How To Succeed in Engineering
by trying really, really hard!

Bob Colwell
UC Irvine
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No One Formula

• Like best engineering problems, there’s no single algorithm to follow
  – But there are “Best Practices”
  – There are Things To Avoid
    And fun observations too...you judge utility

• Don’t make all the mistakes yourself,
  – Learning from others’ errors is much better 😊
How do YOU Define Success?

1. Do you want to get really rich?
2. Do you just want a job with decent pay?
3. Do you want to change the world?

**Or did your parents put you up to this?**

→ You may go 10-20 years without answering these questions, but eventually you have to

→ Set yourself up for success according to your own metrics, from the start

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Getting Started In Engineering

• What are you passionate about? **Do that.**
  – *Mere competence will never trump real passion*
  – Find your point of highest leverage
    • Match your skills, interest to what world wants & needs

• Your answers will change with time
  – Let career evolve
  – You can find career value in any job
    • Just do outstanding work no matter the task
    • Seem glib? How many people do you know who do it?
    • It’s mostly a **choice you make**, not innate talent or IQ
Which Job to Take?

• **Look 20 years out & place your career as a bet**
  – Which technologies are most powerful/promising?
    • I bet on computers in mid-1970’s
    • 2007 equiv.: bio, energy, environment, military, comm, health…?
  – Which line up with your personal belief system?
    • Defense, medicine, consumer, corporate, academia

• **Of surviving job prospects, which have best teams?**
  – You will learn more from co-workers than anywhere else
  – Don’t worry about being compared (unfavorably) to them
    • They started out just like you

• **Manage your career, but don’t micro-manage it**
  – Do a great job and most of your career takes care of itself
Startups vs. Big Corporations

• Good idea to do both over course of your career
• Startups are easier when you’re young
  – More time, more energy, less to lose
  – Startups can sometimes change world explosively
    • But most fail
  – Less overall stability
• Big companies have more opportunities to change world incrementally
  – Remember that those increments can add up over time
  – They set standards
  – More stable, but sometimes that also means stultifying

• Both can be exhilarating, and both can be very frustrating
Getting Hired: Where?

• Where to work
  – Weight these factors heavily:
    1. Do you believe in the mission
    2. How outstanding is the team
    3. How well-run is the company
    4. Would this position leverage your strengths yet demand intellectual growth
    5. Geography, local culture, place-to-raise-kids, spouse’s enthusiasm, add’l educational opportunities
  
  – *Then* consider salary, bonuses, stock, benefits

Beware “which group likes me best”

My 1st corp job: 6 months of hell. Couldn’t eat, couldn’t sleep, hated work...don’t just “get in door”...YOU decide which match is best
Getting Hired: Practicalities

• Standard advice abounds
  – Dress up, be on time...
  – Check books & websites
  – Faculty recommendations DO matter
  – Don’t fail the drug test
  – Try to answer all questions

• Beware “good at everything”
  – Your new employer can’t turn that into profits
  – New hiring group has specific needs

• Do your homework
  – Prepare intelligent questions
  – Know basics about company
Your First Corporate Job

• No matter what it is, become best in world at it
  – Don’t internalize or contribute to pecking orders
  – Plan on 2-3 years to get really comfortable & productive

• Work as hard as you can
  – You are setting your own reputation & trajectory
  – Only High-Flyers have choice of options for next project
  – Find mentors & role models (don’t struggle in silence)

• Don’t Let Your Team Down
  – Take your turn on the critical path but GET OFF IT fast!
  – Know when to stand your ground vs which battles aren’t worth fighting

• Settle for nothing less than outstanding work. Every time.
  – Raises average of whole team
Working Engineer 1

• You-Centered
  – Know Your Career Path
    • Tech vs management
      – 1st line supervision is great, amplifies your IQ
      – Above that is management
    • Try to make career decisions according to your long-term strategy, not short-term exigencies
    • Identify the gurus and befriend them
    • Technology changes rapidly...avoid obsolescence

• Company-Centered
  – What is the mission?
    • Align your career to what company cares about
  – Watch for the cracks in projects & between them
    • Make the right thing happen, keep mgt apprised
Working Engineer 2

• Resources
  – Your alma mater (donate, stay connected)
  – IEEE/ACM: participate & network
    Make yourself useful to others & notice who has been useful to you (and reward them)
  – Books (read outside your own specialty too)

• Balancing Home and Work
  – Design projects come and go, spouse & family are forever
    • Don’t confuse those priorities!
    • You need your spouse’s support to do your best engineering
      – Keep him or her in the loop on overtime, travel, office goings-on
    • Apologize often for your impositions
      – Send flowers, emails, phone calls

And resign yourself to idea that when everybody’s equally unhappy with you, sometimes that’s the best you can do. 😞
Working Engineer 3

• Communications = Influence = Promotions
  – Writing
  – Presentations (not just data)

• Corporate/team culture
  – Overpromising vs overdelivering
  – P6 design humility vs hubris
  – Team play vs getting what’s yours
  – “do your boss’s job” (within limits)
  – Detecting/avoiding burnout
  – Use existing solutions where possible, innovate where necessary

• Legal Stuff
  – Take patents, IP very seriously; wording matters
  – Purge old emails; too easily misconstrued or purposely twisted in court
Getting Ahead

• The **Prime Directive**: do outstanding work and trust that rewards and accolades will follow
  – How? *Work with people who do outstanding work*

• Be visible outside your own company
  – Good for company, good for industry, good for you
  – Write papers, attend conferences, do peer reviews
  – Be active in IEEE/ACM (more on this shortly)
  – Careful with self-promotion, remember Buzz Aldrin
You will eventually find yourself in a leadership position

- You’ll be asked, or
- you’ll seek one out when you realize you can do a better job than the people making decisions above you

Leadership

- If you’re already on top, be lavish with credit
- Take team where they need to go, not where they want to go
- Know who’s good at what, and balance team accordingly
- Know your own strengths and weaknesses
  - Leverage strengths, fill in weaknesses with other people
  - Only invoke ego at end, when product is great
- It’s all about influence, deftly wielded
  - Positional authority alone won’t get world-class results
Leadership 2

• Leaders are also managers
  – Responsibility: convey management messages to troops
  – Responsibility: get your troops what they need & convey their messages to mgt
    • If in conflict, do what’s right for the company

• Don’t be threatened by stellar performers below you
  – A’s hire A’s; B’s hire C’s
    • If B’s get away with this, whole organization declines
  – Remember the prime directive*
  – Develop these people, get them what they need, shield them from corp. nonsense; these are the folks who will make your enterprise succeed

• **IF YOU NEVER FAIL, YOU AREN’T TRYING HARD ENOUGH**
  – Not all failures equally forgivable

*Forgot already? “Do Outstanding work.”
Technical Leadership/Management

• This one may surprise you...

You Must Exercise!

– Bill Daniels, behavioral psychologist:
  • After age 40, if you don’t exercise to combat effects of stress, aging, diet, and a sedentary occupation, you will have a heart attack by 50

I’m not sure I ever got better advice.
Education

• BS, MS, PhD
  – MS is really new entry level
  – PhD required for research
  – My advisor’s advice: “If you’re really good, you can do fine with just a BS. If you need a little extra help, get an MS. In your case, do a PhD.”
    • I’d rather have a PhD and not need it than vice versa
    • School gets more fun as you go along

• Stay viable & current
  – Ongoing education/training
  – Go to conferences, monitor what universities are working on
  – IEEE membership & participation
    • Review papers, submit papers, attend conferences, be active in local organizations (networking & cont. educ.)
  – Don’t give up your non-engineering interests
    • They will inform your engineering
    • They’ll keep you connected to the non-techie world
    • They’ll keep you from burning out
Engineering in the 21st Century

• Always consider the buyer of your products
  – Don’t assume you, a techie, represent The World At Large
    • READCPUID fiasco, FDIV
  – How do buyers think?
    • What’s in an IPOD? Nobody cares about tech per se
    • How high do cell phones bounce?
• Challenges the world is facing, what they mean to you
  – Climate change, pandemics, global markets, outsourcing, energy, water
  – Solutions are likely to come from technology (engineers)
Engineering in the 21st Century 2

• READ. A LOT.
  – Learn about humans, culture, co-workers, buyers
  – Align products to real problems, not just short-term profits

• Competition
  – Don’t fool yourself by comparing your projections vs their current offering
  – Don’t scare paperware scare you into inaction either
If product fails, team fails; if team fails, you fail.

Strive for perfection. But design assuming you won’t get it.

Commit yourself & your sacred honor to project.

Periodically take step back and check big picture.

Don’t be afraid to obsess over your project.

Exercise!

Engineering is risk-taking. Take risks purposely, carefully, and bravely.
Q & A