that you are qualified for

and interested in the position. Using the tips below to prepare will give you the confidence to succeed in your interview.

- Write a script ahead of the major points that you want to bring up during the interview.
- Research the position and the company or organization. Bring your research along to the interview and ask questions related to your research in order to illustrate your interest.
- Focus on your accomplishments and what you think you have to offer.
- Listen for items in the job requirement, so that you can relate them to specifics in your background.
- Stay focused and don't ramble on when answering questions. Watch the interviewer's body language and err on the side of being concise. Ask for clarification on a question, if needed, particularly if you're not sure whether to continue with a longer response.
- Bring along a few reports that you have written. These should be current, and individually bound. Reference these in your resume under "Articles and Presentations".
- Prepare questions ahead of time and plan to get them answered.
- Take notes during the interview and ask about anything you are uncertain about at the end of the interview.
- Relax and be yourself during the interview. Put the interviewer at ease and show some of your personality. Be professional, but don't be stiff.
- Ask for the job, or for the next step in the hiring process.
- Never accept a job offer until you have interviewed the person who would be your actual boss, and preferably his or her boss as well.
- Don’t accept any job offer until you have all your questions answered. Ask to have a day or two to consider it, and really think before you accept.
- Try to have at least two job offers for comparison. But if the first offer looks great, don't continue searching and risk losing it.

Some General Job Search Tips

Professional Networking:

- Expand your Networking to include some Professional Networking (which is different from Social Networking).
- Attend local events that will allow you to meet working engineers and hiring managers.
- Talk to working engineers about the type of projects they do at their company.

Professional Engineering Societies:

- If you are a member of any Student Engineering Society (like IISE or INCOSE), you should list these on your Resume; particularly, if you were an officer.
- If you attended any of the Society's national or regional Conferences, list each of these on your Resume.
- If you are not active with any Professional Engineering Society, you should consider joining as a student – so you can attend their events and do some Professional Networking (where many current jobs are identified, thru your Networking contacts).

Interviewing for Information:

- Plan to do some informal Interviewing of working engineers and others at companies you are interested in working for.
- Attend some local events like Engineering Society events, so you will meet working engineers and ISE alumni.
- Utilize your Interviewing results, to help focus your Job Search and your Career Objective.

Career Objective:

- Think carefully about the type of Industrial & Systems Engineering work you would prefer to do at a company or organization.
- If listing a Career Objective on your Resume, be specific in what type of position you are seeking (otherwise a person reading your Resume will have to figure this out, from your Work History & Education).
- If you are applying for an Internship make sure you state this clearly.

Work History:

- For each of your past employers, and any current employer – you should describe on your Resume the products made or services provided at the site you worked at, and size of the facility (this helps put your Work Experience there in perspective).
- If you did any Internship jobs in your field, mention these on your Resume (but mark them as Internships of only a few months duration).
- If you did a Senior Design Project or any project-related assignments while in college – you should describe these as well (but note that they were projects done while at the University).

References:

- You should have 4-5 References written up on a separate MS Word file, and ready to send out to a potential hiring manager upon request. And you should mention at the bottom of your Resume that you can provide a list of References.
- Make sure you contact all your References, and get them to help you with your current Job Search.
- Make sure you talk to your Professors about possible job leads and contacts.

Practice Interviews:

- Do some "mock" Interviews, if these are available on campus, or do some practice Job Interviews with a friend, acting in the role of the hiring manager.
- This will let you get familiar with answering typical job-related questions, and in utilizing your Resume during a Job Interview.

Professional Certification Training & Additional Education:

- For some types of positions, you may need to pursue a Professional Certification. Even if you don't complete it, just taking the class (live or online) may help your Resume and give you something additional to talk about in a Job Interview.
- A Master's degree (Engineering or MBA) may help your Job Search, particularly if attending a well-known U.S. University, if foreign born. If possible, get some hands-on job experience with your undergraduate degree before pursuing an advanced degree. Many companies will reimburse your fees for an advanced degree if done off-hours.

Industry and Company Investigations:

- Focus on a few companies that you like, and a few industries that you have some experience in – with a focused job search.
- When placing your Resume on a company's Jobs website, follow the site's instructions carefully. Look for a variety of job titles that you qualify for.
- Monitor the results of your Job Search. If you are not getting Job Interviews, try a different approach until you have some results. If you are getting good Job Interviews, but no Job Offers, consider doing some Mock or practice Job Interviews to better prepare yourself.

Career Fairs & Hiring Events:

- If any companies you are interested in have a local Career Fair or Hiring Event on campus – plan to attend and bring several copies of your Resume.
- Be ready to talk about your Career Objective and your Work History very quickly & concisely (since you will have very little time to talk with each company representative).

Search Jobs Listing websites:

- Utilize the University's Engineering Career Center and Placement Office, for Job Search information.
- Use a good general Jobs Posting website, and check it often for possible job openings in your field (and be creative with the types of job titles you regularly look for).

- Also, *Indeed* is a broad, general, job-search site that many working engineers and managers use. It has various filters that can help focus your job-search for locations, as well as specific job titles.

Jump-Starting Your Job Search

There are some basic activities you can do to jump-start your Job Search:

Resume
Write a strong work-oriented Resume that describes what relevant work you have done including any Internships, your Senior Design project, other Student projects, and some of your other accomplishments. List some of your Computer software skills and any Certifications. Use an easy to read Resume format.

References
Have 4-5 professional References typed up as a separate Word file, ready to send out electronically if requested. Use your References & Professional Network to help you with your Job Search.

Job Openings
Use your universities' Engineering Career Center and Placement Office to learn about current Job Openings and any on-campus visits by companies you are interested in. Adjust your Job Search if you are not getting Job Interviews.

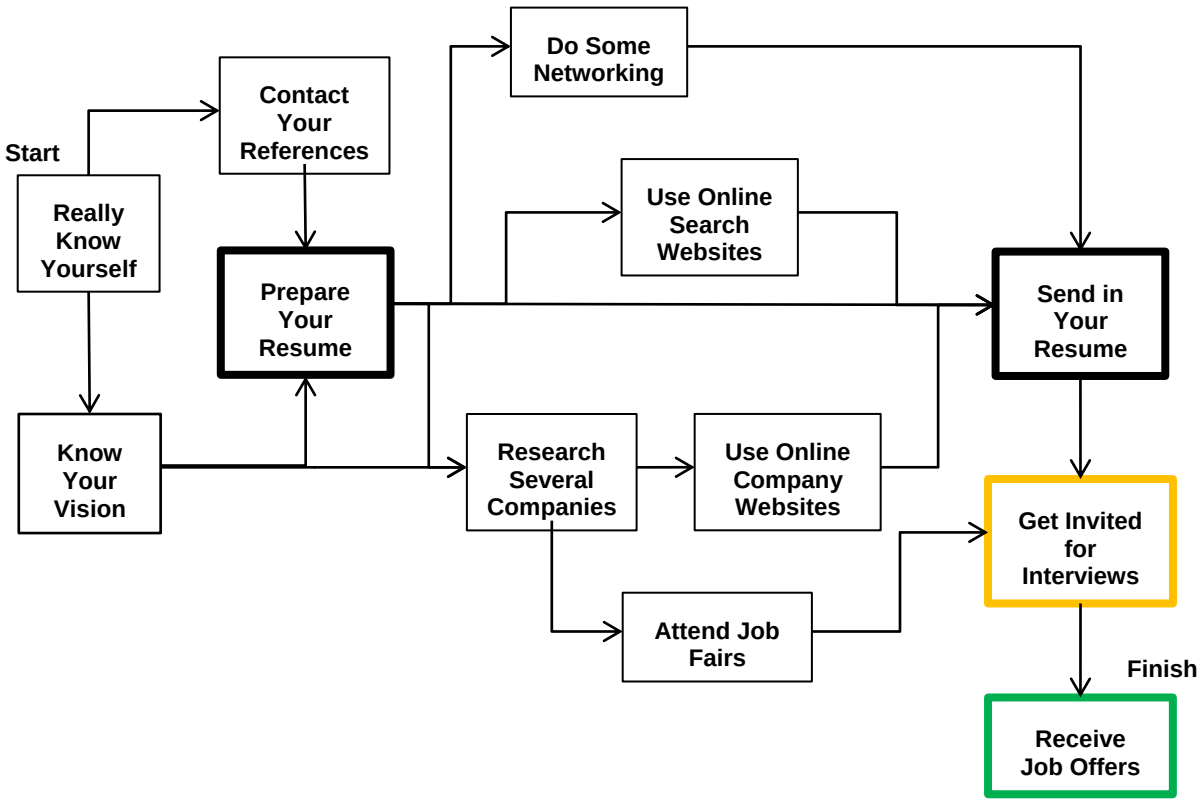
Company Investigations
Use company websites to search for job openings you are interested in, in order to send in your Resume. Do in-depth online research of several companies, their locations, and their products. Use some of this research information later during a Job Interview.

Job Interviewing
Prepare for all your Job Interviews by reading carefully each job description. Do some Practice Interviews to improve your Interviewing skills, including a possible phone interview. Prepare to answer typical Interview questions. Adjust your Interviewing activity if you are not getting job offers.

Typical Job Search Activities & Diagram

- Start your Job Search by really knowing yourself and what you are looking for in a new or first job
- Have a Vision of what you really see yourself doing in a few years, to help you find a company or organization that matches your Vision
- Contact all of your professional References (past managers, University Professors, University Alumni, etc.), and also ask them to help you with your Job Search
- Prepare your Resume using a good format, and practice talking it with a friend
- Do some Networking to expand your professional contacts
- Research several companies that you might want to work for, use your References & Professional Network
- Use company online websites, to post your Resume and apply for positions you are qualified for
- Attend any Job Fairs held on campus or locally, particularly if a company you are interested in will be there
- Use a few online Search websites; filter for applicable jobs that match your background & interests
- Send in your Resume with a short, email note (or as an online submittal) to likely companies that you are interested in
- Eventually, you should be invited in for live Interviews (or occasionally, for phone Interviews)
- Good Job Interviews should result in some Job Offers (if not, make some revisions to your Resume or do some practice Interviews)

Job Search Diagram



Career Opportunities in Diverse Industries

One of the unique aspects of a degree in Industrial & Systems Engineering is that it provides incredible flexibility in terms of the industries where you can find employment. While some ISE graduates work in traditional manufacturing industries such as aerospace, others work in less expected industries like healthcare or even entertainment. Listed below are the wide variety of industries where Industrial and Systems Engineers work:

- Aerospace & Airplanes
- Aluminum & Steel
- Banking & Finance
- Cars & Trucks Assembly
- Construction
- Consulting
- Electronics Assembly
- Energy & Utilities
- Entertainment
- Forestry & Logging
- Insurance & Risk
- Materials Testing & Inspection
- Medical & Healthcare
- Military & Dept. of Defense
- Mining & Raw Materials
- Oil & Gas Distribution
- Plastics, Forming & Components Mfg.
- Retail & Wholesale Stores
- Shipbuilding & Repair
- State & Federal Govt. consulting
- Transportation & Logistics
- Warehousing & Distribution

Recent Growth Industries

In recent years, several Industries have been hiring more Industrial & Systems Engineers (ISEs), featuring many of the skills that ISEs have learned in school and during their Internships.

A good way to get some initial experience in these Industries while still in school is with a focused Internship, or Senior Design Project, or a Student Research project.

The Aerospace Industry (airplane assembly and parts manufacturing) has been hiring Process Improvement, Project Managers & Analysts.

The Automotive Industry (final assembly and parts manufacturing of cars, trucks & motorcycles) has been hiring Lean/Six Sigma Project Leaders, at their assembly plants in different parts of the U.S. (many of the companies are foreign-owned).

The Healthcare Industry (hospitals and hospital consulting firms) has been hiring Management Engineers and Project Leaders to do in-house investigations and process improvements of all their hospital activities.

Management Consulting companies and Engineering Consulting companies have been hiring entry-level consultants, to work on investigative projects (Process Improvement, Production Control, Inventory Control, Systems Analysis, and Big Data Analysis) for their external clients.

Construction companies have been hiring Project Schedulers and Project Managers (in-training), for their large construction projects. Much of the work is often performed on-site.

Warehousing and Transportation companies (truck, rail, & container ships) have been hiring in-house Process Improvement Managers to analyze and improve their operations. There are also consulting companies that specialize in this type of work.

Federal and State agencies (including military installations) have been hiring Process Improvement specialists to look for improvements in all of their operations. Often this work is performed on a project basis by specialized consulting companies.

Investigating Companies

When initially investigating companies that you are interested in working for, there are several activities that can help your Job Search:

- Make a list of companies you are most interested in (maybe start with a list of around 5-10 companies), and utilize your contacts and their company websites, to search for current openings. This will have to be revised every few weeks, as new listings appear and old listings drop off their website.
- When doing company website searches, besides searching for ISE-related job openings, also look at the products & services offered by each company, to see if the company and its products interest you, and what ISE-related positions they offer. If later you get a Job Interview with that company, share some of your Research about their company in order to show your interest.
- Use your Professional Network contacts (including your References, ISE alumni, & ISE dept. Professors) to get company contacts & leads on ISE-type jobs.
- Look over the list of companies sponsoring Senior Design Projects, to see if any of those companies interest you.
- Talk to IISE Student Chapter officers at your university about information they may have on local companies, and any upcoming IISE Chapter tours.
- Talk to other ISE Seniors about their Job Search efforts, and any Company contacts & leads they may be able to share with you.

Expanding Your Job Search: IE-related Job Titles

When looking for a job, don't limit your search exclusively to positions with "Industrial Engineer" in the title. Different companies may use different terms for roles that share similar skill sets. Additionally, ISE is a field that exists at the crossroads of engineering and other disciplines, allowing for broad applicability of your degree. Many professionals with backgrounds in ISE follow career paths that lead them into Project Management or Management Consulting.

Expand your job search to include the titles listed below to make sure that you are not missing relevant job opportunities:

- Industrial Engineer (IE)
- Systems Engineer (non-Electrical Systems)
- Management Engineer (the title used in Healthcare Industry)
- Project Manager (non-Construction projects)
- Facility Planner & Facilities Engineer (non-Maintenance)
- Manufacturing Engineer/Production Engineer
- Process Improvement Engineer
- Productivity Improvement Specialist
- Methods Engineer
- Quality Engineer
- Ergonomics Engineer
- Safety Engineer
- Lean/Six Sigma Projects Leader or Instructor
- Empowerment Teams Leader
- Supply Chain Manager
- Consultant (Engineering & Management Consulting)

Interviewing for Job Search information

These are not Job Interviews, but are more Informational Interviews, in order to learn more about types of industries, or companies, or positions (job titles/duties). Set up some informal interviews or just casually talk with working engineers and managers to identify some companies you might be interested in working for. Attend local events like engineering society events, so you can meet working engineers and ISE alumni. Use your References & Professional Network to meet people that work in positions or for companies that you are interested in working for.

Focus most of your efforts on getting facts about the company, including its size, major products or services, what it's like to work there, the types of positions that an Industrial Engineer might apply for, and the kinds of projects and assignments currently in work.

Use your interviewing results to help focus your Job Search; this includes deciding if you are still interested in a company (or position) after learning more about it. If you become interested in applying to a particular company (or position) then look for ways of applying for any open positions there, such as using the company's online jobs website, or by attending hiring events, etc. Your informational interview contacts there, may be able to offer some advice on applying for positions at their company.

Conducting an Out-of-Town Job Search

When conducting an Out-of-Town Job Search (in another city, or in another state), you may have to utilize other resources to get information on these hiring companies. If a company you are interested in, comes on campus (at a career fair, or at a hiring event, etc.), try to arrange to meet with them, and make sure you let them know the location (city or state) you are most interested in. If you are working through their company website, often you can specify the location of a job you are interested in, or make a selection from the available online choices.

If you are not sure which companies have jobs in the city you are interested in, you will need to get some initial leads on companies to research and later contact. Your References and professional Network contacts may have information on Out-of-Town Companies. You can also utilize the Institute of Industrial & Systems Engineers (IISE) and other engineering Societies that have local Chapters. The IISE Chapter President or Regional V.P. in a different location can be contacted directly by email. You can also do an Industry search for a specific location, using the Internet, to get a list of companies to do additional research on.

Once you have done enough research to have a list of several companies in a different city or state, it will help if you can visit the area for several days, and try to arrange on-site meetings. This will also let you get familiar with places to live and transportation options in the new location.

Staying Calm During Your Job Search

It is important to stay calm and resilient during your Job Search. As you approach graduation, it is easy to feel pressure during a Job Search, or when applying to Graduate school. And sometimes Job Interviews can be additional pressure, along with waiting for results from recent applications or interviews. Even waiting to hear back from Graduate Schools can be stressful. As you get closer to graduation, it can be easy to feel some panic and think your Job Search is failing and you are in trouble of not finding a job, or being accepted to a Graduate School anytime soon.

The best thing you can do is not panic and continue to do useful activities. Be resilient and don't dwell on setbacks, but continue to do your research and other things that will help you be successful.

Revise your Job Search as needed:

- If you are not finding Job Openings, consider changing your approach.
- If you are not getting Job Interviews, consider changing your approach.
- If you are not getting Job Offers, consider changing your approach or maybe broaden your list of company/organizations you are applying to.

Remember, an Industrial & Systems Engineering (ISE) degree is a great engineering degree and there are many companies and organizations looking to hire engineers with this unique skill set.

Professional Networking

Professional Networking is different from Social Networking. Professional Networking is more about developing your work contacts and References, including University Professors and alumni. Professional Networking should be ongoing, fun, and lead to some long-term contacts.

Professional engineering Societies like the Institute of Industrial & Systems Engineers (IISE) can be very helpful with developing a professional network. IISE has local Student Chapters, Professional Chapters, Regional activities, and National activities. Some of the national activities include: Societies, Divisions, Interest groups, Mentoring, and Annual Conferences.

Annual IISE Conferences make it easy to do professional networking, such as attending the various educational Track sessions, and meeting working engineers & students from different countries and industries. You can use the name-signs everyone wears, with "experience ribbons" that identify their membership in the different divisions & interest groups. And the colorful polo-shirts with school names/logos, worn by the University ISE students, can be useful for identifying which schools have students in attendance.

You can add to your professional network, by being active and encouraging an ongoing exchange of ideas. When attending speaker meetings, tours, or special events, look for people you have common interests with and exchange some information. Talk to them about their jobs and the type of projects they work on. Be willing to give out your name and email address, so you can both do follow-up communication. If you use LinkedIn, make sure your online profile accurately describes your background and interests. Attend alumni events and get to know other ISEs from your University.

Volunteer to work on special projects that interest you, since you are likely to meet others with similar interests. Don't be shy during meet & greet events; mingle and meet as many people as you can at these types of events. Keep good records of your professional contacts, including where and how you originally met them.

Chapter 2 – Resume Writing

SAMPLE STUDENT RESUME FORMAT

Name (in Initial Caps, Bold, 14 pt.)

Student address and/or Home address
Cell phone and/or Home phone
Student e-mail and/or Home e-mail

EMPLOYMENT OBJECTIVE:

Not always necessary, but if used – describe the types of jobs that you are most interested in, and maybe how they link to your Intern work experience, or Senior Design Project, etc. If applying for an Internship, clearly state this.

EDUCATION: Month & Yr. of planned graduation

- Formal school degree, name of school, program and location of school
- List any school related projects involving outside companies (Sr. Design Project)
- List any Independent Study (with which Professor)
- Work related course summary, certifications, etc. might also be used
- List any honorary academic societies or other academic awards

COMPUTER KNOWLEDGE:

List of computer software (maybe as multiple columns, maybe organized by type of software, & any code writing skills).

EMPLOYMENT HISTORY:

Company name (most recent) City, State Month/Yr. – Month/Yr.
Position title – describe main duties (or let this be the first bullet).

- Briefly describe the size of the facility and main products, etc.
- Briefly describe a project or activity you worked on.
- Utilize key action words like Cross-Functional Team, Project Management approach, Business Forecasting, Process Improvement, etc.
- Have several interesting things to talk about in the interview (maybe bring a written project report or activity summary).
- About 4-6 bullets in total for each position.

Other Company name Location dates
Position title – describe main duties (or let this be the first bullet).

- Briefly describe the size of the facility and main products, etc.
- Briefly describe a project or activity you worked on.

Name (repeated on 2nd separate page), don't copy to back of 1st page

PROFESSIONAL ASSOCIATIONS:

List any student professional associations (like IISE) and any officer positions.
List any professional Conferences attended or any papers presented.

HOBBIES & INTERESTS:

Not always necessary, but if used - list a few of your hobbies & interests – to serve as an icebreaker (or help make a connection with the Interviewer).

[References will be furnished upon request.]

If you add the statement above, have 3-4 references already typed up on a separate sheet, ready to send out (by mail or e-mail).

Keywords for Resumes & Job Searches

When you apply for a job, especially if the position is at a large employer, your resume will likely enter a database that companies use to keep track of job candidates. Recruiters and hiring managers can query the applicants in this database to find candidates who are a good fit for a role. Even if a company reviews resumes by hand, the person reviewing your resume will be scanning it for similar key items.

To improve your chance of success in the initial winnowing of resumes, you should include some of the keywords, listed below, in your resume. You can also use these keywords when searching for IE-related jobs:

- Benchmarking
- Cost estimating & cost engineering
- Cost reduction
- Cross-functional teams
- Defect reduction
- Ergonomics & safety
- Facility planning
- Implementation results
- Inventory control & management
- Material handling
- Production control & scheduling
- Productivity improvements
- Project management
- Quality control & inspection
- Root cause analysis
- Six Sigma/Lean manufacturing
- Strategic planning
- Supplier on-site visits
- Systems integration

Write Your Resume Like a Hiring Manager Will Read It

Make sure you fully explain items in your Resume, so you won't confuse or waste time explaining things during a Job Interview. Try to anticipate the areas of your Resume that will need some clarification and expand on these in your Resume.

When you describe your Work History, describe the companies you worked for in enough detail that the Interviewer will understand what the company does and what your job duties were. Also, put the size of the organization in perspective, so the Interviewer can better understand the types of projects & responsibilities you had.

Make it clear when your work was an Internship, and not a permanent job. Also, make sure that school Projects are identified as being done while in college, and not during an Internship.

Make it clear what types of positions you are applying for, when you will be graduating, and what degree you will be earning. If graduating with an advanced degree (or a double major), make this clear on your Resume.

When you include any Awards or Honors in your Resume, make sure you describe these in enough detail so the Interviewer will understand the Award or Honor. Then if they ask you a question about it, it's because they are interested, and not because they didn't understand the significance of the item.

Look carefully at any potentially confusing or complex items in your Resume. Decide first if you should delete these items. If keeping the items in, add some clarification or try to anticipate the kinds of questions that might be obvious on each item. It's important not to waste the Interviewer's time, with items that you could easily clarify in your Resume. Mock or Practice Interviews can be very useful at identifying potentially confusing things in your Resume.

Some Reasons Why Resumes are Thrown Out Early

There are some simple mistakes to avoid, in order to keep your Resume from being thrown out early in the review process by a hiring company:

- It's not clear what job you are applying for.
- You should be applying for an Internship, but your Resume looks like you are applying for a permanent job, before you plan to graduate.
- It looks like you are applying for an Internship, when you meant to apply for a permanent job.
- It's too hard to follow where you have worked or what experience you have.
- You've included several self-praise comments that make you look egotistical and maybe a potential problem employee.
- You have a confusing timeline of when you will graduate.
- It looks like you are going directly into Grad school, and will not be available for a job anytime soon.
- You have used a strange or small font and it is very hard to read your resume.
- It is very difficult to follow the text used in your Resume (bad grammar, or bad spelling), making it hard to read.
- You used an unusual file type (or software), that others can't open.
- You are an International student (non-U.S. citizen), applying for a U.S. Defense job, where U.S. citizenship is required.
- You are applying for a much more senior position, than your current work background suggests you are qualified for.
- You ignored the minimum criteria listed for the position.
- You sent your Resume to the wrong division, or wrong department, or the wrong mailing address.
- You are applying for a position that has already been closed, so no new applications are being received (as stated on the company's website).
- Your contact information is incorrect, so you can't receive a reply from the company.
- There were no key words used in your Resume, for the position you were applying for (so an auto search didn't pick your Resume).

Transmittal Email Guidelines & an Example
(for sending a Resume)

General Guidelines:

- Unless doing a U.S. Postal mailing (letter, envelope & stamp), most old-style cover letters have given way to more informal e-mail notes when sending an attached resume or application form, electronically.
- If applying to a specific job posting, start by specifying the exact position title, the date the position was originally posted, the source of the posting (company website, newspaper ad, etc.) and any job number/code (if applicable).
- Keep the e-mail note very short and to the point, but tell them why you are responding; and maybe point out some key items in your background that are relevant to the position.
- Make sure the subject line of your note is complete & relevant to the overall content of the note.
- If you also placed your resume on their company website, let them know what position you applied for & when you responded (just the most recent position you applied for – don't list multiple jobs).
- Ask for the next step in the process, or come up with a pro-active way for you to help the process along (e.g. Volunteer to be in their area, if interviewing for an out of town job).

Example Transmittal Note:

To: John Smith, IE Manager - XYZ Company
From: Bill Student Date: 12/4/20XX

Subject: **Resume for Job #A113 IE - Special Projects position**

Attached is my current resume for consideration for the Industrial Engineer - Special Projects position in Denver with your company - Job #A113. I saw this position posted on your company's website on Dec. 2nd.

As you can see from my attached resume, I have completed several Process Improvement projects and have some Lean/Six Sigma training. I applied online for this position on Dec. 3rd using the company's website.

I will be in the Denver area during the week of Dec. 14th - 18th and would be very interested in meeting with you at your convenience, to discuss this position or other similar positions with your company.

Professional Resume Format

Name (in Initial Caps, Bold, 14 pt.)

Home Address (City, State only – for security reasons)
Home e-mail
Cell phone
LinkedIn Profile path

EXPERIENCE
SUMMARY (or Position Sought):

Not required, and not always desirable. But if used, include a short sentence or two that summarizes your entire work experience; or that highlights your main interests or the type of job you are seeking (change the side heading to reflect which of these were used).

WORK HISTORY:

First Company Month/Yr. – Month/Yr.

Current Position City, State M/Yr. – M/Yr.
Position title – describe main duties (or let this be the first bullet).

- Project or main activities to briefly describe, that will highlight an aspect of your experience.
- Utilize key action words like Cross-Functional team, Project Management approach, Business Forecasting, Process Improvement, etc.
- Have several interesting things to talk about in the interview (maybe bring a written report or summary of some of these)
- About 4-6 bullets in total.

Previous Position (with same company) City, State M/Y – M/Y

Position title – describe main duties (or let this be the first bullet).

- Project or main activities to briefly describe, that highlight an aspect of your experience.
- Utilize key action words like Cross-Functional team, Project Management approach, Business Forecasting, Process Improvement, etc.
- Have several interesting things to talk about in the interview (maybe bring a written report or summary of some of these)
- About 4-6 bullets in total.

Other Company name Location dates
Position title – describe main duties (or let this be the first bullet).

- Any major project or activity of note – a significant accomplishment.

Name (repeated on 2nd page)

Other Company name Location dates
Position title – describe main duties (or let this be the first bullet).

- Any major project or activity of note – a significant accomplishment.

Other Company name Location dates
Position title – describe main duties (or let this be the first bullet).

- Any major project or activity of note – a significant accomplishment.

COMPUTER KNOWLEDGE:
List of computer software (either as bullets or multiple columns, maybe organized by type of software skills)

EDUCATION:
Formal school degree, name of school and program
and location of school Yr. of graduation
Any school related project involving outside companies (like Senior Design Project).
Any school honors or special study.

PROFESSIONAL ORGANIZATIONS & CERTIFICATIONS
A list of professional organizations and any officer positions held. Any professional certifications.

HOBBIES & INTERESTS:
Not required, and not always desirable. But if used, list a few of your hobbies & interests – to serve as an icebreaker (or help make a connection with the Interviewer).

[References will be furnished upon request.]
And then have 4-5 references already typed up on a separate sheet, ready to send out (by mail or e-mail attachment).

Preparing a List of References

Using your References:

- Use your References, professors, and other professional network contacts for job leads
- Be very specific in telling them what you are looking for
- Let them know your sense of urgency
- Keep following up with them until you get the job you want
- Tell them when you get your new job

Preparing a list of References:

- You should have 4-5 References written up as a separate document, ready to send out to a potential hiring manager, upon request.
- Make sure you have contacted all References you list, and get an agreement from each that they will speak very positively of you, where possible
- List their current work information (title, company, e-mail address, & phone)
- List when you knew them & which company they are a reference for
- If a reference is working at a different company now than when you knew them, state what company they were at when you knew them
- Add this phrase to the bottom of your Resume:

[References will be furnished upon request.]

A format for a separate List of References document:

References for [*Your Name*]

Prepared on: [*put the date the file was last updated*]

1st Company (or Organization)

[*Month/Years this Reference covers* (MM/Yr. - MM/Yr.)]

1st Reference's **Name** & Title

- Relation to you when you worked there (*your boss, or a co-worker, etc*.)
- Location (city & state) of the office or work site
- Reference's current e-mail address & cell phone (or work phone)
- Company or Organization they work for now, if different from when you originally knew them

2nd Reference's **Name** & information (*like above*)
(*from the same company or organization*)

2nd Company (or Organization)

Next Reference's **Name** & information (*like above*)

3rd Company (or Organization)

Next Reference's **Name** & information (*like above*)

4th Company (or Organization)

Next Reference's **Name** & information (*like above*)

5th Company (or Organization)

Next Reference's **Name** & information (*like above*)

Your LinkedIn Profile

Add a path to your LinkedIn Profile on your Resume, near the top of the first page, under your name, along with your email address. Make the link active, so if viewing an electronic copy of your Resume it can be clicked on, taking the reader directly to your LinkedIn site.

Make sure the information on your LinkedIn Profile is current and descriptive of your recent situation. Include a good picture of yourself on your site. In your Education section, include your degree, university name, Industrial & Systems Engineering department, and your planned graduation date (month/year).

Include any past or current Internships and other Work Experiences, and the dates you were there. Besides the company's or organization's name, describe what they do and what your duties were when working there. List some of your Student projects, similar to what you may have on your Resume.

Make it easy for a Hiring Manager or Human Resources person at a company, to read about your background easily. If you are currently looking for an Internship or a permanent job, mention this near the top of your site.

Keep your Profile's content Professional, and assume it will be read by any company interested in your Resume. Keep your Work History and Educational information current.

Chapter 3 – Job Interviewing

Some Job Interviewing Tips

Listed below are some general tips to make your Job Interviews successful:

- Do some mock (practice) interviews to build up your interview skills & to have a crisp delivery about your experience.
- Do some research on the position and the company or organization - bring this along on the interview. Maybe ask them some questions related to your research in order to illustrate your interest in their company.
- Prepare some questions ahead of the interview and plan to get them answered.
- Don't over-dress (or under-dress) for the Interview.
- Be on time and make sure you know how to find the meeting location.
- Turn your cell phone off during the Interview.
- If a meal interview, order something easy to eat & no alcoholic drinks.
- Bring along several copies of your Resume and References.
- Listen for items in the job description so that you can relate them to specific things in your background (be concise).
- Prepare a script ahead of time of the major points that you want to make about your Resume (or bring up during the interview).
- Focus on your accomplishments and what you think you have to offer.
- Stay focused and don't ramble on when answering questions. Watch the interviewer's body language and err on the side of being concise. Ask for clarification on a question, if needed, particularly if you're not sure whether to continue with a longer response.
- Relax and be yourself during the interview. Put the interviewer at ease and show some of your personality. Be professional, but don't be stiff.
- Bring along a few (2-3) Student Project Summaries (1-2 pages each) to show during the Interview. Refer to these projects in your resume.
- Listen carefully to any follow-on questions, a response to these will be very important to the Interviewer.
- Plan to take a few notes during the Interview and ask about anything you are uncertain about at the end of the interview.
- Ask for the job, or for the next step in the process.
- Don't accept any job offer until you have all your questions answered. Ask to have a day or two to think about it, and then really think about it before you accept.
- Don't ignore issues like benefits, vacation, and continuing education.
- Avoid conditional jobs or trial-period jobs.
- Never accept any job offer until you have interviewed the person that would be your actual boss, and preferably their boss as well.
- Try to have at least two job offers for comparison. But if the first one looks great, don't continue searching and risk losing it.

Some Sample Job Interview Questions

It helps to anticipate some of the Questions that may come up during a typical Job Interview. Most Job Interviews are employer driven, but it still needs to be a two-way communication – since both parties are trying to determine if you are a fit for the company or organization.

Listen carefully to the Questions asked during the Interview, and plan to point out relevant sections of your Resume, if applicable. Any follow-up questions asked by the Interviewer are very important and are either indications of their areas of interest or items where they need additional clarification.

Listed below are some typical categories of Job Interview Questions, with a few examples:

Questions about You:
Tell me about yourself.
What are your greatest strengths / weaknesses?
What leadership roles have you had?

Questions about Your Education:
Describe your most rewarding college experience.
What led you to choose Industrial & Systems Engineering?
Which areas of study were you most interested in?

Questions about Your Work Experience:
Which companies have you worked for?
What 2 or 3 accomplishments have given you the most satisfaction?
Describe a Project where you were able to get some things implemented.

Questions about Your Work Preferences & Values:
Do you prefer to work by yourself, or with others?
What factors are the most important for you in a job?
What type of managers have you enjoyed working for the most?

Questions about This Position / This Company:
Why are you interested in this company / this position?
What can you contribute to this job / position?
How will you evaluate whether this job is a fit for you?

Questions about Your Future:
What are your future career plans?
How does this job fit into your future plans?
Do you plan to attend Graduate school soon?

Behavioral Questions:

Discuss a major conflict, and how you handled it?
What motivates you to do your best work?
Describe a situation where you influenced someone or a group.

A Case Study used during a Job Interview

How a Case Study might be used during a Job Interview:

- The Hiring Manager may use a Case Study during a Job Interview to see how comfortable the candidate is with talking about some initial steps to set up an investigation of a typical manufacturing problem.
- They are not looking for a perfect or correct solution, as much as an organized approach (methodology) for what to do at the beginning of an open-ended problem statement.

Example of a Case Study:
A Quality/Defect Analysis for Medical Equipment problems found during Final Testing.

Here is a "*theoretical*" starting statement from a Medical Equipment, Production Manager to a staff Industrial Engineer:

- "We are having problems in the Final Testing of some of our Medical Equipment during Final Assembly. Over 50% of the machines are failing during some part of the final Quality Testing. This requires considerable re-work of the equipment that fails the testing. I don't know what is causing the problem and need to have all the quality issues investigated so we can resolve the problem(s). "

The Case Study is to describe some of the starting steps & activities (methodology) you might initiate at the beginning of this Quality Control/Defect Reduction Analysis:

- The Production Manager doesn't have much more to tell you, except maybe the models of machines having the problem, and the name of a contact you could start off talking to.
- The purpose of a Case Study in a Job Interview is <u>not</u> to solve the problem, but to show how the IE being Interviewed would approach an open-ended problem that is typical of issues that Industrial Engineers work on in manufacturing companies, on a complex assembly product, like medical equipment.

Some possible items to mention in responding to this Case Study:

- Get some help from the Production Manager, to get you set up with one of his production Leads or Supervisors to give you a tour of the problem area and which models are having the trouble, and some recent history of the problem. Also a contact in Quality Control involved with the final testing of the machines.
- Go out into the shop and observe the problems live (on the specific medical equipment having the problems) and start talking to some people that do some of these final inspection tests.
- Talk to Quality Control and start getting some currently available data that helps quantify the problem (vs. just doing Interviews and getting anecdotal information).
- Talk to Quality Engineering about the Final Test procedures that they wrote & developed.

- Examine the process "*upstream*" to see if there are some earlier quality checks that should be catching some of the problems prior to the final quality tests.
- Decide if any new data needs to be obtained (if the current data is not helpful).
- Check to see if the problem is recent, or has occurred in the past.
- Check to see if the same problem occurs on both 1st shift & 2nd shift (if not, this might generate additional areas to investigate).
- Talk to the parts stockers to see if there is a Supplier Quality problem that they already know about.
- Build a Cause & Effect ("fishbone") diagram, and maybe a 5-Whys chart, and other similar IE-analysis tools.
- Depending on how big the Investigation looks, consider forming a small Team to help with the Investigation, including preparing a draft Workplan that you run past the Production Manager to get his/her buy-in to a small Team investigation – to make sure the scope is not too large and the production time frame is considered (they may need an immediate short term solution or work-around, before committing to a longer more comprehensive project).

Conducting a Job Interview by Phone

Doing a Job Interview by phone is a little different from a live meeting with an Interviewer.

Here are a few general tips to consider:

- Try to do some preparation reading about the company and the position, ahead of their call
- Make sure you are ready for the call (if scheduled ahead of time)
- Write down the name of the person calling you from the company (and their job title, if they tell you)
- If you need to re-schedule the call, let them know as soon as you can (particularly if they call you un-scheduled, which doesn't happen very often)
- Make sure you have a good phone connection, if using a cell phone
- Try to minimize background noises on your end of the call
- Try to cancel any alarms or other sounds on your phone, while on the call
- Have a copy of your Resume, and any documents you may have sent them previously (such as your transmittal letter or References) out ready for you to see (or up on your computer screen), while on the call
- Listen carefully to the questions, and be brief with your initial answers; if they need clarification, they will prompt you
- Listen very carefully to any follow-up questions – since these will be very important to the person interviewing you
- If you need them to repeat something, let them know if it was due to sound quality of the call, etc.
- Try to relax and give yourself time to think before answering each question
- For any tricky questions, listen very carefully before answering and don't make any comments about the question being tough or tricky
- Try not to repeat yourself too often
- If possible, mention related sections or descriptions on your Resume (tell them where this item is located on your Resume)
- If more than one person doing the Interview (or they are using a speaker phone), make sure you can hear and answer the questions from all the Interviewers
- At times there may be silence on the call (they may be taking notes, or briefly talking quietly amongst themselves); don't talk over these quiet times
- Be patient, and let them end the call, but feel free to ask about the next steps in the process (if they can tell you), but they may need to discuss the Interview offline, before they can tell you the next steps
- If they request any additional files or documentation from you, make a note of it and send it to them soon after the call has ended

Doing "Mock" or Practice Job Interviews

It is very helpful to prepare for actual Industry Job Interviews, by doing some "Mock" or Practice Interviews. These can be done formally, like at an event on campus (with invited local Industry representatives conducting one-on-one Mock Interviews); or they can be done informally with a friend or room-mate acting in the role of the Hiring Manager.

Bring along at least 2 copies of your current Resume (for each Interview), and try to act as if it is a real Job Interview. Listen carefully to any feedback you receive on your Resume, or feedback on your responses to their questions. Prepare a few questions that you would like to have answered, either about the company or the job being discussed.

Mock Interviews are usually not for current job openings, but will represent the type of ISE-related jobs their Company sometimes offers. The first part of the session is conducted similar to a real Job Interview; the second part of the session will be to provide some feedback on your Resume and some discussion of your responses to their questions (maybe with some suggestions to consider).

One of the advantages of doing several Mock or Practice Interviews is to become comfortable talking about your Resume and your background/work history, and to practice some responses to typical Job Interview questions.

Interviewing at Career Fairs

When applying for jobs at Career Fairs or Job Fairs, you need to approach the hiring event differently from a traditional Job Interview. You may have time to stop at only a few of the companies' booths, so you need to walk around quickly and see which companies, interest you the most. Then approach the companies you are most interested in first, in case you run out of time and can't visit all of them.

Have several copies of your Resume ready, so you can hand one to a company representative (who may or may not be a hiring manager). Also have a short version of your interests & job experience ready to talk about clearly (above the noise of the room). State whether you are applying for an Intern position or a full-time position. Give the name of your degree and when you will be available (or plan to graduate). If you are completing an advanced degree or a double major, make sure you state this early in your talk.

It helps to think of the brief conversation with a company representative, as an "*elevator pitch*". Imagine yourself riding up an elevator with just you and a senior manager at your company, and they ask you for a quick update on your current project (while still in the elevator). You only have a few floors to go, to very concisely give them a progress report. In fact you may be cut short if someone else comes onto the elevator after only a few floors. This is how you should prepare to give a concise summary of your work background and qualifications to a company representative at a hiring event. You can practice your "*elevator pitch*" with a roommate or friend, prior to the event.

Try to relax and be yourself, when talking to a company representative. Try to make a connection with the person, and get their business card or any literature they hand out, so you can follow-up later (by email or by phone). Listen carefully to what they tell you, including any follow-up activities they request, such as having you apply to a specific job title online, using their company website.

Chapter 4 – ISE-related Skills

Skills Hiring Companies Look for in Industrial Engineers

You've completed your bachelor's or master's degree in ISE, and you have internship or co-op experience under your belt. You've proven yourself to be a dependable worker, but are you ready to secure your first job? When hiring Industrial & Systems Engineers, many companies are looking for both skills taught in the classroom and general skills beyond that set. Focus on fostering the following skills to gain a competitive advantage in your job search.

Ability to apply ISE Fundamentals:

- Production Control
- Inventory Control
- Process Analysis
- Facility Planning
- Material Handling
- Statistical Analysis

Strong grounding in Engineering Fundamentals:

- Basic Design
- Strength of Materials
- Thermodynamics
- Electrical Theory
- Applied Physics
- Machining

Communication & Inter-personal skills:

- Success in working with cross-functional team skills
- Ability to work well with others
- Ability to communicate ideas through technical writing. You should be able to write documentation and reports that are clear, logical, and grammatically correct.
- Ability to present ideas to diverse audiences. This requires good communication skills, including the ability to prepare and give presentations, to actively listen, to discuss a range of topics with a variety of people.
- Ability to establish a rapport with a variety of people, from shop personnel to senior management

Project Management skills:

- Ability to develop Objectives, Scope, Work plan, and Schedule
- Lean/Six Sigma analysis skills

Analytical skills:

- Proficiency in doing investigations and Root Cause Analysis
- Internet research skills
- Methods improvement skills

- Standard Data development and conducting Time Studies
- Cost Analysis, Return-On-Investment (ROI), and Cost Estimating skills for analyzing alternative solutions

Computing skills:

- MS Office: Outlook, Word, Excel, Access
- MS Project
- Statistical software
- Electronic layout/drafting skills, like AutoCAD
- Simulation software & electronic comparison analysis

Some Techniques Used by ISEs

Industrial & Systems Engineers (ISEs) use a variety of techniques when working on projects and during their daily activities. Some of these techniques are learned in school, and some of these techniques are learned during the initial five years of working (if you are assigned a wide variety of projects).

- Benchmarking
- Contract Reviews
- Data Analysis
- Design of Experiments
- Employee Involvement
- Equipment Utilization studies
- Environmental studies
- Ergonomics & Human Factors evaluations
- Facility & Equipment Layouts
- Flow Diagramming
- Information & Data Flow analysis
- Interviewing for Information
- Lean Manufacturing & Lean Audits
- Maintenance Reviews
- Material Handling analysis
- Modeling & Testing
- Operations Audits
- Organizational Analysis
- Pilot Programs
- Product Development & Product Costing
- Project Management
- Project & Product Scheduling
- Risk Analysis
- Safety Reviews & Safety Audits
- Simulation
- Site Location comparisons
- Six Sigma projects
- Statistical Analysis
- Strategic Planning
- Systems Optimization
- Theory of Constraints
- Time Studies
- Tooling Studies
- Transportation Studies
- Warehousing Analysis
- Work Sampling

Interviewing for Information Tips

Whether investigating a Root Cause Analysis problem or talking to an experienced mechanic about an assembly, there is often a need to Interview for Information.

Listed below are some tips on Interviewing for Information:

- Set up the interviews ahead of time (if possible), you may need to get permission from their management to be given the time for the interview
- Prepare some starting questions ahead of time with a clear topic & goal for each interview
- Introduce yourself to the person(s) being interviewed, and tell them which group or organization you work for
- If you are allowed, tell the person being interviewed what you are investigating (and why)
- Check that the person being interviewed has experience in the function (they could just be filling in for the day)
- Make sure the person being interviewed has time on the day of the interview (conditions may have changed for them, that day)
- Let the person being interviewed finish their answers, don't rush them
- Write down any words or descriptions you are not familiar with and confirm you understand the usage of the term or description
- Ask follow-up questions, as needed, to complete a topic
- If describing a sequence of activities, make sure you have the sequence correct (read back the order of the actions that were described to you)
- If describing a specific problem, try to get the interviewer to estimate how often (%) the problem has occurred recently
- Ask for collaborating data (or where to find the data), so as not to be focused on only anecdotal information, and confirm how long ago a problem was observed (if too far in the past, the original problem may have been resolved)
- Ask who else you should talk to, or who might have useful data on the topic
- Type up your interview notes, immediately following each interview
- If two people were taking notes, get together and reach consensus on what you both heard during the interview
- If possible, send your typed interview notes back to the person you interviewed, to see if they agree with what you documented (or any conclusions you may have drawn); this also can help with planning the next steps

Project Scheduling Software Skills

A helpful skill, which new Industrial Engineers can utilize to their advantage, is to learn the Project Scheduling software at their new company. The software may be similar to something you have utilized before at school (Microsoft Project is commonly used, or something similar). Not only will knowing the scheduling software help you on your own projects, but you can help others with their projects.

Early on, you can get a good reputation as a useful project resource, by featuring your project scheduling knowledge. This will also let you have contact with several Project Managers and exposure to several different types of projects. It will be important to really understand the details for using the software, in order to build useful project schedules. This may require taking some online courses or studying the available reference materials on the software. It also should involve you meeting others at the company who know how to utilize the project scheduling software.

Build your schedules from a good tier 1, tier 2, and tier 3 outline, with logical links of related & dependent tasks. Make it easy to view the phases and major sub-tasks of the entire project. Develop good task completion estimates (based on past knowledge of similar activities), and build in recovery times based on known & potential risks. Show key presentation dates and planned deliverable reviews on the project schedule.

This is also a good time to review your overall Project Management knowledge from your previous Internships and your Senior Design Project. Bring in any useful textbooks from your University classes; or take some online training and buy some textbooks from the Project Management Institute (PMI).

Time Management Techniques for Project Managers

There are a lot of good books and articles on Time Management, but many of the techniques are easy to forget or ignore in daily practice. Probably the best application of good Time Management & Organizing skills is to try a few of the available techniques and see what works best for you. Also, look carefully at the wasteful time-consuming habits that you currently have and try to minimize or eliminate them.

Have a good Plan
A good place to start is to lay out what overall needs to be done, and back-schedule some of the major milestones (or critical activities) that relate to a particular end goal for a project or activity. The more complex the project – the more time it will take to accomplish the phases or major tasks. This can be a simple Plan for a single complex activity, or it can be an involved Plan that includes several complex activities (and some less complex activities that also must be included). Utilize good Project Planning software, for complex Projects.

Manage Your Schedule
You have to manage your day, your week, your month, and your entire year. Good time management begins & ends with how you schedule your work time, and to some extent how you schedule your free time. If you let the work day manage you (with too many meetings or distractions), there is really no way to control your time. Build a schedule that allows you to be effective and productive. When scheduling your time (or others') it helps if you've been realistic about the time it took to accomplish similar tasks in the past. Usually, it is better to build in extra time to accomplish difficult tasks (since you may encounter unplanned delays or setbacks). Finishing something ahead of schedule is much preferred, over finishing something late or past the due date.

Manage Your Resources
When dealing with your own Time Management, you respect and manage your available time. You need to be realistic about your work on difficult tasks, don't over-schedule yourself as a resource. Sometimes this means saying "No" to new projects or activities, if you don't have the time to finish something within the deadline needed, without a major impact on other activities equally important. It also includes the need to sometimes share the workload or delegate tasks (if this is an option), and respect their available time as well. It is important to manage critical resources, such as Subject-Matter-Experts.

Sleep, Breaks & Vacations
It is important to get plenty of sleep each night, to get a fresh start each work day. You may have to go to bed earlier, in order to get enough sleep. Take occasional short breaks during the work day, including some "micro-breaks" when doing a lot of keyboarding. Get away from your office area for Lunch; don't just eat Lunch at your desk. Leave the office on time, most work days. Use all of your available Vacation days, and don't make

it a "working" Vacation (have minimum use of smart phones & "checking-in" with the office).

Create Project & Activity Lists
Short, simple lists – whether hand-written on *post-it-notes* or formally typed up on a computer – can keep several activities from being ignored or forgotten. The use of good lists can also free your mind up to focus on the important activities, since you can't prioritize things until they have been listed. The lists will give you a visual queue of how you are progressing with completing tasks. The lists can also help you organize the sequence and dependency of related tasks.

Prioritize Your Activities
The best way to focus your time better, is to spend a proportional amount of time on the items that are really important. Multiple projects can have different priorities at any given time (based on critical deadlines, etc.) – but on any given day, you should know the priorities of the work scheduled for that day, and spend your time on them, accordingly.

Avoid Procrastination
There is a natural tendency to put off difficult or time-consuming tasks, or just not get started on time. It can help to break complex projects into phases or blocks of manageable work – but it is important to not delay the start of an important project. The loss of available time to complete a complex task or project is impacted greatly if any procrastination is involved. A good approach to eliminating procrastination is to jot down some ideas and a rough approach for a complex problem – as soon as it has been added to your workload. This allows you to think early and often about the upcoming tasks necessary to complete a new, complex project. It also lets you visualize completing the project, which is very helpful in developing an overall Plan and for being motivated to start & stay engaged on a project. Often working with others on small teams, can help keep the momentum going on a large complex project; it also allows for individual strengths to help the overall activity.

Stay Focused When Working
When you are working on important activities, concentrate & stay focused on what you are doing, and eliminate all distractions (no meetings, phone calls, or e-mail). A focused 30 minutes on a single important task can be a very useful way of making progress on a project. Break up the work day with enough variety that you are making progress on several important tasks on different projects. Start by only trying to do 3 or 4, 30-minute, intense work sessions a day – then do more each day as you are able.

Document Your Results
A good way to monitor your performance (or a small group's performance) on a complex activity is to have some measurable results throughout the activity, and not just focus on the end product. By having an ongoing view (and review) of progress throughout a complex activity – it allows for adjustments or alternate approaches to be utilized, if necessary. It is important for the documentation to be related to the end results, and be a useful portion of the project (and not just a status report).

Use Parts of Your Day Differently
Determine when you typically have more quiet time & fewer meetings, and use that time to plan & think in a focused way. When you have limited time between meetings, use that time for work-related e-mails, phone calls, and even electronic filing. If you have public travel time (by airplane, train, bus, or van) – use that time to read correspondence and do some planning for the next event (or for the next day). Try to use the end of each workday to do some preparation for the next day (or at least the first activities of the next day). Leave the top of your physical desk neat and organized, with everything needed "within an arm's reach" (such as an in-basket, stapler, pen & pencil, note pad, etc.).

Organize Your Electronic Files
It is important to be able to find electronic files quickly & easily, including work-related documents & e-mails. Develop a simple folder & filing system on your computer and any shared File Servers. The easier it is to find critical documents and correspondence, the less time is wasted searching for needed information. Something as simple as being able to access all the names & e-mail addresses of project members, or using a standard format for reports & correspondence – can save considerable time and frustration. Even how you name folders and files, can help you retrieve important information quickly. How you organize the "desk top" on your computer screen, is just as important as how you organize your work desk & office area.

Use Manila Folders for Printouts
Often Projects require you to save and carry around printouts and hard copy documents. An easy way to do this is in individual manila folders that hold typical 8½" x 11" sized printouts. These folders can each have a label/title (handwritten in pencil, so the folders can be re-used later), and can easily be placed out on your physical work desk, or filed away in hanging folders in file drawers in your desk (or a separate filing cabinet) when not actively being used (or at the end of each day). One or two folders can also be carried to meetings, along with a nice writing pad portfolio for taking meeting notes. Even in today's electronic, digital age – paper printouts are often generated and will need to be saved & organized. Sometimes an individual printout can have multiple uses – such as taking notes directly on the bottom portion of a meeting announcement that may also have the list of invited attendees' names at the top of the page.

Practice Scan Reading
Scan Reading is very useful for getting through magazines & newspapers, and can help when doing research (either on the Internet or in text books). Scan reading is not the same as Speed Reading. Scan Reading initially focuses on looking at the outline of a document or source. Does it have a Table of Contents, Index, or other outline that tells you where items are located? Most magazines have a table of contents & maybe a featured articles page – that can be very helpful in deciding if the topic (based on the title or a brief description) is of interest to you. Once at the article, usually there is a brief synopsis (just under the title), or the first paragraph will often tell you what the story or write-up is about. After reading these – you can decide if to read any more of the article (or if busy, mark it for a full reading later). An important part of Scan Reading is to

"give yourself permission" not to have to read something cover-to-cover (like a newspaper, magazine, or a book).

Keep Learning and Growing

Leave some time each week to improve your performance and efficiency. Look objectively at the time that was wasted and try to improve how you manage your time each week, and each month. Read improvement books, take in-house or external classes – and talk to others about how they have improved their Time Management skills.

Build a Good Time Management System for Yourself

Utilize all of the Time Management & Organizing techniques that work best for you. Modify and experiment on a regular basis, so you are always improving. Keep using the system that you create for yourself, and monitor your results to make sure it continues to work for you.

Scheduling Techniques for Everyday Use

Listed below are some general *planning & scheduling* techniques, and a brief explanation of how they might be applicable for everyday use (either separately or in some combination):

- **Do some Long Range Planning**
  Important events, like attendance at weddings, graduations, vacation trips, Conferences, major birthdays, etc. – may require some long range planning, in order to make airplane & hotel reservations, schedule time off from work, and for increased family communication.

- **Include most activities in a visible schedule**
  It helps to use a variety of methods to make planning & schedules visible & accessible to all that need to see them. This can be as simple as a centrally posted calendar or bulletin board of upcoming events. Sometimes it helps to have 2 or more months visible at a time, so an event at the beginning of a new month doesn't surprise anyone (when the calendar is flipped to the next month).

- **Distinguish types of activities & those most affected**
  Make it easy to tell which detailed activities relate to which planned event, or who is most affected. A creative use of color ink/pencil or color post-it-notes, may help organize which activities relate to which event (or who is affected most, if not impacting the entire family).

- **Utilize previous information**
  Whenever you are repeating an event, or something similar from a previous year, use that information in your planning & scheduling. This could include airline & flight routes previously used, driving routes, nearby hotels, nearby fun sites to see, days needed to be on location, etc. Accordingly, it helps if you save this information on a regular basis, maybe in trip or event folders on your Laptop Computer or Tablet.

- **Make action items lists, for complex or detailed activities**
  Closer to an actual event, it may help to make a list of the sequential activities that need to be done (whether written out on paper, or typed up lists on your computer, tablet, or smart phone). This allows you to check-off completed items, and keep track of any items still needed to be completed (with the deadlines in mind).

- **Prioritize your activities, for important deadlines**
  Try to use the overall schedule & end-dates, to help prioritize the most important activities, and also any long range activities that can take time to complete. This includes leaving time for other resources to complete their tasks (such as a 3rd party, Travel Planners or Event Planners).

- **Keep visibility of completed activities**

Have some visibility on which tasks & activities, and for which planned events, have been completed (and conversely, which tasks or activities still need to be completed). This can be as simple as a ~~strikethrough~~ line (either in pencil on a handwritten list, or on a typed list).

- **Avoid Procrastination**
  Try to minimize procrastination, particularly when starting difficult or time-consuming tasks or activities. It helps to have visibility of the end-dates for important events, to give incentive for starting important tasks on time.

- **Have some contingency plans**
  It always helps, to build in some contingencies, in case things change, get behind, or are accidentally forgotten. Schedules can change for a variety of reasons (sickness, emergencies, new priorities, etc.) – so the more built-in flexibility, the better.

- **Use the best time of day, or day of week, for some activities**
  Some activities can be more easily completed during certain days of the week, or times of day. As a Retiree, I often can accomplish tasks quicker by avoiding doing them on the weekends, or after 5 pm. Many businesses are less busy, during daytime hours (9 am - 3 pm), when many people are at work. Some airports and airlines are very busy during certain times of the day, or days of the week – so try to avoid these rush times, which can create significant travel delays.

- **Organize your errands**
  When you are running errands on any given day, try to make it a logical & efficient driving trip. Think like a UPS driver, and mentally think about the best route to take, and the order to accomplish your errands for that day (or for that driving trip). Give priority to the most important errands first, in case you run out of time or energy. Be realistic about how much you can accomplish during one set of errands. Don't ignore weather conditions (excessive heat, or snow, or rain).

- **Make it fun**
  Try not to be obsessive when doing planning & scheduling; but use it to help make things go smoothly & efficiently. A good plan or schedule usually works best (like for vacation plans), when it is almost invisible to others (or it just seems to be an easy plan to follow, that allows for a maximum amount of spontaneity & fun).

Manufacturing Systems

Often Industrial Engineers spend time analyzing and improving the main Manufacturing Systems. When you are involved in working process improvements at a manufacturing facility, it helps to have some familiarity with the main systems that constitute the overall business.

Here is a list of some of the main Manufacturing Systems:

- Production Control Systems (& Production Scheduling & Expediting)
- Production Reporting Systems (& daily performance reports to management)
- Inventory Control Systems
- Quality Control Systems & Product Testing
- Receiving & Inspection Systems
- Manufacturing Sequence Systems (production routings & product build details)
- Tooling, Tool Maintenance, Tool Design & Tool Fabrication Systems
- Conveyor Systems
- Material Handling Systems (forklifts & overhead cranes)
- Warehousing & Bulk Storage Systems
- Shipping Systems
- Transportation Systems (truck, rail, & cargo ship)
- Suppliers & Raw Material Systems
- Customer Support Systems & Sales/Marketing
- Product Returns System (from Customers & from Suppliers)
- Maintenance Systems & Capacity Analysis of critical equipment
- Facility Planning, Building Support & Site Maintenance Systems
- Energy Systems (buildings)
- Environmental Systems
- Security Systems
- Communications & Phone Systems
- Skills Training Systems
- Safety & Ergonomics Systems
- Human Resources & Organizational procedures
- Computer Systems & Computing Support (management of software & hardware)
- Internet & Wi-Fi Systems
- Accounting System & Cost Control Systems
- Business Records & Data Systems
- Management Reporting (high level reports above plant level)
- Long Range & Strategic Planning Systems

Successful Team Collaborations

Successful Team activities (both at work and with outside volunteer groups) requires the need for improved collaborations. Listed below are some practices to consider – when involved in Team collaborations:

- Reorient your thinking to match the group you are representing, and also the Team you are working with – on each separate collaboration Team.

- Look for cross-applications and similarities between the various Team collaborations you are involved in.

- Choose the media and technology used for each collaboration wisely, and reevaluate its effectiveness often. Face-to-Face meetings are usually better than Tele-conferencing (WebEx, or other types of electronic communication). Real-time electronic communication is usually better than delayed electronic correspondence (e-mail, etc.). Delayed electronic correspondence is usually better than no correspondence. All communication methods may need to be employed at times, in various combinations.

- Team collaborative discussion, needs to eventually result in a useful activity – sometimes by a smaller group (or even by just one person). It's better to get volunteers rather than give out assignments.

- Be inclusive and representative, as much as possible, in each Team collaboration – but with real results as the key metric; don't just do something for appearances.

- Not everyone can function well in a collaborative environment and may need to be an "individual contributor".

- Better to build on an idea to make it better, rather than tear it down or be too negative.

- Some ideas and innovations may need to be phased-in to match the project's timing or even allow technology to catch up.

- A "devil's advocate" is often encountered on some Teams, but if encountered too often, or it's the same individual – is rarely helpful for long, and can impede achieving useful results.

- If an individual Team member is too disruptive, they may need to be removed from the Team, otherwise the Team's results may suffer and everyone will be blamed for the lack of success.

- Bad Time Management – whether the time is wasted or just ineffectively used (such as bad multi-tasking) – is a personal, controllable activity.

- Volunteers can easily be over-tasked – either by the Team, their management, or by themselves – by an inability to say "NO" to accepting new tasks, or to realize their current "absorption" capability. Actual results can be a useful metric to determine if an individual (or Team) capacity problem exists.

- Results, when a cost analysis is performed, should include the entire system's cost (and related impact) – to avoid a "sub-optimal" solution.

- Realistic deadlines are often helpful and allow group "synergy" on sub-tasks (like on a complex, longer project). But un-realistic deadlines – set by a manager or the Team members themselves – are often counter-productive and can dramatically reduce the quality of any results.

- Re-discovering older technologies and practices – can sometimes be beneficial. Also, cross-industry applications can be a way of having an easy-to-implement improvement, if applied appropriately and the necessary adaptations are considered.

Performing an Operations Audit

Introduction
The Industrial & Systems Engineer (due to training and job position) is frequently called upon to examine the "big picture" in a production/operations environment. This may be a formal request for a diagnostic review or a vague request by top management to see what is wrong with production/operations. The Operations Audit is a procedure that aids the Industrial & Systems Engineer in determining not only what is wrong, but just as importantly, what is right in an operations activity.

What Is It?
The Operations Audit is the first step in performing an overall, objective evaluation of a production or operations area. It is called by many other names such as Diagnostic Review, General Survey, Operations Examination, etc. It can be conducted as a stand alone project, but is frequently part of a larger project such as a Cost Reduction or Productivity Improvement. The technique is based on a logical assessment of the current factors that are controlling the operations environment.

The audit can be performed by one person or by a team, depending on the complexity of the operation under examination and the need for skills outside of the Industrial & Systems Engineer's training. The audit can vary from as short as two days to as long as several months, depending on the size and complexity of the operation being examined.

The audit should result in a written, concise statement of the strengths and weaknesses of the operation and support functions. It should also contain diagrams of the interactive functions that contribute to the product or service being provided and any comments regarding areas for improvement and any specific areas for further analysis. The audit will rely on data, numerous interviews, field tours, and the objectivity and past experience of the Industrial & Systems Engineer.

When Do You Do One?
An Operations Audit should be performed whenever major changes of a general nature are being considered. Some major changes might include: a plant wide cost reduction effort, installation of a productivity program, new product introductions, management information system changes, new plant acquisitions, prior to plant relocations, etc.

An audit is usually the first step performed by a Management Consultant who has been given a broad objective by top management to improve the profitability of an operation. A portion of the audit may be conducted by the Consultant prior to the formal proposal being submitted, to ensure that the correct problems are being addressed in their proposed work plan. Similarly, the Plant Industrial Engineer or Internal Consultant will frequently find that the audit is a necessary first step to ensure that they are addressing the controlling problems and not just some of the symptoms.

Most operations experience enough change that an Operations Audit could prove beneficial every three years and more frequently if a major change has occurred or is planned since the last audit.

What Tools Do You Use?
A variety of tools are used during the conduct of the Operations Audit and the emphasis will vary based on the complexity of the audit and the time available. One of the most important tools will be the Industrial & Systems Engineer's ability to conduct the audit as a project, with a written objective, defined tasks, expected deliverables, listing of work steps, and a schedule. If other team members are used, then their efforts will be directed and coordinated as well.

Other important tools are the ability of the Industrial & Systems Engineer to conduct meaningful interviews at all levels of the organization, and to document findings and draw clear, concise, conclusions. The handling and gathering of data necessary for the conduct of the audit is a particularly important task, since the time usually allotted to the audit will require not only care in analyzing data, but in making realistic data requests of key departments, such as Accounting and IT (Information Technology).

The operations tour and related field trips can be an important source of general information, and the tour can be augmented with product flow charts, equipment location drawings, and facility expansion plans. The observations and answers to key questions during tours and subsequent operations visits can become a useful part of the data gathering stage of the operation audit for confirmation and verification at a later date.

Organization charts, job descriptions, budget plans, financial statements, production records, and written operating procedures can be useful information to be obtained during the conduct of the audit.

Computers and computer departments may become essential tools in the audit if new data is being developed or extensive analysis is required, but the auditor should be careful not to "reinvent the wheel" when gathering new data and not to forget the objective and time frame of his project when spending time on computer programs.

How is the Audit Performed?
The Operations Audit can take a variety of directions and any number of steps can be involved, depending on the complexity of the audit and the size of the operation being examined.
A typical audit may include the following steps:

- Discuss Purpose and Objective of the Operations Audit with top management.
- Develop a Work Plan for the audit and create a Project Team, as required.
- Determine major data sources and list of key interviews.
- Review detailed Plan and data sources with top management.
- Conduct a detailed plant tour with the Operations Manager.

- Arrange for interviews starting at the top and going down the organization. Cover all necessary departments such as production/operations, engineering, sales, marketing, finance, Information Technology, inventory control, etc.
- Make any data requests early in the study to the appropriate department head.
- Conduct interviews and gather departmental information such as sample reports, job descriptions, organization charts, etc.
- Analyze data being gathered and develop various diagrams of product flows, information flows, and departmental interactions.
- Develop familiarity with products manufactured (or services provided) and major costs associated with the operation processes.
- Place all data gathered and interview notes in file folders, and keep organized by department. If other team members involved, conduct periodic review sessions and share data.
- Document preliminary findings as a series of un-ranked strengths and weaknesses. List strengths first, so as not to overlook anything when detailing weaknesses.
- Do not discuss preliminary findings with people being interviewed, since comments will not be finalized and final results may be confidential.
- List "unknowns" as well as "knowns" and begin to draft the Final Report, being careful to include data being developed that substantiates observations.
- Call in all data requests previously made and analyze data with help from the person who prepared the information.
- Develop a prioritized list of major strengths and weaknesses, and describe any specific areas for further analysis or for immediate action that are beyond the scope of the operation audit.
- Review Final Report with top management, complete with any appropriate Action Plans.
- Review copies of report with department heads, as appropriate.
- Begin to follow up on appropriate action items and develop additional Plans, as required.

Conclusion

The Operations Audit can be a beneficial first step in aiding the Industrial & Systems Engineer in assessing the appropriate focus for later problem solving efforts, and can be used in a variety of circumstances in most production & operations environments.

Applications of Benchmarking for Analysis Projects

Introduction

This type of Benchmarking is very Tour & Interview oriented, and is a good way to get new Ideas and identify Best Practices. It's usually part of a larger ISE-type Analysis Project.

What is benchmarking for analysis?

This type of benchmarking differs somewhat from traditional benchmarking, which is usually performed at a high level such as a total company comparison or a large system comparison. Benchmarking for analysis is used during an ISE-type investigation and tends to be part of a larger analysis project. It usually is more focused on specific problems for comparison and looks at similar and dissimilar activities. It tends to be more Tour and Interview focused and usually tries to answer specific questions.

What are some typical applications for benchmarking?

Some ISE-related Analysis Projects that might utilize benchmarking might include: Material Handling methods comparisons, Production scheduling methods, Inventory Control & Warehousing comparisons, and Maintenance procedures comparisons. You can benchmark within a large company with multiple sites, or benchmark different companies within an industry, or benchmark in different industries.

What are typical results?

It should answer your baseline questions and give you an opportunity to see a lot of new ideas that can be folded into your project's recommendations. It should provide some real examples of what others have tried and implemented.

When do you do it?

Whenever you need comparisons and have time in your project's plan. Whenever you need to provide detailed Implementation information. Usually you can start after you fully understand your own organization, but not too late in your Project Plan, so you can use the findings from the Benchmarking activity.

What do you focus on?

You should focus on specific items that you want to compare and are curious about, as well as any areas that you know are your organization's weakness or the benchmark organization's strength. Try to consistently cover your basic questions (and data requests) at each place visited.

How do you structure it?

Start with what you would like your deliverables to look like, and then structure your interview questions. Determine who you think would be a good benchmark comparison and then call to find a good contact at each place (maybe send them

your list of questions and the information you seek). Give yourself plenty of time to schedule the tours/meetings and leave enough time between tours to write up your notes, and to not over-schedule too much travel at any one time. But don't spread the benchmarking sessions out over too long a period, either.

How do you do the work?

Start with good interview questions. Try to take some of your customers along on the tours and at the start of each tour/interview re-state what you are hoping to see and why you are there. Be as open and receptive as possible, as you see and hear what each visited organization has done. Ask follow-up questions and keep your tour guide/host focused. Write up each tour's notes and discuss the tour findings as a group, immediately after the tour. Summarize your results as a separate write-up. Later do any follow-up tours on areas of particular interest.

How do you analyze the results?

Summarize each tour/interview as nothing but observed facts, initially. Discuss as a group everything you observed & heard and try to reach consensus among your team. Organize your findings & observations into several logical categories. Identify the best practices, where they occurred, and any items that seem to be the most applicable to your organization. Identify the steps they used to get to their best practices, if known (including things they tried but later abandoned). Also identify worst practices, where they occurred, and compare them to problems in your organization. Put any comparison figures into a summary table or chart. Determine the best items for application and write down the steps required to introduce the change. Write a separate Benchmarking section for your Project's Final Report that integrates into your Final Recommendations.

Systems Thinking

Systems Thinking is the ability to look at the "big picture", whether dealing with a Process Improvement project, or a Facility Planning project, or an Organizational Analysis project, etc. It means including all of the integrated processes that make up the entire system. For Industrial & Systems Engineers, this often means expanding your view at the beginning of a project, to ensure that all of the relevant processes are included, and to not just focus on some of the symptoms. This doesn't mean an unnecessary Scope increase, but it does mean that all of the cause & effect relationships are included, and all suspect processes are examined.

Any benchmarking, whether for comparison of similar problems, or for identifying useful solutions, must also take a Systems View. This means that often the entire organization must be included, when doing comparisons, and there is a need to look at all similar processes. It also means that the benchmarking results must be viewed from a larger perspective, in order to identify all possible solutions.

It often takes some effort to broaden your thinking enough to see the complete system. Where this is very important is at the beginning of a project, when the overall Objective & Scope are being determined. It also helps when doing Data Collection, if the larger view is used when determining what areas to include in the Data Collection activity. It is important to broaden your view when looking at possible solutions, to ensure that all feasible solutions are considered.

As you broaden your view to see the "big picture" make sure that all members of the Project Team are also utilizing Systems Thinking, as they perform their work on the project.

The 30-minute Method of Working on Tasks

Here is a brief description of the "30 Minute Method" to work on multiple projects & tasks (but one at a time), during a busy work day. [Note: *This is not the same as multi-tasking*.] Basically, you use a digital watch or your smart phone (counting down backwards for 30 minutes, with an alarm), or just use a wall clock and start & stop on the half-hour marks – to focus for a solid, un-interrupted 30 minutes on a detailed task on a single project. And on the next 30-minute session, you focus on an important task on another project or activity.

During each 30-minute session, you let your phone go directly to Voice Mail, you don't answer or send any e-mails, and you don't go to any meetings, or have any visitors at your desk or office (unless they are helping with the detailed task during the focused 30-minute work session).

You can do two 30-minute sessions back-to-back on a single project or task (but only occasionally). Between the 30-minute sessions, spaced out during a busy day, do something else that is more relaxing – like answering or sending e-mail, or typing up meeting notes, or organizing electronic files, etc.

If possible, take 5-minute "micro-breaks" (get up from your desk and walk around or get coffee, or just flex your fingers silently while you stretch your legs) every 30 minutes – particularly important if you are doing intense keyboarding or studying data or reports.

If during a day you can find time to do four or five intense, 30-minute work sessions (during an 8-9 hr. day) – you can do a surprising amount of work each day and stay up on almost every project, if you do a 30-minute session on different projects that are currently active, each day (or every other day). Start by only trying to do two or three 30-minute, intense sessions a day – then work more in each day as you are able.

You can significantly increase your daily output, using this simple technique. It also helps with scheduling for critical deadlines, so fewer deadlines will be rushed (or missed).

Doing Research on the Internet

Often it is necessary to do a technical search using the Internet, as part of your job duties. This could be a quick investigation of suppliers or companies that make products you are researching for your company; or it could be to research subject-matter-experts outside your company that may be utilized as consultants.

Unlike quick Internet searches that you may have performed while in school, a work-oriented search may require a lot more persistence and even take several hours to be completed successfully. There will probably be additional follow-up with the content you discover, and you may need to summarize it to share with others on your Team at work.

It helps to understand how most company websites are organized; it also helps to understand how Internet searches work. Many companies have much of their website content organized under major top headings. Then usually under each top heading is a pull-down menu with several sub-headings. Often it takes a few tries to "drill down" to the category of information you are seeking.

One tip is to utilize the company websites' own internal key-word search capability (often at the top right-side of their home page); or open up the "menu", if one is provided, that will show a detailed outline of the site's content.

Another tip is to periodically save your search path temporarily to your computer laptop or notebook desktop so you can easily retrace where you've already been on a complex website. If doing several related searches on different company websites, it may help to make a temporary folder on your laptop or notebook desktop, so you can store website searches on related topics.

Another tip is to use the "voice" feature of a Google-type search, to save yourself some initial typing, when doing a complex Internet search. It may take a couple of tries to get the key words that are needed to start a useful Internet search, using the "voice" feature.

While reading some of the content, you may learn enough of the company's terminology or some useful information about their current product line that may help you continue a more detailed search. Don't ignore things like News articles or Sales/Marketing write-ups – since these may offer useful information to help with your search.

Sometimes using Scan Reading techniques can help get through lots of content during your Internet Searches.

Scan Reading vs. Speed Reading

Scan Reading is a particularly useful skill to learn and practice regularly. It differs from Speed Reading, which employs techniques for broadening the width of text you can see at a single glance, plus moving quickly down the page to keep from having any wasted eye movement. Speed Reading takes some time to master and you can slow down again if you don't keep using the technique regularly.

Scan Reading has nothing to do with how fast you read the text, but it can save a lot of time, by helping you decide what to read (and not read). First, you have to give yourself permission to only read what you want to – or what you need to – otherwise you will need to read the newspaper or magazine cover-to-cover. Quickly, you will realize that most things are not read cover-to-cover, so some selective reading is always present. Scan Reading takes this further and allows you to organize the content into what you want to see. Existing table of contents, outlines, even indexes – can help you find and read titles of articles – to then decide if you want to read any more.

Scan Reading is very useful for getting through magazines & newspapers, and can help when doing research (either on the Internet or in text books). Scan Reading initially focuses on looking at the outline of a document or source. Does it have a Table of Contents, Index, or other outline that tells you where items are located? Most magazines have a table of contents & maybe a featured articles page – that can be very helpful in deciding if the topic (based on the title or a brief description) is of interest to you. Once at the article, usually there is a brief synopsis (just under the title), or the first paragraph will often tell you what the story or write-up is about. After reading these – you can decide if to read any more of the article (or if busy, mark it for a full reading later).

You might want to put a *post-it-note* on the cover of a magazine or book, or slip in an index card as a bookmarker, to indicate what you have already found of interest – that you may want to read later. Often you may breeze through most of a magazine or newspaper – just looking at the article titles or pictures – before deciding to completely read anything. Think about reading the article, the way you might look at someone's resume – you look at the major side headings, and focus on the main experience sections, once you see how their other information is organized. You glance through or scan read the entire document, before you go back and really read a few sections that interest you.

In today's fast paced business world, time to read is scarce, and information is important. Scan Reading on a daily basis can be very helpful for saving time and maximizing the information that you can receive.

Preparing a Feasibility Study

Sometimes before proceeding with a new project or a complex implementation, it is necessary to first conduct a Feasibility Study. This focused study will determine if it makes sense to start a new project or begin a complex implementation. The uncertainty of whether to proceed may be due to outside factors such as Finances, Organizational issues, Production Capacity, or Timing Issues.

An example that might require a Feasibility Study would be to determine if there will be enough time to complete a project prior to a major scheduled event such as a factory move to a new location, or a product line being discontinued. If there is not enough time to complete the project, or to gain enough benefits before the major change, the Feasibility Study would suggest that the project be cancelled, or at least postponed until after the scheduled change has taken place.

The essence of a Feasibility Study is to provide a detailed answer to the question: "Is it feasible to start a project or begin an implementation at this time, or are there factors that indicate it should be cancelled or postponed?" If there are concerns about starting a project or an implementation, it is important to do the analysis before continuing any further. This is far better than discovering during the project or during a complex implementation, that there are current factors making it undesirable to continue at this time.

Sometimes a Feasibility Study may involve an initial assessment of the potential cost of making a major change, such as a plan to replace expensive factory equipment like an Annealing Oven or a complete Paint Line. The company may not have the resources to consider an expensive equipment replacement, at this time.

Reasons for Taking the Fundamentals Exam

During your senior year in college, or soon after graduation, consider taking the Fundamentals of Engineering (FE) exam, towards becoming an Engineer-In-Training (EIT). Also, consider starting to prep for the Principles and Practice of Engineering exam in order to eventually get your Professional Engineer (PE) License.

Industrial & Systems Engineers who go into Engineering Consulting will eventually want to get their PE license. Certain jobs such as Facility Planning for city or county governments will require that you are making progress towards your PE.

In order to become a PE, you first have to pass the Fundamentals of Engineering (FE) exam and be an Engineer-In-Training (EIT). Then your work has to be reviewed by a current PE in order to verify that your Industrial Engineer work qualifies you to take the PE exam after several years.

The best time to be able to pass the Fundamentals of Engineering (FE) exam is when the material is still fresh in your mind, like during your senior year. Often your university will have a series of refresher classes (usually after hours) that can prepare you for the exam. Also there is information on the NCEES website.

Chapter 5 – Some First Job Tips

What to Investigate Before Accepting a Job Offer

What to investigate before accepting a job offer
Job interviews shouldn't be a one-way conversation. They are also an opportunity for you to learn about the company and its culture and benefits. Work for a company that you admire and that inspires you.

Before taking any job, investigate the following topics. Much of this information may come from the company website or human resources, which you can investigate prior to your interview, but some, may need to come from the hiring manager.

- Relocation cost reimbursement
- Cost of living for the job location
- Commute time for the location
- Medical coverage
- Sick leave policy
- Vacation policies and time to accrue vacation
- Flex-work and work from home policies
- Travel commitment for the job
- Any items the job offer may be contingent on (such as a new contract)
- Company financial contribution toward advanced degrees
- Company paid training, certifications, and society membership dues & conferences
- Company investment plans
- Retirement benefits

Comparing job offers
When weighing your options, look beyond just the annual salary and try to compare total compensation and work environment.

- Take all benefits into account when comparing the overall salary.
- Avoid jobs that require long commutes, which add to your work day.
- Make sure you understand the job description and duties completely.
- Don’t accept a "conditional" position (e.g., with a possible termination after a 3-month review), unless you must.

Navigating Career Development in Your First Job

Navigating Career Development in your first job

Your first job opens the door to boundless opportunities for you to develop new skills and grow professionally. A degree in ISE provides you with a strong foundation to build upon, but it is up to you to continue building by making the most of the opportunities your job presents. Consider the following tips to learn how to excel both in your job and in the larger professional and networking environment.

Succeeding in your position

- Read and understand your job description.
- Work towards the next level's job skills.
- Gain as much experience and knowledge as you can from each company and each position you hold.
- Be open to learning and absorbing new experiences.
- Learn about the company's products and the product build-sequence (or the main function of the site you work at).
- Develop a network of useful company contacts.
- Dress similar to your co-workers (don't over-dress or under-dress).
- Act professionally, so you will be treated professionally.
- Pay close attention in staff meetings for new opportunities, and take careful notes.
- Learn what your boss' hot buttons are, so you can avoid them (and not tick them off).
- Prepare well for annual performance reviews (if these are being used).
- Don't feed the company rumor mill, but do pay attention to impending news that may affect you.
- Bring some of your university textbooks to work, to use as references.

Volunteering

- Volunteer for a new assignment at least once each year.
- Look for an opportunity that you are uniquely qualified for (e.g., helping build a departmental website or helping set up a simulation).
- Work on one fun volunteer activity to broaden your company contacts (e.g., a back-to-school backpacks activity or community service team).
- Offer to help others, occasionally, with their projects.
- Let your manager know of your outside volunteer activities (e.g., Engineers Week or IISE Chapter).

Project Management skills

- Develop strong project management skills and use them often.
- Take care when starting a new project and when developing the objective, scope, and approach.
- Develop strong interviewing-for-information skills, to use in conjunction with your technical skills.
- Keep very organized files, both electronically and manually (in file folders).

- Keep very organized correspondence, calendar of meetings, and contacts lists.
- Leave time during each day to think and bring something useful to all your work and projects.
- Buy some basic project management texts, offered through the Project Management Institute (PMI), and consider taking online training through PMI.
- Learn how to use your company's project scheduling software well enough to assist others with their projects.

Personal skills

- Get plenty of sleep and pace yourself for a full 40 - 45 hour work week.
- Be on time each day for work and all meetings.
- Listen much more than you talk, particularly early during a new project.
- Be very sparing in giving your opinion, best to be asked first.
- Try to be a team player and get along with everyone (even if you don't really like someone).
- Develop a good attitude about your work and your job.

In-house Training

- Take advantage of the internal training that your company offers (much of it online).
- Talk to co-workers about useful in-house training.
- Stay current on all mandatory training & certifications for your group (or job description).
- Consider taking additional certification training (e.g., Lean/Six Sigma, project management, safety, and ergonomics).
- Utilize useful company websites for information.
- Practice your technical report writing skills and presentation skills.

Professional Society activity

- Join the Institute of Industrial & Systems Engineers (IISE) as a professional member and volunteer. (Joining is half price for the first year after you graduate, if you were previously a student member.)
- Attend some local chapter meetings and events, or work with an IISE Society or Division.
- Develop a professional network through IISE.
- Try to attend professional conferences often, and consider being a speaker.
- Consider starting to prep for the Principles and Practice of Engineering (PE) exam in order to get your Professional Engineer License.
- Take the Fundamentals of Engineering (FE) exam, towards becoming an Engineer-In-Training, during your senior year.

Career Planning

- Enjoy your career as it unfolds.
- Make a career plan and update it periodically.
- Find a few mentors and follow their advice, but only if it works for you. (Utilize IISE's Mentoring Board.)

- Practice life-time learning, to stay current in your field. (You can become outdated in less than 5 years.)
- Buy a few job-related textbooks each year.

Give back

- Give back to your university & the ISE Department; your degree is only as good as the school's current reputation.
- Continue to promote the ISE profession, within your company and globally, through organizations like IISE.
- Later in your career, be a mentor. (Start early, as a mentor to university and high school students.)

Transitioning to Full-Time Work

It takes some adjustment when transitioning from being a full-time college student to being a full-time working Industrial Engineer. Adapting to a 40-45 hr. work week with ongoing meetings, small Teams, office politics, etc. – can be more difficult than you might think.

Even if you have done one or two Internships, they may not fully prepare you for the transition to a full-time job. More will be expected of you by your new manager, and you will be given daily activities and more scheduled meetings. At first this will seem new and interesting, but about your second month in the new job you may experience some difficulty fitting in, or you may find the 8-9 hr. days seem long and sometimes tedious. It helps to eliminate outside distractions your first few months and plan to get plenty of sleep, so you can get up early and have enough energy to complete each day. It also is important to learn your manger's "hot buttons" as soon as you can, so you don't do the one or two things that may make them mad. Try to focus on being a good Team member and help the group be successful, along with the company and its products or services.

Often students can find the mental adaption to their new job duties as challenging as the physical challenges. Sometimes the Team Dynamics can be deceptive, since you will no longer receive special treatment as an Intern; since now you will just be the newest, most junior member of the group. The other members of the group will have high expectations of you, and may not be pleased to have you give your opinion too often, until you have learned more about the current conditions, and you have earned their trust. It is best to listen a lot more than you speak, particularly when it comes to sharing your opinion. Later, after you have built some trust with the group, they will ask for your opinion as you become an equal member of the group.

A good way to improve and even speed up your acceptance by the group (and your manager), is to volunteer to help with some activities that you may have newer skills: such as setting up a simulation, helping build a website, or doing statistical analysis. You can usually take your recent software knowledge from your university classes and adapt quickly to the software being used by your new company.

You will no longer be an Intern, planning to return back to college life, after your work session has been completed. It helps to think of this transition as the start of your Industrial Engineering career. Build trust and instill confidence with your work group and all the Teams you are assigned to. Begin expanding your professional Network of useful contacts within the company. Learn the company's products & services, and start to grow into your current job description.

Volunteer for Something You are Uniquely Qualified For

A good way to get noticed on your first job (following graduation) is to volunteer for something that you are uniquely qualified for: like helping with a department's website, or being a project scheduler on a large project, or doing a simulation.

As a recent graduate, you may have some skills that are newer (and maybe better) than some of your co-workers. As the newest member of your work group, sometimes it can take a while to be accepted into the group. But by volunteering for something that you are good at, you can earn trust and respect quickly with the other members of the group (including your supervisor).

Pick a task that you think you can help out with, and something you would enjoy doing. Make an extra effort to do a great job, and show some of your creativity as well as your technical skills; so you will be seen as a valued member of the group, with useful skills and good ideas.

If you have successfully built websites, look over any website plans for the existing website utilized by the department, and see if you can help develop a better website. By volunteering for this activity, you will learn a lot about many parts of the work that the organization does, and it may give you an opportunity to work with several others outside your organization (like other webmasters).

If you have learned the Project Scheduling software used by the company (or organization), consider volunteering to help with the Project Schedule of a large project. This is a great way to get involved in an important project and also provide some useful technical skills. This also will let you be close to the Project Manager and pick up some useful Project Management tips, to use later on your own projects.

If you have learned the Simulation software used by the company (or organization), volunteer to help build and run the simulation on a complex project. This will get you directly involved in supporting a complex project or analysis.

Volunteer for a Community Activity at Work

Volunteer for something fun at work that helps your local Community. This could be a company sponsored activity like back-to-school backpacks, or a Volunteer work-day to build a playground, etc. Pick an activity that you think you would enjoy and really get into it. Besides being good for your Community, it lets you meet other volunteers at work, outside your immediate group. This will help broaden your Networking within the company, and will be a good way for others in the company to associate you as a good worker and a volunteer. Make sure you discuss your plan to volunteer with your supervisor first, if it will involve any time off during work hours.

Often these volunteer events are done on an annual basis, so you can plan for them and set aside personal time to participate again the following year. Try to meet the organizer of the event and occasionally offer to help with the planning, if you can. It also helps to understand more about the Community group that will be benefiting from the Volunteer activity, since you may want to do additional follow-up activities later.

Eventually, after a few successful volunteer activities, you might want to lead or organize one of these events yourself.

Leading Volunteers

On your first job, whenever you can, try to volunteer for something outside of work, such as an officer in a local IISE Chapter, or to lead a Community Help drive (like a school supplies drive, or a volunteer clean-up day). The leadership skills you develop off-hours will carry over to your work and career.

There are some special circumstances to consider, when leading a group of volunteers:

- Be a good team member first, before trying to be the Leader
- It helps if you have previously done a lot of the duties involved, as a team member, before being the Leader
- Understand the larger group that you are working with, if larger than the Leadership Team (such as a Student IISE Chapter, or ISE department)
- Make sure everyone knows the end goal & key deadlines
- Be organized and develop a good timeline/plan
- Do the prep ahead of time, to make things go smoothly
- Get into the details, so nothing important is missed
- Plan for contingencies
- Practice good communications, including explaining expectations
- Try to get everyone involved in the activity
- Try to get volunteers rather than make assignments
- Respect the other volunteers' time and try to set everyone up for success
- Encourage initiative and creativity by each team member
- Monitor progress regularly, and share with the entire Team
- Use a "*trust but verify*" approach, when monitoring results from individual Team members
- Make it fun for everyone (including yourself)
- Observe other leaders and copy their best practices
- Celebrate success with the entire Team
- Be aware of individual team members' skills, to ensure everyone is safe, such as when leading volunteer groups doing potentially dangerous activities (like a downhill ski trip, or a white water rafting trip).

Controlling Your Workday

It is important to control your workday, which may also include managing routine tasks that you may find boring. Most jobs have at least some routine tasks, but it is important not to ignore them, but try to simplify them so they don't take much time to complete – so you can spend most of your time working on important items that will help the company (or clients/customers).

Look carefully at the number of meetings that you have to attend each week, to see if some of them can be eliminated or at least shortened. Often, "standing" (re-occurring) meetings can become unproductive over time, since the original objective for the meetings may have been lost. Just reducing the number of people that are required to attend a meeting can sometimes make the meeting more productive for the remaining attendees. Make sure each meeting has a focused agenda that matches the original reason for calling the meeting. Look for ways of shortening the amount of data shown or any long presentations in meetings; much of this information may be better shared using other media (like email, or wall charts in a shared conference room).

Look for ways of expanding your current job duties to do important activities. Try to answer the question: "What can I do with my skills & background to help the company or its products/services, or clients/customers?" Then look for useful activities that you can perform that later may become part of your regular job duties.

Dealing with Office Politics

On your first job after graduation, or during any Internship, it is best to avoid any "office politics" at work. It is easy to get caught up in the casual "water-cooler" conversations with co-workers. However, as the newest person in the group, your knowledge of what is acceptable to talk about and what is not, will be very limited, and you may offend someone without even knowing it; this goes double for telling any questionable jokes or any labeling of co-workers.

If there are co-workers making derogatory comments about others (including management, or the company), don't chime in with your opinion, or be seen as taking sides in any personal disagreements. Be aware of the various personalities and even on-going disputes, but don't personally take sides or add to any of the problems or disputes.

Act professionally and you will be treated professionally. Try to get along with everyone, so you can do your work and be seen as a likeable, competent, employee. Stay focused on your job and your assigned projects. Try to enjoy working with all of your co-workers and get along well with management.

One of the problems with office politics, is it is often more of a "rumor mill" than containing any useful information. Another problem is that it can miss-orient your thinking, or give you an inaccurate "spin" on a situation or a person. And if you are actively participating in the discussions, you will be seen as validating someone else's opinion that you have no real basis for trusting. In general, office politics is usually so one-sided as to be counter-productive for making any fact-based decisions.

But if you get brought into some office politics, tread very lightly, since it may affect your relationship with some of your co-workers, or even be seen negatively by management.

Later, when describing your work or your activities at a former company or division (such as during a job interview), avoid describing any "office politics" you may have encountered – just describe your job and the projects you worked on.

Working from Home

Working from home can be quite different from working in an office or factory setting. There are a number of benefits to working from home, such as the lack of time spent commuting, more personal time & flexibility in being able to help other family members during the day, and having the ability to take a phone call outside on nice days.

But there are some challenges to working from home that need to be considered. When working from home (full-time or part-time), you will have to be disciplined in order to stay focused and not be distracted by other activities at home. It helps to communicate with the people you live with, how you are going to live together and enable space/time for working remotely. Having that conversation can help you, and those who live with you, set expectations.

Try to maintain a normal work hours schedule; it can be easy to keep working extra hours if you don't monitor your time. Take short breaks occasionally during the day, to help you stay focused, particularly during any two-way communications. Eat meals at regular times and don't forget to exercise and get plenty of sleep.

Set up an ergonomic work space at home that is convenient to use on a regular basis, and can be made quiet for both independent work, and for group internet call-ins. Communicate to family members when you are working and when they need to minimize their interruptions (particularly during conference calls).

There will probably be extensive communication: by phone calls, texting, and instant messaging. You may be doing multiple group meetings using the Internet (Zoom, or Teams, or GoToMeeting, or WebEx, etc.), including some meetings showing your image on camera. Try not to schedule back-to-back Internet meetings, but allow at least a 10 minute break between meetings.

You may need to adjust your work hours in order to communicate with other team members. Some Internet meetings will require adapting to others' time zones (3 hours difference on the east coast). You will have to be very organized when maintaining a schedule of planned meetings with other team members, including scheduled staff meetings.

Take care to communicate your intended emotion/tone in e-mails and written communication. Carefully choose your words and re-read your text before sending it, so you are faithfully communicating what you are intending to say. Keep your tone friendly but informative.

You will need to keep organized files on your laptop computer, so you can easily bring up important files when working on several different projects with multiple teams.

You will need to utilize security features to ensure the safety of company information, including care when sending information to others. You may be issued a secure, company furnished, laptop computer that must be protected at all times from theft; and only used for company business.

Working from home is easier for some people than others. Introverts usually like working remotely; but Extroverts can sometimes struggle. If you are struggling from a lack of connection, consider calling a co-worker on a regular basis. Just having conversations regularly helps stay connected, and having pets nearby can be very comforting as well.

Consider setting up re-occurring check-in meetings with your boss/supervisor (daily, weekly, or bi-weekly depending on the role), to ensure they are aware of all the things you are working on, as well as to have scheduled times to get their guidance/advice.

Occasional off-hours "happy hour" Internet meetings with co-workers and friends can be very helpful, since these can help replace the after-hours live "happy hours" that you may have done previously with co-workers and friends.

Re-branding Yourself at Work

The issue of making a personal brand, or re-branding yourself, if you think you have been "*restrictively-labeled*" by others at work, is a fairly common problem for all engineers, and particularly for Industrial & Systems Engineers (ISEs). In general, different groups may think of Industrial Engineers as doing only certain things (like Time Studies, or Simulation, or Cost Estimating) or they may view you personally as being good at one thing but don't think of you as being strong in other activities.

This has happened to me several times at different Management Consulting companies, when working with other consulting disciplines (like Finance, Marketing, or Computer Consultants). It has also happened to me at the Boeing Co. when working on projects with other engineering disciplines (like Aeronautical, Mechanical, Electrical, or Civil Engineers).

Look for opportunities to brand (or re-brand) yourself, at the beginning of a new project or assignment. You might be able to bring in some of the solutions or approaches you used on your past Internships, or your Senior Design Project, or from your University classes. You might bring in approaches & solutions you have read about in *ISE Magazine* or other technical sources. Try to "show by doing" whenever you can, rather than just "talk about what you can do". Once others see you have additional skills, they will broaden their view of what you can do, particularly if they really need your help.

I used to mention the type of projects or activities I wanted to work on next, to my management, or volunteer for a challenging Team assignment as soon as I heard about it. After a while, a good opportunity would usually open up. Afterwards, when I was successful on a new assignment (either with a small team or just working by myself) – senior management usually noticed, particularly if they heard good reports back from internal customers. I tried to find a way to invite my direct management, whenever we were receiving any Team awards for a successful project, since it reflected well on them too.

During an Implementation, try to go the extra step and offer additional help, and show some of the things you can do, but usually don't get to try. If you can, find some people in your company that are doing the kind of work you want to be doing, or the kinds of projects you would like to be on – then volunteer to work with them, or at least meet with them occasionally and share ideas. You might find several "kindred spirits" and they may enjoy sharing their ideas and projects with you.

If Performance Evaluations are being used at your company, look for a way to document your interests and new focus areas, and bring these up during your Review sessions; be specific about new things you would like to try, or skills you want to utilize more. If an opportunity doesn't come up for this sort of discussion with your management, you might need to schedule a one-on-one meeting with them to talk about it. With a large size group (10-15 staff members), it is often difficult for a manager to know as much about

each member of their staff as they would like to; and often their attention is on the "problem of the moment" (issues with their own management, production/operation problems, newer team members, etc.).

An occasional need for some "re-branding" is not uncommon, for working Industrial Engineers.

Ethics & Engineers Protecting the Public

All Engineers have an obligation to protect the general public, who assume the products and services they regularly use will be safe. This is also true for Industrial Engineers. It is not hard to imagine a Safety or Ergonomics project that if done poorly, could end up causing harm to someone.

All of us assume the bridges we use, or the roads we take, or the cars we drive to work, will be safe and not cause us harm. The same is true for public transportation like trains, ferries & buses. It is equally true for other forms of transportation like airplanes and cruise ships.

Industrial Engineers are involved in a variety of products and services that are utilized by the general public, and are often members of product development teams, and production teams. Care must always be used to ensure the general public is kept safe from products, processes, structures, and services.

Ethics cannot be compromised, and must be practiced every day. Situations may arise that could test your resolve, even for Industrial Engineers.

Give Back to Your University and the ISE Department

Upon graduation, plan to give back (annual donations and volunteer your time) to your University and the Industrial & Systems Engineering (ISE) department. Your degree is only as good as your school and department's reputation, so you want to help the school remain strong, academically.

Be a good alumni, it is fun and personally rewarding. Have pride in being an ISE graduate. One easy way to give back to the ISE department is to volunteer to be a Mentor to ISE students, either formally through a department Mentoring Program, or informally by agreeing to be a Mentor if contacted directly by an ISE student.

Annual donations can be made directly to your ISE department easily online, and often your company will have a gift-matching program that increases the impact of your donation.

Regularly check out the ISE department's website, and attend any events that are organized for alumni and local industry. You might even get to be your company's representative at on-campus Career Fair events.

As an alumni, consider yourself an Ambassador for your University and the ISE department; talk positively about both to all your co-workers and friends.

Be a Mentor

After you have been working for a little while (following graduation), consider becoming a Mentor either at your university, or at a local community college, or at a local high school. Mentoring is fun and fairly easy to get started doing. You could start by being a mentor to a local high school student who is interested in engineering.

Mentoring is a focused way of helping an individual, one-on-one. It is a great way to pass on any lessons learned, in a very concise way, thus ultimately helping the profession. Most Mentors were also mentored during their career, so it is a great way to "pay it forward".

When you are being a Mentor, focus on the individual and their current needs & questions. Help them broaden their vision of what they really want to do, and help them learn about Industrial Engineering as a career, or prepare later for their Job Search & Job Interviews. Show some examples of the type of work you have done, so they can make the connection to real IE work.

Some Simple Financial Planning Advice

After you graduate, you will probably be making a good income as a working Industrial & Systems Engineer. It will be important for you to be responsible with your finances. Develop a simple budget and follow it. Watch your expenses, including housing costs & other monthly expenses. Control your discretionary expenses (like travel & meals out).

Live within your means, and not just existing from paycheck to paycheck. If you have student loans, build a budget that allows for gradual repayment. If you borrowed money from relatives, plan to repay them as well. Go slow on major purchases (like a car); consider buying a good quality used vehicle, initially. Control extravagant costs like wedding expenses and exotic travel expenses. Set up some emergency savings for unexpected expenses (like car repairs). Make sure you have adequate health insurance.

Pay all your bills on time. Utilize local online banking, and online bill payments. Check your bank accounts & credit cards regularly online. Keep track of your credit score, and do some actions that may improve it.

Chapter 6 – Career Planning

Planning Your Career

Why do Career Planning?
Career Planning is an important and useful activity whether you are looking for a job, thinking about changing jobs, or are just trying to figure out what to do next. If you don't do Career Planning, you will have to be satisfied with whatever chance brings your way. With Career Planning, you still will have chance events to deal with (both positive and negative) but you will have more of a road map to get back to, if you need one.

Step 1
Know Yourself
Utilize some self-analysis techniques such as the exercises in the "*What Color Is Your Parachute?*" book and similar references to objectively list your strengths & weaknesses – as well as likes & dislikes. This is a very important step, so don't rush it. Try to really understand & document yourself, and maybe ask your friends.

Step 2
Know Your Vision
Explore your current Vision of what you see yourself doing in the near and long term future. Cite specific examples of what your Vision would look like. Take as long as needed, for this important step, since the results will be used often when you assess future options.

Step 3
Do Your Homework
Research industry types, other companies, or other positions within your current company. This includes literature searches as well as networking & interviewing for information. Do in-depth research of the few companies & organizations that you are most interested in.

Step 4
Explore All Your Options
Look carefully at all the alternatives and weigh the options that are "currently" best for you. Some of these may include:

- Management vs. Technical Specialist?
- Manufacturing vs. General Business?
- Manufacturing vs. Service Sector?
- Current Employer vs. New Employer?
- Current Industry vs. New Industry?
- Large Company vs. Small Company?
- Local Work vs. Relocate?
- Consulting vs. Staff?
- Owner vs. Employee?
- High Travel vs. Low Travel?
- Graduate Program vs. Self Study?
- Night School vs. Full Time School?

Step 5
Use Your Contacts
Talk to your references, college alumni, professional contacts , and many others. Also, talk to your Mentors & Management contacts. Research current conditions, locate companies, and learn about possible opportunities.

Step 6
Look For Opportunities
Be constantly looking for new opportunities and be willing to accept new challenges. Learn how to recognize new opportunities quickly and how to evaluate them against your Vision for yourself.

Step 7
Prepare Yourself
Take courses and do home study to prepare yourself to match your Vision's requirements. Keep informed and interested in new developments in your chosen field. Have a long term improvement plan for yourself. Utilize professional resources at your disposal, such as IIE.

Step 8
Enjoy Your Career
Work at your career, but enjoy it as it evolves. Much of happiness in one's career comes from enjoying the day-to-day activities and focusing on your positive accomplishments and not dwelling on set-backs. Don't put off enjoying your career until some arbitrary goal has been achieved. Take time to do an objective audit of the good and bad aspects of your current career path, and make adjustments accordingly.

Step 9
Adapt to Changes
Prepare as best you can for the unexpected and learn how to adapt to changes (both external and internal). Look for ways of allowing yourself to absorb and even enjoy changes as they occur. Develop your core strengths and use these to embrace changes. Try to understand why the changes are taking place and develop personal strategies that fit your career vision.

Step 10
Include Your Family
Discuss your plans with your family, particularly if they are directly affected (such as a relocation). Match your spouses career vision to yours and see how they can both be achieved. Assess your family's future condition and the impact they will have on your career planning (e.g. a new baby). Assess any increase in time away from your family, either due to longer work hours, a longer commute, or increased travel.

Step 11
Separate Curiosity from Interests

Explore your real interests, but learn to separate out the things that you are merely just curious about. Curiosity is good and natural, but real Career Planning involves following your real interests, not merely side issues that you are just curious about. Avoid the "grass is always greener elsewhere" syndrome.

Step 12

Utilize Quiet Time

Do your Career Planning and "soul searching" under the best conditions. This usually means getting away from distractions and doing your Career Planning when you are relaxed and clear headed. Don't rush yourself, just do some quiet thinking about your career (like during vacations).

Step 13

Pursue Your Interests

Interview regularly for information and pursue your interests. Constantly compare reality against your original perceptions. Find people who have had similar Visions and talk to them about their Career Planning and current job satisfaction.

Step 14

Everyone May Be a Consultant

Develop core skills including seeking professional certification. In the future, job-shopping may be common-place and lifetime employment or even long-time employment, a thing of the past. Learn your chosen profession well, in order to be a consultant (whether external or internal). Keep your skills current and yourself motivated and challenged.

Step 15

No Regrets

Career Planning is a lot like Project Management:

- plan your activities
- work your plan
- modify your plan
- and enjoy your ~~*project*~~ *career* as it unfolds

Enjoy the Trip with No Regrets.

"Life is a Journey, not a Destination." - Ralph Waldo Emerson

Explore Your Career Choices

Find the Career Choice "currently" best for you, such as:

- Management vs. Project Management
- Consulting vs. Staff Position
- External Consulting vs. Internal Consulting
- Current Employer vs. New Employer
- Current Industry vs. New Industry
- Large Company vs. Small Company
- Local Work vs. Relocate
- Owner vs. Employee
- Current Career vs. Different Career
- Advanced Education:
  - Graduate School vs. Self-Study
  - Night School vs. Full Time School

_____ _____

There are potential pluses (+) and minuses (-) associated with each career choice, that need to be evaluated, when picking the career choice "currently" best for you.

Management vs. Project Management

Management:

+ Able to do more work thru others
+ May have more responsibility & impact
+ Can provide Coaching & Strategic thinking
- May see more bureaucracy & meetings
- No longer completing the projects yourself

Project Management:

+ Get to work closely with small teams
+ Get to focus on interesting problems
+ Work has a lot of variety
- Not in on Management decision making
- May not get to make Strategic plans

_____ _____

Consulting vs. Staff Position

Consulting:
- \+ Can work in a variety of industries
- \+ Can work on a wide variety of projects
- \+ Excellent pay
- \- Considerable travel & work out of town
- \- Long hours & promotions may be limited

Staff Position:
- \+ Much of work is regular hours & stable
- \+ Get to know a company & products well
- \+ More opportunities for promotion
- \- May have to attend lots of meetings
- \- Some work may be fairly repetitive

External Consulting vs. Internal Consulting

External Consulting:
- \+ Can work in a variety of industries
- \+ Can work on a wide variety of projects
- \+ Excellent pay
- \- Considerable travel & work out of town
- \- Long hours & promotions may be limited

Internal Consulting:
- \+ Get to know the company's products
- \+ Can develop expertise within the company
- \+ Stable work & may travel less
- \- May be vulnerable to mergers & layoffs
- \- Type of work may be more limiting

Current Employer vs. New Employer

Current Employer:
- \+ You already know the company & products
- \+ Your skills & background may be in demand
- \+ You may have good opportunities for promotions
- \- The company may not appreciate your work
- \- The company may be in trouble

New Employer:
- \+ New opportunity for growth & learning
- \+ Your skills might be better appreciated

+ Work may be challenging, leading to raises
- Not easy changing jobs & new managers
- May have to relocate or do a longer commute

Current Industry vs. New Industry

Current Industry:
+ You already have knowledge of this industry
+ Your experience will transfer to other companies
+ You like your current industry
- Your current industry may not be healthy
- You don't like working in your current industry

New Industry:
+ May offer you more opportunities
+ You are excited about a new industry
+ You have friends that enjoy this industry
- You may have to relocate
- Your skills & experience may not transfer

Large Company vs. Small Company

Large Company:
+ There are a lot of positions you qualify for
+ It may be easier to go into management
+ It is easier to work projects in groups
- It may be easy to get lost in a large company
- The bureaucracy may be hard to deal with

Small Company:
+ You may get to do a lot of different things
+ The decision making will be more nimble
+ You can see the work you do more easily
- The company may have fewer benefits
- You may be the only Industrial Engineer

Local Work vs. Relocate

Local Work:
+ You already know the area you live in
+ You don't have to move your family
+ You like the area you live in currently
- The local economy may be doing poorly

- You don't like the city where you currently live

Relocate:
+ You get to move to a new area
+ New opportunities if you move
+ You like the new city better
- It can be expensive to relocate
- It can be disruptive for your family

Owner vs. Employee

Owner:
+ As an owner you can make all the key decisions
+ You can feel proud of your company
+ You can take risks & be inventive
- You may have to work very long hours
- You may have limited benefits & high risk

Employee:
+ You may enjoy what the company does
+ You get to work with a variety of teams
+ You may have good benefits
- You may not get wealthy from your work
- You may not like your current boss

Current Career vs. Different Career

Current Career:
+ You have good experience in this career
+ You are making good progress
+ You are still learning a lot
- Your career is not progressing
- You don't enjoy your current career

Different Career:
+ A different career interests you
+ You are ready to try something different
+ You have been preparing for a new career
- You may not be as good in a new career
- You may be starting over

Advanced Education Options: Graduate School vs. Self-Study

Graduate School:

+ You can learn a lot from a Grad School
+ Your job requires an advanced degree
+ You will enjoy the immersive learning experience
- It is expensive & may require student loans
- You may have to relocate

Self-Study:

+ You can control what you read & study
+ You can get a lot of key information quickly
+ You can take courses online
- It may be difficult to learn on your own
- You may not receive a diploma or degree

_____ _____

Advanced Education Options: Night School vs. Full Time School

Night School:

+ You can still keep your current job & salary
+ Your company may pay for Grad school
+ You won't fall behind on promotions at work
- It may limit any travel assignments at work
- It takes a long time & some long work/study days

Full Time Grad School:

+ You may enjoy the immersive learning
+ You will finish the degree quicker
+ You may know the professors better
- You may need student loans
- You give up current job salary & advances

_____ _____

Find the Career Choice "currently" best for you, such as:

- Management vs. Project Management
- Consulting vs. Staff Position
- External Consulting vs. Internal Consulting
- Current Employer vs. New Employer
- Current Industry vs. New Industry
- Large Company vs. Small Company
- Local Work vs. Relocate
- Owner vs. Employee
- Current Career vs. Different Career
- Advanced Education:
  - Graduate School vs. Self-Study
  - Night School vs. Full Time School

_____ _____

Some Summary Comments

- Explore all the Career Choices, that are "currently" best for you
- Objectively consider the Pluses & Minuses of each available Choice
- Be comfortable with your "current" best Choice

What ISEs Do

Industrial & Systems Engineers (ISEs) work to make things better, including: processes, products and systems.

Depending on the type of industry, Industrial & Systems Engineers may do all (or some) of the traditional Industrial Engineering activities, including:

- Root Cause Analysis problem solving
- Process Improvement & Product Flow Analysis
- Lean/Six Sigma Projects
- General Project Management with small Teams
- Inventory Control & Supply Chain Management
- Production Scheduling & Shop Floor Control
- Standard Data Development & Time Studies
- Cost Estimating & Product Cost Development
- Distribution, Transportation & Warehousing
- Facility Planning & Layout
- Strategic Planning & Long Range Forecasting
- Safety & Ergonomic Reviews
- Maintenance & Tooling Studies

- Some ISEs work in specialty industries/organizations like Hospitals, Construction, Defense Contractors, and Government agencies (both Federal & State)
- Some ISEs do Consulting work (both Engineering Consulting & Management Consulting)
- Some ISEs go into Management (at all levels, including Senior & Top Management positions)
- Some ISEs do Research in a Commercial Lab environment or at a University
- Some ISEs teach at Engineering Schools
- Some ISEs are full time writers and engineering book editors

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The Institute of Industrial & Systems Engineers (IISE) has a *Career Center* section on their website that further describes what ISEs do.

Why ISEs Go Into Management

Later in their career, many Industrial & Systems Engineers (ISEs) will often go into management positions (both engineering management and general management). The same Systems Thinking and Project Management skills that many ISEs develop, carry over well into management positions. ISEs usually enjoy working with people and often can make the transition from managing small teams on projects, to managing groups full time. Leading small teams and leading a group full time, utilizes similar skills and viewpoints. The biggest adjustment is often being satisfied with letting others do much of the actual work, while the manager directs their efforts and helps them succeed.

The transition into senior management positions will usually depend more on available opportunities and personal interests. Sometimes it is helped by getting an advanced degree; often a Masters in Business Administration (MBA) for general management positions, or a Masters in Engineering (ME) for engineering management positions. It often helps to develop an understanding of the business side of the Operation or Facility, and not just be focused on the technical side of the products or services being provided at the site. Being mentored by other senior managers, can be very useful for young engineers or first level managers who wish to go into senior management positions.

Why ISEs Go Into Consulting

The same problem solving skills and Root-Cause-Analysis skills that most Industrial & Systems Engineers (ISEs) have, will carry over well into Consulting (both Engineering Consulting and Management Consulting). Engineering Consulting is usually more about technical applications, such as software or hardware implementations. Management Consulting is usually more about general problem solving and advice to senior management. Both types of consulting often utilize good Project Management skills during the investigations and implementations.

In addition, ISEs often work in many different industries, where similar situations are encountered. This often helps the individual ISE to develop a more "global view" of problem solving. Sometimes this "global view" encourages them to look into positions with consulting companies.

Often on a Management Consulting assignment with other types of Consultants (Marketing, Finance, Information Systems, Transportation, etc.), the Production & Operations (Industrial Engineering) consultant will become the team leader, due to the importance of the product & processes being examined (such as at a Manufacturing Facility).

Some Career Advice

- Interview well for all jobs you take.
- Work for companies that you admire.
- Get as much experience and knowledge as you can from each company & each position you hold.
- Learn the company's products & the product build-sequence (if applicable).
- Develop a "network" of useful contacts.
- Volunteer for a new assignment at least once each year.
- Practice life-time learning to stay current in your field.
- Find a few Mentors & Coaches, and follow their advice, but only if it works for you.
- Enjoy your Career as it unfolds.
- Make a Career Plan & update it periodically.
- Join a professional Society like IISE, volunteer, and try to attend professional Conferences often.
- Give back to your University & the ISE Department
- Later in your Career be a Mentor.

How Automation May Affect Your Future Career

The impact of Automation and Robotics on future Manufacturing Operations, may significantly affect Industrial & Systems Engineering (ISE) - related jobs. Some course-work and self-study during college, and also during the first years out working, may help in dealing with this future impact.

Expect many traditional Manufacturing Operations to utilize much more Automation and Robotics. This will probably make the traditional ISE job duties become more of a "Systems Consulting" role, utilizing large-scale analysis and process simulation (vs. more traditional, detailed manufacturing design).

For those working in future Manufacturing applications, it may require the Industrial & Systems Engineer to also be very familiar with some Manufacturing, Mechanical & Electrical Engineering applications. To do this while still in college, you may need to be selective in which technical electives you chose, to go along with your ISE degree.

The combination of increased use of Automation, smart Robots, and expansion of Artificial Intelligence, will make for a much smarter "Factory-of-the-Future". This will require engineers to have a broad understanding of many technical applications, in order to be an effective engineer and consultant in the future.

The ISE should still be effective in the future, if their traditional knowledge is also supplemented with knowledge of Automation and Robotics/Artificial Intelligence.

Giving an Extra Effort in Your Career

Introduction
Throughout my education and work history, I found there were many advantages to "*giving an extra effort in my career*", and to look for activities that opened new opportunities for me.

Virginia Tech Co-op Program
When I was in college at Virginia Tech, I knew I wanted to be in their engineering Co-Op program which alternates school sessions with work sessions during the sophomore & junior years of college. But the program had very few openings, based on the jobs made available by sponsoring companies. I talked to the Co-Op office and asked them – if I could get my own job lined up with a company – if they would accept me into the program. It was rarely done that way – but they told me to try it – if I wanted to. With some local contacts, I was able to get an interview with a large company in my home town (so I could live at home during work sessions to save money). At the end of a half-day of intensive job interviewing – they agreed to sponsor my Co-Op job with them (it was an expansion of an existing program that the company had already set up, with Virginia Tech). By alternating work & school sessions during my sophomore & junior years (all with the same company) – I was able to pay for most of my college education. It made the engineering degree a five year vs. normal four year completion – but it was well worth it. I later went to work for the same company when I graduated and I received annual vacation benefits based on my years of service (which they started counting back when I was still a sophomore in college) – so I had several weeks of annual paid vacation, my first job out of college.

Special Study in College
My senior year of college I got an opportunity to do Special Study with one of my engineering professors. It came about during a casual conversation with the professor at an after-hours event (sponsored by the student chapter of an engineering society). I had enjoyed the Human Factors class the previous year with this professor, and I asked him if he ever sponsored Special Study for undergraduate students. He said he needed some help with a research contract assignment he was working on for the Navy in the Virginia Tech, Human Factors Lab – and offered to sponsor me for Special Study. I worked directly with him and several grad students on "*Visual capability, eye movement measurements – using different flight deck instrumentation arrangements, for Navy fighter pilots*". It was my favorite class in college, and taught me a lot about doing independent research and writing technical papers.

Engineering Contracts Class
Another time in college I had to take some technical electives as part of my undergraduate engineering degree. I went to several engineering professors and asked them what courses they would recommend outside of my Industrial Engineering department. Several professors suggested I take a Contracts Law course – taught by the Civil Engineering department. It was a challenging class with a lot of technical

documents to read – but it gave me a strong background in writing and performing to formal contracts (taught by a working civil engineer with a Professional Engineering license). Later, as a Management Consultant, I used everything I learned in the Contracts class – to try and keep our clients out of court on complex engineering projects. I also got to work on several projects with Civil Engineers and found I could more easily relate to them from my taking the Contracts Law class in college.

Co-op Facility Planning Projects

As an engineering Co-Op student, while still in college, I was often given special Facility Planning projects – since I was viewed as extra help to the small engineering group at each plant I was assigned to. They often gave me some of their projects that they didn't have time to work on – but were anxious to see finally get started. They also wanted to see the project (and me), be successful – so I received a lot of project coaching and mentoring. They also took me to professional engineering society dinner meetings and paid for my dinner – so I got to meet Industrial Engineers from other local companies. Later, one of my first permanent jobs as an Industrial Engineer gave me an opportunity to work on some special projects. The coaching and mentoring that I received as a Co-Op student helped me succeed with several of my early project assignments. I found if I volunteered occasionally, for a challenging assignment – it often came with significant feelings of accomplishment, if the project was completed successfully. I also got to meet others in the company (outside of my own group) – who were working on challenging projects.

Site-wide Mobile Equipment Assignment

One of my early engineering assignments, when I was just out of college, was to coordinate the purchase of replacement mobile equipment (forklifts & electric transport carts, and battery charging equipment) for the large production plant site. It was a huge plant site and it had a lot of large and small pieces of mobile equipment. The senior engineer who gave me the assignment was glad to get rid of it – since he didn't like going around the large plant site looking at all the equipment and he had a hard time getting any new equipment purchased. I enjoyed going all over the plant site and meeting the department managers and forklift operators. I also had met some of the people at company headquarters – involved with equipment replacement approvals (back when I was a Co-Op student). I did a review of all our equipment needs for the entire plant site; then I talked to corporate headquarters about the replacement procedures and justifications needed. By proving our needs for the plant site, I was able to get a $2 million annual replacement budget approved for our mobile equipment needs (more than 10 times any previous budget assigned to the plant site). I was also able to get an improved maintenance bay paid for – so we could upgrade all new and old equipment to better meet the conditions of our plant site's material handling needs. By using some of our own plant labor, we also got a maintenance pit dug & installed – so we could do under-carriage repairs and servicing, easier and quicker. I had fun with the special assignment and met a lot of people at the plant site – who were anxious to have their old mobile equipment replaced and set up better servicing of the existing equipment. Later, as a Management Consultant, I was able to do several similar projects – involving improved mobile equipment upgrades – with other companies.

In Summary

Over the years, first as an Area Industrial Engineer, later as a Management Consultant, and still later as a Special Projects Manager – I often utilized the early skills and learning experiences I received as a Co-Op student and as an early engineer-trainee. And later in my career – I was able to be a Projects Coach and Mentor to other young engineers – and also help them attend professional engineering dinners & annual conferences (like others had done for me, early in my career). When I look back at the results from "*giving an extra effort in my career*" on occasion – I am amazed at the benefits that were achieved.

The Importance of Lifetime Learning

The bad news is that an engineering degree must be constantly maintained; otherwise it will become dated in less than five years. The good news is that it is fun and easy to keep an engineering degree current. What you learn during a 4-5 year University, Industrial & Systems Engineering (ISE) program will become dated at some point, if you don't constantly keep renewing your technical knowledge. This shows the importance of "lifetime learning", as you continue in your career.

Many companies require ongoing learning, to stay up on advancements in their products & services. Many industries may encourage ongoing learning, as the field evolves and new information is encountered. Often companies provide on-hours training and online training, to help you keep up technically. Often your job duties may broaden, requiring you to take additional on-hours or off-hours training.

Some of the best ways to maintain your degree are to:

- Attend professional engineering conferences (like those offered annually by IISE)
- Join a local chapter of a professional engineering society
- Take some online courses (often leading to a certification)
- Learn new software
- Buy technical books & study them
- Read technical magazine articles

It may also become necessary to get an advanced degree, whether attending a University or completing it online. As you progress in your career, the need for an advanced degree (either a Masters in Engineering, or a Masters in Business Administration) may become necessary for your advancement. Often these advanced degrees are paid for by your employer, if completed off-hours or online.

Dealing with Burnout in Your Career

Burnout can occur at any time in anyone's career for a variety of reasons, but it is usually something that time will take care of. Often a change in scenery (a new job, or new industry, or new location) can help, but it can take time to sort out what was the real cause and try to keep it from happening again.

Anything you can do to take the pressure off yourself will help you resolve a situation. For instance, if you are working too many hours and not finding time for home life – you may need to step back and work fewer hours (even if it means forgoing a promotion). Or if you have gotten bored with an industry or a company – you may need to make a major career change.

It's best to take some vacation time (1-2 weeks), and do some thinking to sort out what you really want to do next. Often the next thing to do will be easier to see if you are not in the day-to-day grind of the job. Try to do a mental review of how things were going during the past year, and think about what you want to do differently next year.

You might also want to talk to a mentor or to some of your professional network contacts. Make sure you include your immediate family in some of your planning. Then initiate an action plan to improve your situation and to make the necessary changes.

Some Job Satisfaction Tips

It took me a while, but eventually I realized that often I could re-write my job description at most companies. Not necessarily re-written on paper, but if I found an important ISE-type activity that wasn't being done, and just started doing it – eventually management was happy to have that be a major part of my job duties. Industrial & System Engineers are good at seeing the "big picture" and often can see improvements that will help the product or the customer. Rather than ask for permission or get into an argument with management – I would just start doing some of those important activities. Usually if there was any explanation required later, it was always easier once I had accomplished some results.

Another thing I learned eventually, is if you are having trouble with your immediate boss or supervisor, go out of your way to do something important that their boss wants done. If senior management is happy with your results, your immediate boss will often leave you alone (and may even treat you better). Good, ongoing communication with senior management can really help; about once a month I would give an update on some major activity I was doing (or the Team I was leading was doing), and that helped put the activity in perspective. For instance, one time I let a Senior Manager know that one of the projects we had completed, saved as much money for the company as his entire annual budget (people and support services) – he became my champion after that brief conversation and I never had any more trouble with my immediate manager.

Chapter 7 – Student Projects

Importance of the Senior Design Project

The Senior Design Project and your Internships are representative of the type of Industrial & Systems Engineering (ISE) work you will probably do full-time, upon graduation. As soon as you have a title for your Senior Design Project, you should list it on your Resume, so you can easily talk about it during a Job Interview. You should also prepare a short (1-2 page) summary of the project as soon as you can, in order to take it with you to show during Job Interviews. Initially, you may only have your Project Plan, but later you will have a Summary of the entire Project.

Pay extra attention during the Senior Design Project classes and during your entire project. More than just another class grade, the Senior Design Project will give you some useful Project Management, Project Scheduling, Final Report Writing, and Team Dynamics skills; and it will bring together many of the skills that you have been learning in your earlier ISE-related courses.

During a Job Interview, a Hiring Manager may be interested in asking you questions about your Senior Design Project, since this could be a strong indicator of how you would handle a similar project for their company. In your answers to their questions, they can also get an indication of your skills when working with others on small Teams, and how you develop an Objective & Approach for a more open-ended, real-world problem (as opposed to a classroom exercise that may be more about testing specific course knowledge).

Most working Industrial & Systems Engineers (ISEs) enjoy doing Projects and being a Project Manager. The variety of projects, the Team dynamics and the useful methods of resolving many different types of Industry problems, makes the work challenging and interesting. It is one of the main reasons that ISEs usually love their jobs and their careers.

Student Project Summary - format

It helps to prepare some written Summary Reports (1-2 pages each) of some of your Student Projects, to bring to a Job Interview to show to a Hiring Manager, along with your separate Resume. Make sure these Student Projects are mentioned briefly on your Resume, as well.

You can also use this format to prepare a short summary of your Senior Design Project, since the Executive Summary in the Final Report may not be a stand-alone document.

Shown below is a format of how to write up some of your Student Projects or Internship projects.

_____ _____

Page 1 of x
(*if longer than 1 page*)

Your Name

Title of the Project: _____

Type of Project: _____
[*Student Class Project for a specific class, or done as an Internship, or part of your regular Work History*.]

Size of the Study Team: _____
[*Was this a single person study, or multi-person Team, and also if a cross-functional Team*.]

Name of the Company/Customer/Owner: _____
[*This only applies to a real company project, not a theoretical project with no customer*.]

Objectives of the Project: _____
(This may be 1-2 paragraphs in length.)
[*This is the stated Objective(s) that this project is supposed to resolve when completed*.]

Description of the product, or this facility: _____
(This may be several sentences or paragraphs in length. You might want to attach a picture of the products, or a link to their product or services website.)
[*This will help put the entire project in perspective for a hiring manager reading it*.]

Methodology Used: _____
(This may be a bullet list of the major steps taken during the project; in the order they were done.)
[*This is not intended to be as detailed as the Project Schedule or Work Breakdown Structure, but it should reflect several of the major activities*.)

Data Used and Detailed Findings: _____
(A general description or some examples of the data and the findings.)
[*Some of the main deliverables coming out of the project*.]

Alternatives Considered: _____
(A brief description of the alternatives, if applicable.)
[*List and describe the alternative options considered*.]

Comparison Methods Utilized: _____
(This may be a detailed portion of the Methodology, that describes if a Cost Comparison or a Simulation was used to pick the best alternative.)
[*Briefly describe the comparison methods used to pick the Final Recommendations*.]

Final Recommendations or Results: _____
(This may be several items or a list of final results & recommendations.)
[*A summary of the brief results from the project, or the items Implemented, or the next steps planned*.]

Chapter 8 – Project Management

Project Management Tips for Industrial Engineering Projects

Project Profile, Deliverables, and Scope

- Developing a good Project Profile (Objective, Scope, Statement of Work, & Deliverables) is an important part of setting up any new project.
- Do not rush defining the Project's Objective and really understanding the nature of the main work to be accomplished – even checking on what type of project is expected (whether it is mainly a defect reduction, or a recovery plan, or a facility plan, etc. – since the approach will vary for each main type of Industrial Engineering project).
- Do not overstate what should be expected as Deliverables from the Project. It is better to surprise the customer and provide more than the originally stated Deliverables – rather than promise more Deliverables than is possible with the time available and disappoint the customer.
- Continually compare new action items against the original Scope of the project (Scope is primarily the project's boundaries of what is to be included vs. what is not to be included) – to be aware of any increase in the project's Scope (whether planned or unplanned). "Scope creep" is when the Scope increases incrementally (or in great leaps) – without it being planned or sometimes properly recognized.
- Make sure the original Objective and Deliverables will not be significantly impacted by expanding the Scope.
- Consider setting up a separate project Plan to manage significant Scope increases (after the impact is understood and the Scope changes have been agreed to by the internal customer and the project team).

Project Schedule

- Develop a realistic project Statement of Work (the main planned activities or tasks) which will drive out the actual Project Schedule.
- Be careful regarding how much simultaneous work you show in your Project Schedule – particularly if a small group (or a single person) – are really doing much of a task – or they have limited time available to work on the project.
- Show the entire project in the MS Project schedule (including any previous steps done prior to building the initial MS Project schedule file), with elapsed days estimates and responsible persons or groups (if known, when the initial schedule is being developed).
- Develop a good detailed outline (sometimes best to use MS Word initially) of planned tasks.
- Write out the tier 2 or 3 level tasks - to understand which are higher level (Tier 1) activities, or middle (Tier 2) activities, or lower (Tier 3) activities.
- Show key "links" of related or impacted tasks on the schedule – so the project tasks are connected (not just a list of tasks). These "links" should also relate to key deliverables that need to be produced.

Project Phases

- On some larger projects, it may be necessary to break the project into several Phases that can be worked sequentially as smaller projects.
- Due to delays in the customer's decision making, it may be necessary to break out portions of the project for completion later.
- Implementation and significant follow-up activity is commonly viewed as a separate Phase of the project and may need to be tracked separately (or may require a new Project Profile and Schedule to be prepared).

Resource Partnerships

- Look for ways of partnering with other groups or individuals on projects.
- Look for Subject Matter Experts (SMEs) for technical areas related to a project and include them in the project planning, benchmarking, and solutions development.
- Use some individuals with strengths you may not have, and outside your group – to help out on items that they may have better knowledge on. For example: a Research & Development (R&D) group may have some "technical experts" available – and may even be able to purchase some inexpensive items for testing.
- Coordinate regularly with all the Resource Partners on a project.

Project Manager's Duties

- Make the project management duties relatively quick & concise, on smaller projects.
- Don't ignore the project management duties, since it is difficult to correct a project that gets in trouble.
- Separate out when you are working action items on a project and when you are doing the project management duties.

Project Communication

- Utilize good, ongoing communication with all project members and with anyone affected by the project.
- Use a variety of medium (for example: meetings, e-mail, digital pictures, file servers, white board discussions, Web Ex, etc.) – to stay in communication with your immediate team and others that are providing you information.
- Ask for reviews during the project – don't wait for everyone to chase you down to find out how it is going. Periodically plan to show your documented progress so any advice or ideas on implementation can be incorporated as you go.
- Communication with your customer is very important – the more regular you can make it, the less "forced" the final presentation will seem (and the less time it will take to prepare a summary update). Face-to-face meetings are best, but e-mails with Word status reports are the next best.

Project Documentation

- One common project weakness is not doing enough ongoing documentation.
- Each major section or phase of a project should be generating typed documentation (for example: summary notes, flow diagrams, excel files, possible solutions, conclusions, or PowerPoint presentations, etc.).
- Moving on too quickly to the next project task – before completing the existing set of related tasks is a common mistake.
- It might help if you compare working on a project to shooting a movie film. Each section of your project plan is like shooting a scene in a movie. The movie Director must make sure they are completely done with the scene and have good "film in the can" (enough good film footage ready for film editing in the storage canister, and it will not be necessary to return to shoot anything in that scene or that location). On a project, make sure each section of the project plan drives out some results that are typed up and can be shared, so that part of the project plan is completed (the "film is in the can").
- Show the results from each major "scene of the movie" or each separate portion of the project plan – to get feedback and make sure you are finished with a section before moving on.
- Regularly look over your project documentation and see what it is telling you – make adjustments to your project plan – if the data requires it. Use this regular review to make sure you are staying within the project Scope, and it can also help you identify any resource help that may be required.
- Utilize File Servers and other methods for safely sharing files with your immediate team. Regularly back these files up on your laptop.

Data Analysis & Measurement

- Understand what data is needed, then develop your collection plan (for both historical & new data).
- Use data to verify and help investigate what you are hearing or observing.
- Utilize good statistical analysis skills, and check all calculations.
- Link the data to actual observations, whenever possible.
- Set up lab tests and mathematical models to check data results.
- See if the micro data relates to macro conditions (Does it seem realistic and feasible?).
- Constantly do "reality checks" with your subject matter experts.

Benchmarking

- Do the main benchmarking only after you fully understand your current process – otherwise you may have wasted a good benchmarking learning opportunity. And if done too late – the benchmarking can't properly influence the solution development phase of a project.
- Utilize "white board" discussions (that are later typed up) to reach consensus with your team members following benchmarking tours.
- Try to include your customer on some of the benchmarking tours.

Project Solutions & Evaluations

- Write down alternative solutions throughout the project, and plan to investigate them thoroughly.
- Be creative and comprehensive when developing initial solutions ideas.
- Do additional benchmarking, if needed.
- Develop an evaluation approach (the criteria you want to use to determine which solutions are best).
- Rank the most likely solutions (the ranking may be based on cost, schedule, or risk factors).
- Bring the customer in on the selection process and to offer real applications information (a "reality check").

Conclusions & Recommendations

- Research & investigate the most likely conclusions with the entire team.
- Review the possible conclusions ongoing with your customer (or their representative).
- Take the best of the ideas and form a coherent recommendation (or recommendations).
- Recommendations may need to be assessed by cost and risk when presented.
- Recommendations may need to be time phased.

Project Presentations & Reports

- All final presentations (and final reports) should be reviewed, prior to being given to the customer.
- At the conclusion of the assignment, make sure all files are organized and stored on the file server and all hard copies are organized and stored properly (in labeled file folders or binders).

Project Management Training

- Consider taking some Project Management classes or Project Manager Certification series.
- Read some good books on Project Management.
- The Project Management Institute (PMI) has book resources, and training - leading to certification, and also local PMI chapters have speakers & tours.
- Go back and review your own past Projects, and see if there are any "lessons learned".
- If you did a Senior Design Project in college – you may want to go back and review what you learned from that class, and look over your final report and presentation.

Main Project Sequence

Listed below are the main steps (shown in order) for starting and completing an Industrial Engineering project:

- Project request received
- Discuss project's Objective with Customer
- Tour the problem area (if possible)
- Meet with people close to the problem
- Do some preliminary analysis of the problem
- Form a Project Team (if needed)
- Develop a Project Plan (Objective, Scope, Approach, & planned Deliverables)
- Develop a Project Schedule
- Review Plan & Schedule with Customer, and discuss frequency of project updates (reports & other communication)
- Analyze existing process and existing data
- Obtain and analyze new data (if needed)
- Document Findings & Observations
- Benchmark similar processes (if applicable)
- Develop Solutions & check against actual conditions
- Evaluate & Test Solutions
- Document Conclusions & Recommendations
- Review Findings & Recommendations with the Customer
- Develop an Implementation Plan (if required)
- Follow-up with the Customer

Initial Problem Definition

The Initial Problem Definition at the beginning of a new Industrial Engineering project is very important. Don't just focus on recent complaints that may only be anecdotal information, when examining the main problem at the start of a new Root Cause Analysis project. And don't get distracted by the initial confusion that often is encountered when first seeing an activity or operation that is encountering problems.

It often helps to utilize some simple activities like building a Cause & Effect diagram or a 5-Whys chart, when starting to develop the initial problem definition in order to state the Project's Objective. It also helps to utilize some Systems Thinking in order to view the "big picture" so you are not merely just addressing some of the symptoms.

This is a good time to utilize your Informational Interviewing skills and talk to several people directly involved with the processes being examined. Try to get an understanding of the issues involved, and look for relevant data that helps clarify what is being learned in the Informational Interviews, with useful supporting data.

Build a good Project Plan and determine if you also need to create a Project Team (based on the size and Scope of the Project). Discuss the initial observations and Project Plan with the internal Customer, before proceeding too far.

Don't rush the Initial Problem Definition, since this will set the stage for how the entire Project is structured and organized.

Types of ISE Projects

The 7 main types of Industry-focused, ISE projects:

- Operations Review
- Root Cause Analysis
- Out of Sequence Work (Travelers)
- Material Handling Analysis
- Production Parts Shortages
- Facility Layouts
- Ergo/Safety Mitigations
  and various other types (*not shown*)

Operations Review

Definition: *"An initial review or survey of the existing operations components or manufacturing activities of a product, department, plant, or division."*

- An Operations Review may be the first step in performing an overall operations improvement, or it can also be a stand-alone assessment.
- A Lean Manufacturing Assessment (LMA) is a special type of Operations Review

- An Operations Review will usually start with some **Tours** & **Direct Observations** (with some **Digital Pictures**), that may also include some **Time Studies**. It also will rely on several focused **Informational Interviews**. Some **Data Analysis** will be needed to document the current conditions that are measurable, and maybe a **Value Stream Map**.
- **Some Benchmarking** or at least similar Operations comparison, may be required – as part of the Operations Review.
- If an LMA, it may include a **5S score chart**, and **Spaghetti chart.**
- The report may include a **Comparison** (of past performance vs. current performance), and maybe a **Gap-to-Goal chart**. If it identified several items to work on, a **FMEA** ranking of the choices may be helpful. Often a list of **Plus & Minus** items will be part of the **Assessment Findings/Conclusions**.

Root Cause Analysis

Definition: *"An analysis of the underlying reasons for a single re-occurring problem (or several problems), that will result in solutions that can be tested, prior to implementation."*

- A Defect Reduction (or elimination) is a common Root Cause Analysis problem.

- The initial activity will usually include some **Tours** of the areas affected, including **Direct Observations**, and some **Digital Pictures**.
- Then some **Informational Interviews** with the process owners, and several types of **Data Analysis**, that may include **Pareto Charts**, and a **Defect Locator Chart** (if it's a defect reduction problem).

- This may result in the construction of a **Cause/Effect Diagram** and the creation of a **5-Whys Analysis** chart. Plus any **Test/Trials** run or any **Benchmarking** (if done).
- The report may include the **Findings & Conclusions**, any **Comparisons Chart,** and results from any Tests/Trials on the possible solutions, and any Benchmarking (if done). Then the **Results Implemented**.
- A full **Follow-up** and **Additional Implementation** may occur later, if a more complex solution is involved.

Out of Sequence Work (Travelers)

Definition: *"An analysis of the reasons why some scheduled work is regularly being performed late (out-of-position). Once the underlying reasons have been identified, it will require solutions to be implemented, and monitored (to ensure the condition does not re-occur)."*

- Out of Sequence Work is often referred to as "Travelers".
- If the Traveler condition cannot be eliminated, a work-around may be required, such as the implementation of a Traveler cart for special parts staging & a Traveler crew trained to work these jobs out-of-position.

- The initial activity will usually include a **Tour** of all the surrounding work, some **Direct Observations** of the Out of Sequence Work, some **Informational Interviews**, and some **Data Analysis**.
- Then the use of a **Precedence Diagram** and **Process Flow Chart**, along with some **Time Studies** will help identify the actual sequence of all the jobs.
- The use of a **5-Whys diagram** and a **Cause/Effect diagram** may help identify the underlying conditions, and some **Benchmarking** may help identify solutions.
- The report will include **Findings & Recommendations**, and if a **Work-Around** is Needed.

Material Handling Analysis

Definition: *"An analysis of various material handling activities performed within a facility (or between facilities), to look for process improvements and overall efficiencies."*

- It may include a review of the type of material handling methods and any interim staging procedures, as well as point-of-use considerations.

- The initial activity will usually involve **Tours**, some **Direct Observations**, several detailed **Process & Product Flows** which may be overlaid on **Facility Layout Drawings**. It also will usually involve some **Informational Interviews** of the material handlers, and **Point-of-Use** groups, with a focus towards creating **Just-In-Time** deliveries.
- Also some **Data Analysis** of the storage and staging, and any re-occurring delays, may be included in the analysis.
- Some **Benchmarking** of similar material handling activities may help generate solutions.

- If a complex material handling issue, it might be helpful to prepare a **Cause/Effect Diagram**, or a **5-Whys Diagram**.
- The report may include the **Findings & Conclusions**, and a **Corrective Action Plan.**

Production Parts Shortages

Definition: *"An analysis of the underlying reasons for on-going parts shortages that are critical to production."*

- A Production Parts Shortage may involve a review of Staging, Storage & Inventory procedures, and even Supplier related issues.

- The initial activity will usually involve **Direct Observations**, and **Informational Interviews** with the process owners & parts support groups, and also some **Data Analysis** of the parts shortages, to see how often it is occurring. This might include **Analysis** of **Staging**, **Storage** & **Inventory** procedures, and use of a **Process Flow chart**.
- If a complex issue, it might be helpful to prepare a **Cause/Effect Diagram**, or a **5-Whys Diagram**.
- If the condition is outside the immediate operations, it may be due to a Supplier condition. **Meetings with groups working with Suppliers** may help resolve the problem, or some **Supplier Visits** may be necessary.
- The report may include the **Findings & Conclusions**, and a **Corrective Action Plan.**

Facility Layouts

Definition: *"A layout of a new facility, or a revision to an existing facility, that utilizes an optimized flow for the product or activity involved."*

- The layouts will usually conform to the drawing system being utilized by the company. AutoCAD is the most common Facility Drawing system in use.

- The initial activity may be to first determine what is being added to or changed of an existing facility. This may involve some **Tours, Direct Observations**, and **Informational Interviews** of the process owner.
- Copies of **existing Layout Drawings** will be needed to review and verify the current layout.
- **New Measurements** will be taken of the existing area, to verify the layout condition and to note any stationary or fixed objects (which will not move).
- Then a variety of analysis tools & forms may be utilized to optimize the new layout: **From/To chart**, **Activity Relationship chart**, **Space Utilization chart**, and **Process Flow chart**.
- If there are multiple **Working Layout** alternatives a **Comparison Chart** may be useful, or even a **Simulation** performed, to determine the best layout (based on key factors such as cost, process time, staffing needs, etc.).
- The report will include the **Findings & Conclusions** along with the **New Facility Layout Drawings**.

Ergo/Safety Mitigations

Definition: *"An analysis of specific ergonomic risks or safety conditions, and a plan to mitigate or eliminate the risk or condition."*

- Usually this will be done in conformance with an existing site-wide ergo or safety program being utilized by the company.

- The initial activity will usually involve a **Tour**, and **Direct Observations** of the job, task, or area. Also I**nformational Interviews** of the process owner.
- A **Risk Assessment** is usually performed, using published Ergonomic data or Safety criteria, or the services of a trained Ergonomist or Safety Consultant. This will usually include **Some Measurements** being taken.
- Some **Benchmarking** of similar conditions and **Research** of useful **Mitigations** will usually be helpful, along with some **Test Trials**.
- The report may include the **Findings & Conclusions**, and any **Suggested Mitigations** to reduce or eliminate the ergo or safety conditions.
- The **Implementation** will put in place the mitigation and then **Monitor** the **Results** to see if the risk or condition has been eliminated or reduced.

In Summary

- Understand the different types of Industrial Engineering Projects, and the different methodologies used to conduct each type of project.
- Spend time at the beginning of each new project, to develop a good project plan, in order to have a successful project.
- Review your Objective & planned Methodology with your Internal Customer, before starting any detailed project activities.
- Focus considerable effort on the Outcomes & Results for each type of project.

Early Warning Signs & Corrective Actions on Industrial Engineering Projects

Be aware of the early warning signs on an Industrial Engineering Project and take the appropriate corrective actions as soon as possible. Monitor the outputs for each stage.

Stage 1 – Start-up Activities

Main Outputs: *Project Objective, Scope & Schedule, and possible Feasibility Examination*

Objective is not clear.
Stop and write down a clear, concise Objective in a few sentences, and review it with the project's customer.

Customer is not "onboard" yet.
Set up a discussion meeting with the project customer before continuing.

Schedule is too tight.
Reduce Scope, or look for more Resources, or doing the project work in Phases (if OK with customer).

Started work without a Plan or Schedule and now causing some confusion.
Limit the initial work until an overall Project Plan is developed. Make a Project Schedule as soon as possible, and continue to update it throughout the entire project.

Project is very large and may be beyond the capability of the current Team.
Develop a Project Plan and discuss initial concerns with customer; may need to limit project Scope, or form a larger Team, or break project into Phases, in order to accomplish the bigger project.

Stage 2 – Process Documentation & Measurement

Main Outputs: *Historical & any New Data, Observations, Flow Diagrams, Cause/Effect, & Benchmarking*

Having difficulty getting access to the people that own the area under investigation.
Discuss access with project customer, may need them to assign a focal to the project or introduce the Team to some of their people (explaining the assignment given to the Team).

Hard to view the entire process at once, due to multi-shift operation, etc.
Break the process up into viewable sections, but make sure all portions are covered.

Current available data is not conclusive or not specific enough.
Determine what new data is required and set up a data collection plan.

New data being collected is not helping the project.
Review the original Objective & planned Deliverables, and see what data needs to be collected to support the project; may have started data collection before identifying project's data needs.

Stage 3 - Develop & Evaluate Solutions
Main Outputs: *Preliminary Solutions, Evaluation of Findings*

Having difficulty coming up with any viable Solutions.
May need to review the results from earlier stages and look for partial Solutions; may also need to do some benchmarking of other similar operations to see some possible Solutions already being used elsewhere.

All Solutions look good, not sure how to compare them or choose one.
Discuss the Solutions with your project customer (or their assigned focal) to see which of the Solutions might work best for them; may also need to have a ranked criteria for evaluating, or even some limited testing to pick the best Solution for this application.

Want to do some limited testing, but not sure how to proceed.
Discuss the Solutions you want to test, with the project customer, and get their help with setting up a simple, but fair, test of the Solutions.

Stage 4 - Conclusions & Recommendations
Main Outputs: *Final Report & Final Presentation*

Have lots of hand-written notes and data, but difficult to come up with any Conclusions or Recommendations.
Need to go back as a Team and type up all Findings and see what the data says; may need to have a Team "white board" discussion session to draw out the Team's knowledge - and if necessary - to keep doing benchmarking or other Solution generating activities.

Have a lot of Findings & Conclusions, but not many Recommendations.
May need to organize the Findings & Conclusions into a preliminary presentation and discuss with the project customer; this may generate some Recommendations, or the need to continue developing more viable Solutions.

Final Presentation or Final Report is too long, and not easy to follow.
Develop a good working outline, before starting to write the Final Report, or build the Final Presentation. Practice and get some feedback on the presentation to make sure the Objective and all Deliverables are met.

Stage 5 - Implementation or Follow-up

Main Outputs: *Implementation Plan (if required)*

Not sure if any Implementation would happen, so no Implementation Plan was prepared.

Discuss need for developing an Implementation Plan later, with project customer (based on whether initial Recommendations are accepted).

Trying to use the Final Presentation or Final Report as an Implementation Plan, and running into trouble.

May need to stop and develop a detailed Implementation Plan and review this with the original project customer – based on the Findings, Conclusions & Recommendations of the earlier project. May also have to discuss the earlier Presentation/Report with the original authors (for clarification).

Not sure if any Follow-up is required, after the Final Presentation has been given.

Discuss this with the original project customer - or if possible, check the area for any problems they may be experiencing with the original Recommendations.

Summary Comments

- ✓ Be aware of the Early Warning Signs at each Stage of an Industrial Engineering Project.
- ✓ Take the appropriate Corrective Action for each Early Warning Sign.
- ✓ Monitor the Outputs for each Stage of a Project.
- ✓ Utilize good Project Management techniques throughout the Project.

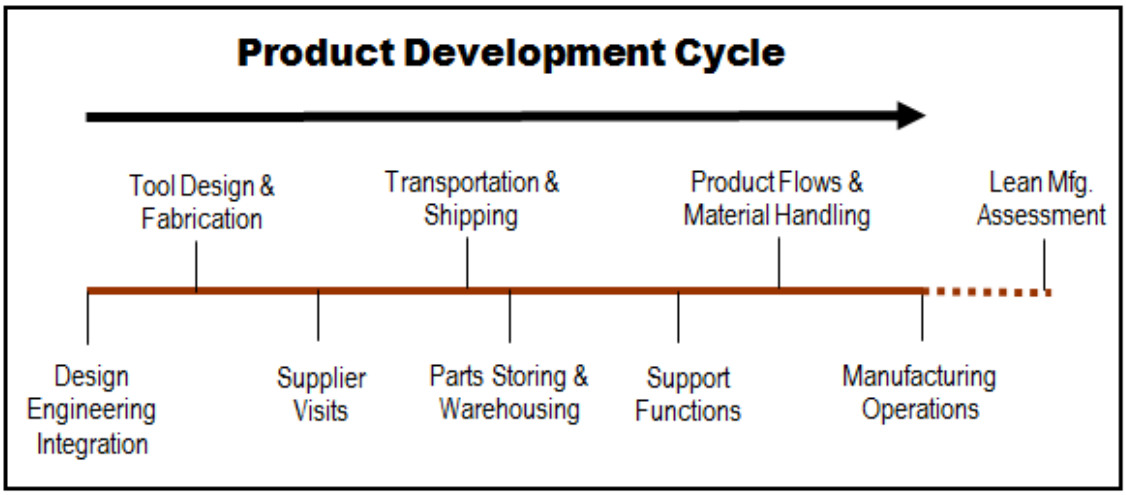
Working on Projects "Upstream" to the Assembly Process

Often there are compelling reasons for working on Manufacturing projects "Upstream" to the Assembly Process. This might include: Design Engineering, Tool Design & Fabrication, Supplier Visits, Transportation & Shipping, Parts Storing & Warehousing, Support Functions, and Material Handling. See the diagram of the "*Product Development Cycle*" (*shown below*).

To significantly influence the major impacts, the "upstream" activities can often become the primary focus. By the time some of these "upstream" issues have come all the way "downstream" to Manufacturing Operations (including Final Assembly) it may be too late to resolve the earlier Root Causes.

It often helps to include the entire Product Development Cycle in the early analysis, before just focusing on the problems being observed in Manufacturing Operations. There are significant dividends to including the entire Product Development Cycle in any major analysis of a Manufacturing activity.

Working with the different groups and individuals that own these "upstream" operations, may require some broadening of your Project Team and some increased collaborations, but it is well worth the extra effort.



Visual Tracking on Projects

In order to bring some logic and order to ongoing Project Status meetings with other Team members, it helps to utilize some type of "Visual Tracking". This might involve a simple Excel spread sheet that allows you to list out blocks of activities (or departments, or locations), and then keep track of planned critical tasks (when they are planned to be completed, current % completion, who or which group is assigned to each task, and maybe how the tasks tie-in to the overall project).

It is important to keep the Visual Tracking tool as simple as possible. Often a complex project does not require a complex tracking tool. Actual results are a good criteria to use when measuring the effectiveness of a Visual Tracking form.

Sometimes this Team status on critical tasks and activities can be updated in real-time during the Team meetings, or soon afterwards from notes taken during the Status Briefings. You can use a Visual Tracking Excel form in combination with ongoing status to the Project Schedule.

Visual Tracking on Projects

Item #	Task Name	Sub-task name	% Complete	Group/Person Assigned	ECD	Actual Completion Date	Comments on Status
1	**Main Task #1**	**Task #1 summary**					
2		Task 1 - item 1					
3		Task 1 - item 2					
4		Task 1 - item 3					
5	**Main Task #2**	**Task #2 summary**					
6		Task 2 - item 1					
7		Task 2 - item 2					
8	**Main Task #3**	**Task #3 summary**					
9		Task 3 - item 1					
10		Task 3 - item 2					
11	**Main Task #4**	**Task #4 summary**					
12		Task 4 - item 1					
13		Task 4 - item 2					
14		Task 4 - item 3					

Preparing a Contacts List

Often on Projects, it is helpful to prepare a Contacts List (either as a Word file or Excel file) in order to keep track of all of the people involved: either the active Team members or others that have useful information to the project.

It helps to build the Contacts List at the beginning of a new Project, when names are first being learned. It also helps to have a separate Contacts List for each active project.

The list should include the name, email, phone number, and the position or role on the Project, or the area of support they represent to the project. It helps to name the file based on the name of the Project, so each Contact List can be easily located.

Sample headings for a Contacts List:

Project One – Contacts List

	name	**email**	**phone #**	**position/role**
1.	Bob Smith	xxxxx@xxx	(xxx) xxx-xxxx	my Supervisor
2.	Jill Jones	xxxxx@xxx	(xxx) xxx-xxxx	my Lead
3.	Sam Moore	xxxxx@xxx	(xxx) xxx-xxxx	Quality Control supv.
4.	Bill Evans	xxxxx@xxx	(xxx) xxx-xxxx	Team member
	more contacts…			

Project Coaching

Project Coaches

- Project Coaches are senior Industrial Engineers with extensive knowledge from past projects.
- They enjoy working with younger Industrial Engineers.
- They have strong communication & listening skills.
- They have strong Project Management skills.
- They have excellent Operations knowledge.
- They know many useful Contacts.
- They utilize basic Project Management techniques to monitor the Project Plans & Schedules, developed by the newer IEs themselves.
- Project Coaches are able to advise multiple projects in various stages of completion.
- They make themselves available to all the newer engineers.
- They can adapt to the needs of the individuals being coached.
- Project Coaches are comfortable with helping others complete projects, while they often remain "invisible" to the internal customer.
- Project Coaches take newer IEs out into the factory to meet people and understand Production processes: production procedures, support groups, & various data sources.
- They may review presentations prior to being shown to the Project's customer: including the outline & format and likely questions that may come up.

Project Review Meetings

- Check status to the original Project Plan/Profile
  - Is it still valid for the project?
  - Or has the Scope or planned Deliverables changed?
- List names of who is currently working on the project
  - Rough amount of time - or % of their time - they have been working on the project recently
  - What is their main role on the project, currently
- Check status to the most recent Project Schedule
  - MS Project or whatever Work Breakdown Structure or Milestone Chart they are using
- Check current % complete for the major Project Stages
  - For each of the main Project Stages: Start-up, Documentation & Measurement, Solutions, Conclusions, Implementation or Follow-up
- Review some of the results from any Project Stage listed as more than 80% complete
  - Show some of the Outputs from the project's Stages, as is
  - Do not prepare anything new for this Review Meeting
- Discuss the next planned activities
  - What is planned for the next month?
  - Who on the Project Team will be doing what?
- Discuss any project concerns
  - Resource issues, cooperation issues, etc.

- Agree on the timing for the next Coaching Review Meeting
  - Suggested Coaching Review is when the project is starting a new major stage, or a stage is now listed as 80% complete
  - But no more than 1 month away regardless of % complete

Summary

- Project Coaches can be very helpful if they are available, willing, & adaptable.
- They utilize and teach basic Project Management techniques as part of their Coaching.
- They utilize the Project's Schedule (built by the newer IEs themselves), also the planned Deliverables from each Stage of a Project, during periodic Coaching Reviews.
- They try not to influence the project's Conclusions & Recommendations.

Brief bio of the author

Steve Snelling is a retired, Industrial Engineer - Special Projects Manager, formerly with the Boeing Company. His 40 years of Project Management experience includes: 23 years of Process Improvement projects & Internal Consulting work at the Boeing Co.; 12 years of Management Consulting work with Ernst & Young, and A.T. Kearney; and 5 years of Area Industrial Engineering work with Reynolds Aluminum Co. He has worked on Engineering & Consulting projects in 25 states & Canada.

He is a member of the Institute of Industrial & Systems Engineers (IISE), Industry Advisory Board (IAB), an IISE Fellow, and Past President of the Seattle IISE Chapter.

He has a B.S. Industrial Engineering degree from Virginia Tech, and additional training in Project Management, Operations Analysis, Lean Manufacturing, and Engineering Contracts.

He has been involved as a Mentor to students & young professionals for many years. He also enjoys visiting U.S. National Parks and staying at some of the Parks' historic timber lodges.