Motivation

Michael Hilton

November 12, 2019

Interview

CIERA JASPAN

Learning Goals

- Understand the differences among developers and implications for hiring and teamwork.
- Describe various models of motivation and their relationship to productive work environments.
- Design conditions that motivate developers.
- Understand team development and progression.

17-356/17-766
SOFTWARE ENGINEERING FOR STARTUPS

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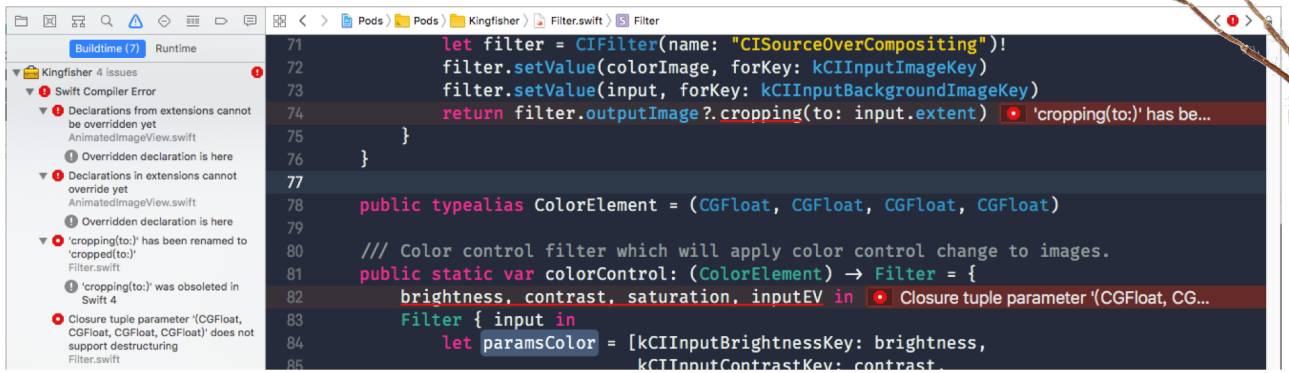
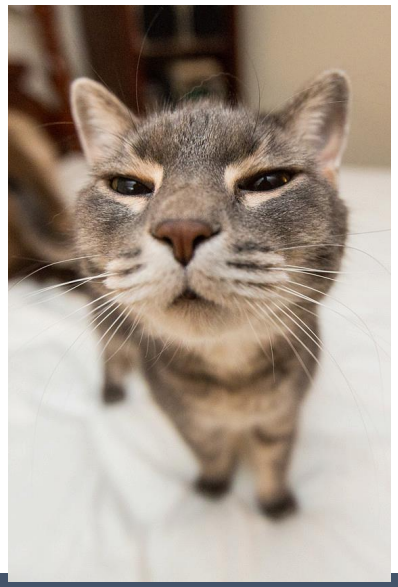
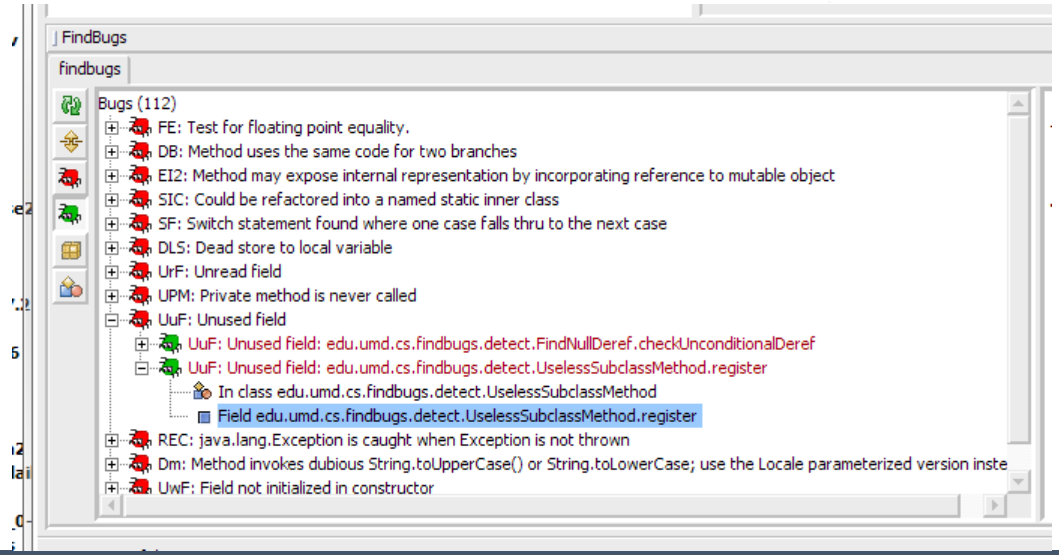
17-355/17-665/17-819 Program Analysis







17-355/17-665/17-819 Program Analysis

- Hate bugs? Want to find and squash them?
- Want to know how your compiler/IDE finds bugs?
- Want to think about how to fix them automatically?
- Take **Program Analysis!**
  - Covers both foundations/theory and practical aspects of program analysis.
  - Satisfies your Logic and Languages requirement.
  - Theoretical/written assignments + practical/implementation assignments + fun research/research-adjacent projects.
  - Find bugs, verify software, and *really* understand what your programs are doing.
- Instructor: Claire Le Goues, Spring 2019, TTh 10:30-11:50 (+ recitation)

Disney+ Lessons learned

Disney says its new Disney+ streaming service is so popular you can't stream it

"The consumer demand for Disney+ has exceeded our highest expectations." Translation: Whoops.

By Peter Kafka | Nov 12, 2019, 12:30pm EST

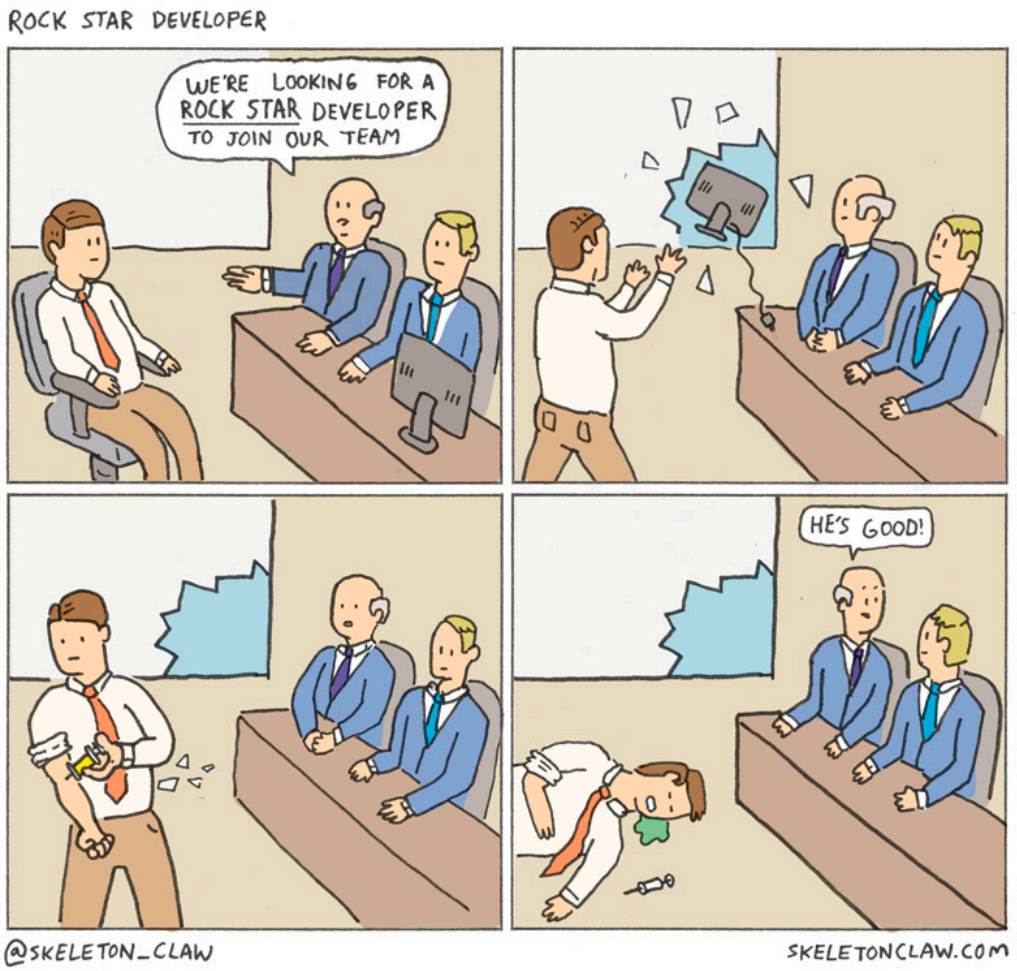
SHARE

A scene from *The Mandalorian*, a new Star War series streaming on Disney+. | Lucasfilm

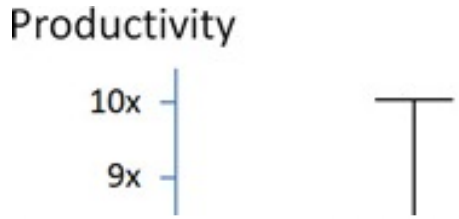
10X ENGINEERS

10X Engineers

- Aka “rock-star”, “ninja”

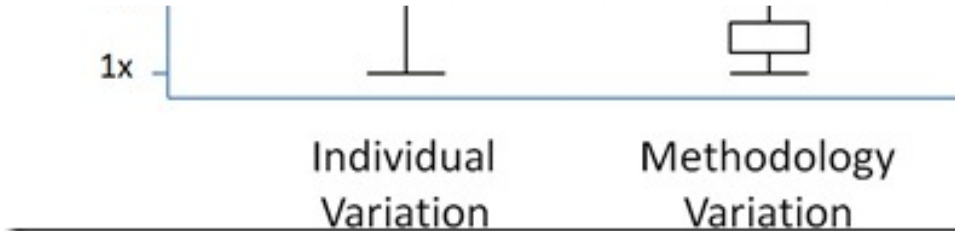


1966 study on online/offline programming performance



rmance variables. To paraphrase a nursery rhyme:

When a programer is good,
He is very, very good,
But when he is bad,
He is horrid.



10x

- Reported as early as 1968 (Sackman, Erickson, and Grant)
  - Coding time 20:1
  - Debugging time 25:1
  - Program size 5:1
  - Execution speed 10:1
  - No correlation to amount of experience
- "order-of-magnitude differences among programmers" repeatedly reported
- Differences not explained by
  - programming language
  - years of experience

https://theundefeated.com/wp-content/uploads/2017/03/gettyimages-71496896.jpg?quality=70&strip=info&w=3000&ssl=1

"During the time I was at Boeing in the mid 1980s, there was a project that had about 80 programmers working on it that was at risk of missing a critical deadline. The project was critical to Boeing, and so they moved most of the 80 people off that project and brought in one guy who finished all the coding and delivered the software on time."

– Steve McConnell

10x of Teams

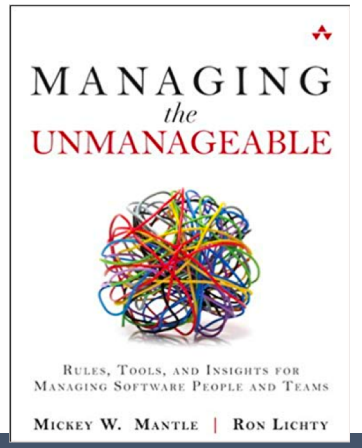
- Lotus 123 version 3
- 260 staff years
- 400,000 lines of code.

- Microsoft Excel 3.0
- 50 staff years
- 649,000 lines of code

Great programmers
according to Mantle and Lichty

- Intuitive sense for structure
- Discipline to design before code
- Write concise, clear, functional, high-quality code
- Produce the desired result

- Software as a craft



Challenge

- Find and hire great developers (Does balancing a red black tree on a white board correlate with being a better developers?)
- Mentor developers into becoming great developers
- Put processes in place to support developers

Interview Advice

Look for people who are:

1. Smart, and
2. Get things done.

DEVELOPER TURNOVER

Rank	Employer Name	Median Age of Employees	Median Employee Tenure	Median Pay
1	Massachusetts Mutual Life Insurance Company	38	0.8	$60,000
2 - tie	Amazon.com Inc	32	1.0	$93,200
2 - tie	American Family Life Assurance Company of Columbus (AFLAC)	38	1.0	$38,000
4 - tie	Google, Inc.	29	1.1	$107,000
4 - tie	Mosaic	37	1.1	$69,900
6 - tie	Chesapeake Energy Corporation	31	1.2	$60,500
6 - tie	Group 1 Automotive, Inc.	32	1.2	$33,200
6 - tie	Ross Stores, Inc	29	1.2	$23,800
6 - tie	Wellcare Health Plans, Inc.	38	1.2	$49,900
*				
11 - tie	Amerigroup Corporation	39	1.3	$54,800
11 - tie	Brightpoint North America, Inc.	45	1.3	$42,100
11 - tie	Devon Energy Corporation	31	1.3	$63,200
11 - tie	Family Dollar Stores Inc	38	1.3	$23,400
11 - tie	Freeport-McMoRan Copper & Gold Inc	36	1.3	$62,900
11 - tie	Paccar Corporation	33	1.3	$62,200
18 - tie	Sandisk Corp	34	1.5	$110,000
18 - tie	Tenneco Inc	40	1.5	$69,900

Source: http://www.techrepublic.com/blog/career-management/tech-companies-have-highest-turnover-rate/; payscale.com data

Turnover

- > 20% turnover per year typical
  - average employment 15-36 month

- Costs?
- Reasons?
- Mitigations?

Unfolding Model of Employee Turnover

Organizational Science has studied employee turnover for over 100 years!

One Hundred Years of Employee Turnover Theory and Research

Peter W. Hom
Arizona State University

Thomas W. Lee
University of Washington

Jason D. Shaw
Hong Kong Polytechnic University

John P. Hausknecht
Cornell University

We review seminal publications on employee turnover during the 100-year existence of the *Journal of Applied Psychology*. Along with classic articles from this journal, we expand our review to include other publications that yielded key theoretical and methodological contributions to the turnover literature. We first describe how the earliest papers examined practical methods for turnover reduction or control and then explain how theory development and testing began in the mid-20th century and dominated the academic literature until the turn of the century. We then track 21st century interest in the psychology of staying (rather than leaving) and attitudinal trajectories in predicting turnover. Finally, we discuss the rising scholarship on collective turnover given the centrality of human capital flight to practitioners and to the field of human resource management strategy.

High turnover is expensive

- Hiring overhead
  - Costs (1.5 month salary to agency)
  - Lost productivity (interviews)
- Getting new developers up to speed
  - Unproductive time (~6 month ramp up; 2 years in some estimates)
  - Training overhead
- Overhead for maintaining abandoned code
- Tendency to short-term viewpoints
- Premature promotions
- Young inexperienced staff

Causes of, mitigations for turnover

- Causes (from literature, caveats for tech companies):
  - Just-passing-through mentality
  - Feeling of disposability
  - “Loyalty would be ludicrous”
  - High turnover encourages turnover
- Mitigations:
  - Environment and culture
    - striving to be "the best"
    - teams
  - Investment in personal growth, via retraining, no dead-end jobs
- *Advice: enable appropriate processes to maintain productivity despite turnover.*

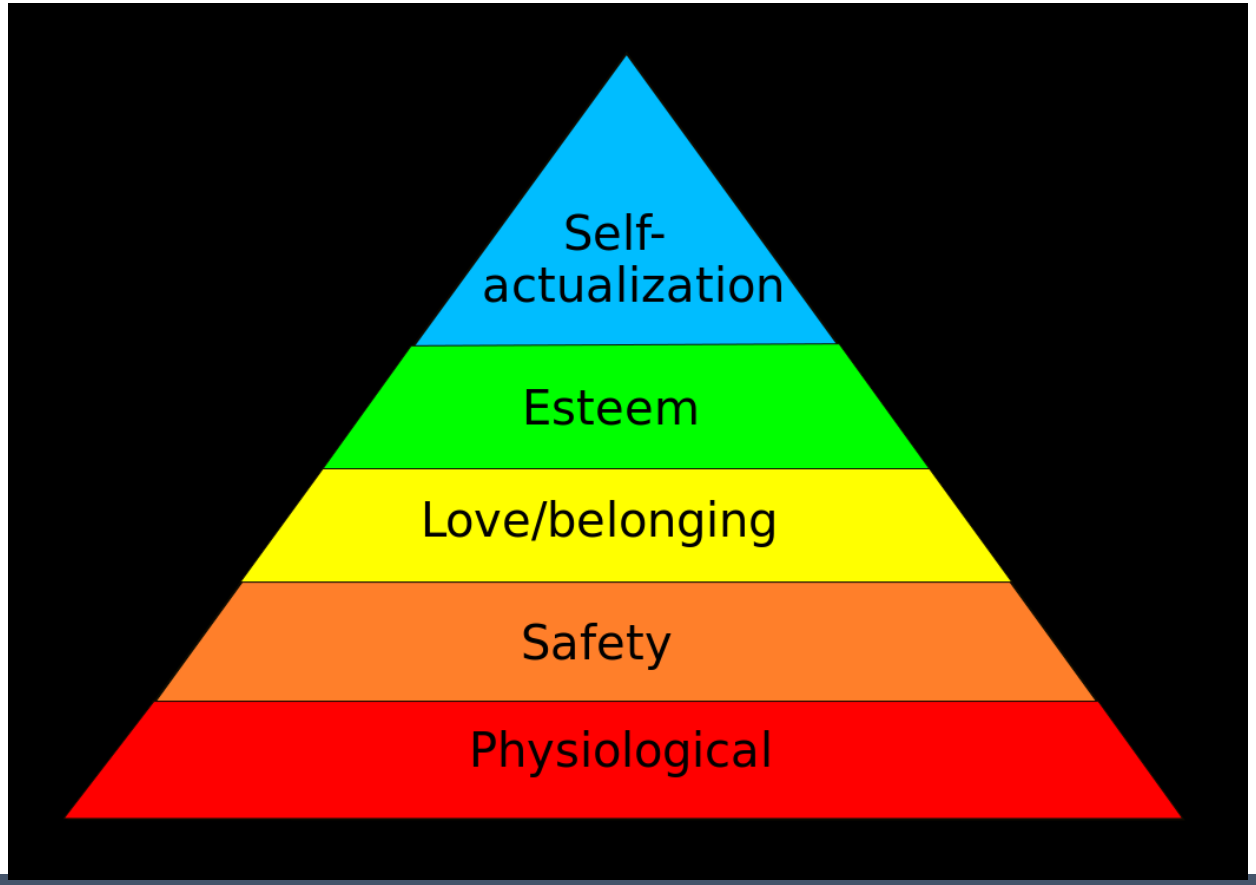
MOTIVATING PROGRAMMERS

Growth and Challenge

Theories

- Maslow's Hierarchy of Needs
- Herzberg's Motivation and Hygiene Factors
- Daniel Pink, Drive: The Surprising Truth About What Motivates Us.

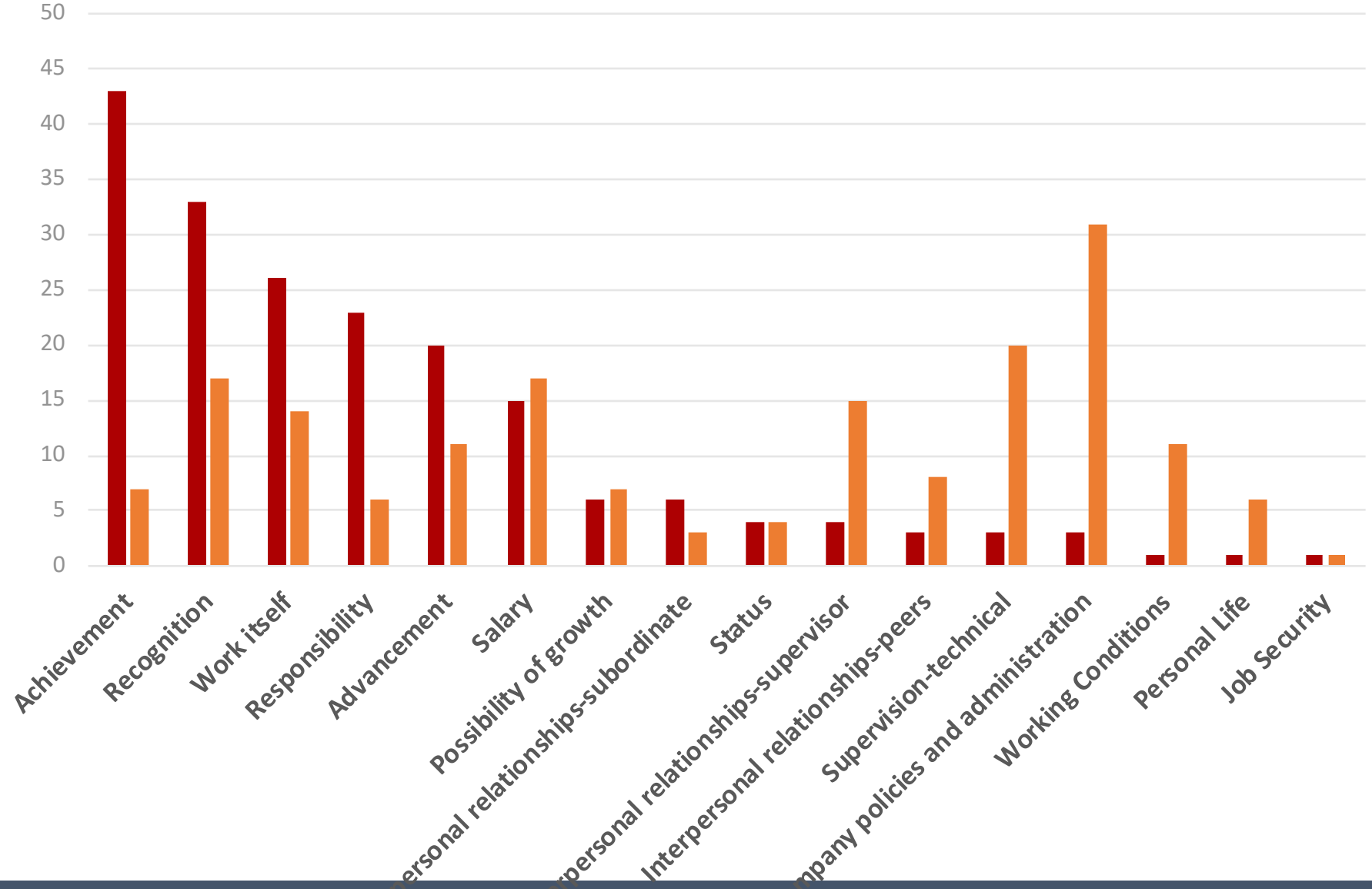
Maslow's hierarchy of needs (1943)



Herzberg's Motivation and Hygiene Factors (1960s)

- (aka two-factor theory)
- Different factors for satisfaction and dissatisfaction
  - Addressing dissatisfaction does not lead to satisfaction
- Step 1: Eliminate dissatisfaction
- Step 2: Create condition for satisfaction

(Observation by Mantle and Lichty, not empirical data)



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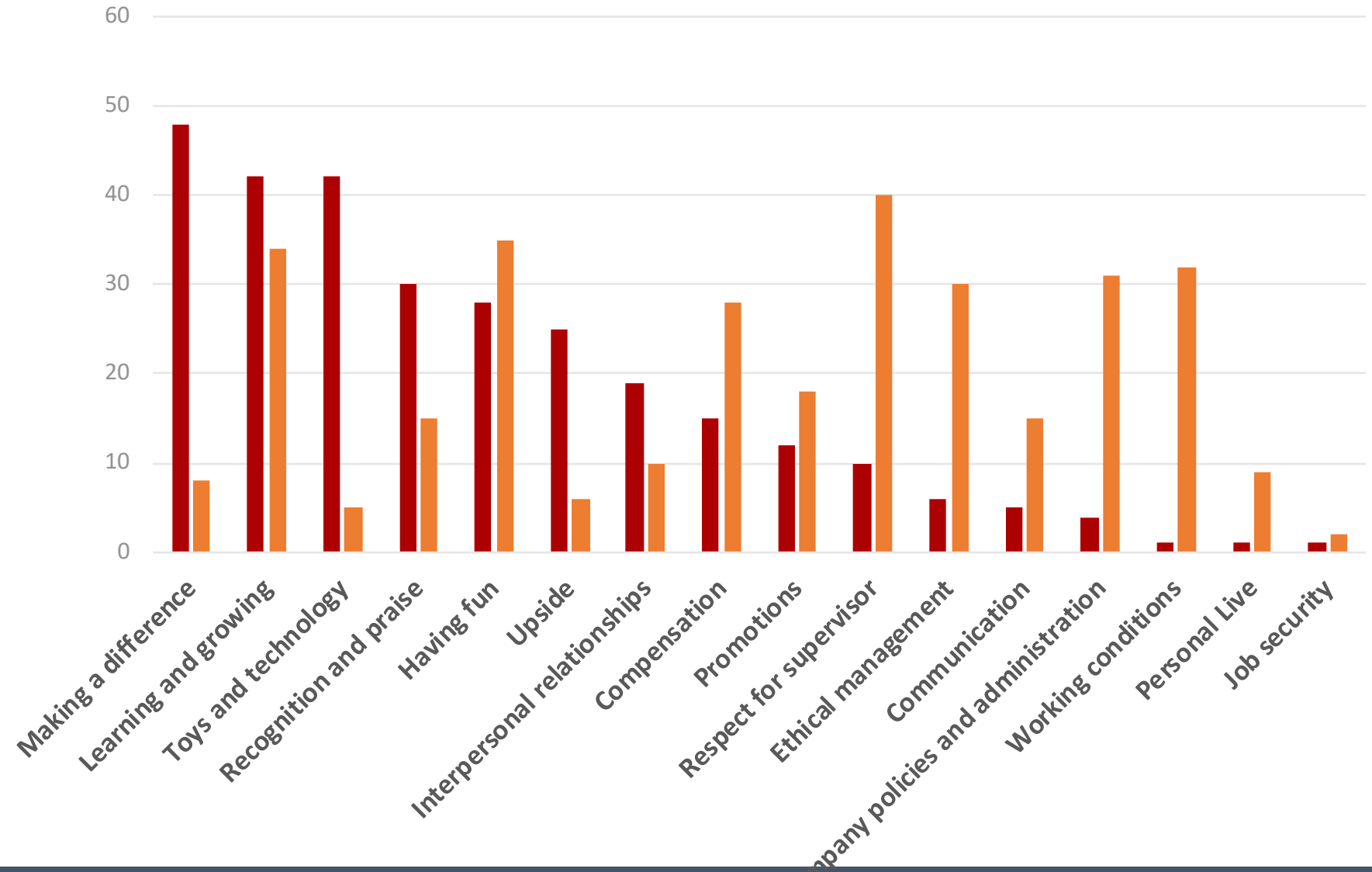


Addressing Causes of Dissatisfaction

- Respect for supervisor
- Having fun
- Learning and growing
- Good working conditions
- Sane company policies and administration
- Ethical management
- Fair compensation

- (often within control)

Addressing Causes of Dissatisfaction (selective)

- Respect as supervisor
  - gain technical credit
  - respect others
  - lead by example
  - help solve technical problems
  - manage and coach
- Having fun
  - out of office play
  - celebrations of accomplishments and occasions

Addressing Causes of Dissatisfaction (selective)

- Learning and growing
  - protect time for learning
  - explore new technologies; prototype
  - budget for attending conferences, seminars, inhouse training
  - invite guest speakers
- Good working conditions
  - plenty of whiteboards
  - room for discussions
  - Quiet space, Limit interruptions, avoid meeting culture
  - cubicles vs separate offices
  - fire “jerks”
  - free food
  - flexible hours, flexible dress, flexible space

Addressing Causes of Dissatisfaction (selective)

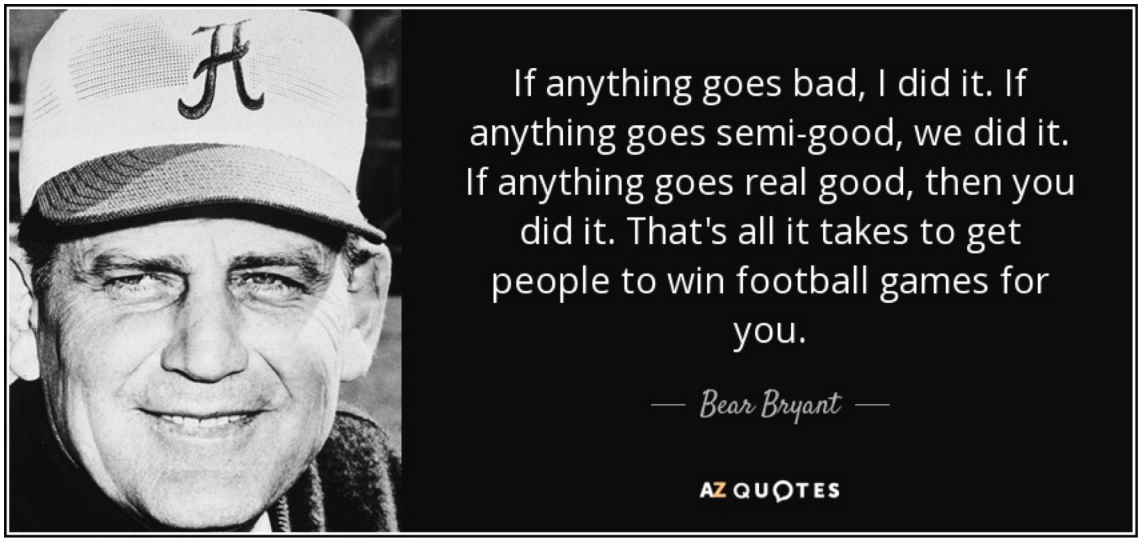
- Sane company policies and administration
  - communicate frequently (vision, intentions, requirements, schedules, …)
  - protect staff from organizational distractions
  - protect staff from bad communication practices (establish culture)

Addressing Motivating Factors (selective)

- Making a difference
  - worthy goals, longterm vision
  - Steve Jobs when recruiting John Scully from Pepsi: “Do you want to sell sugar water or change to world”
- Toys and technology
  - modern hardware, large screens, phones, …

Addressing Motivating Factors (selective)

- Recognition and praise
  - praise loudly and specifically, blame softly/privately
  - celebrate success

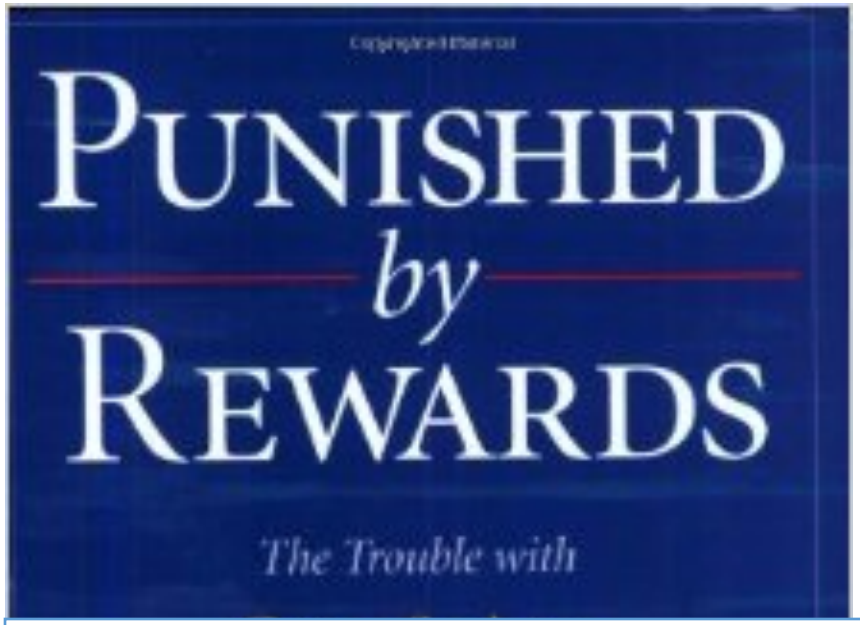


Why do engineers choose TO JOIN particular teams?

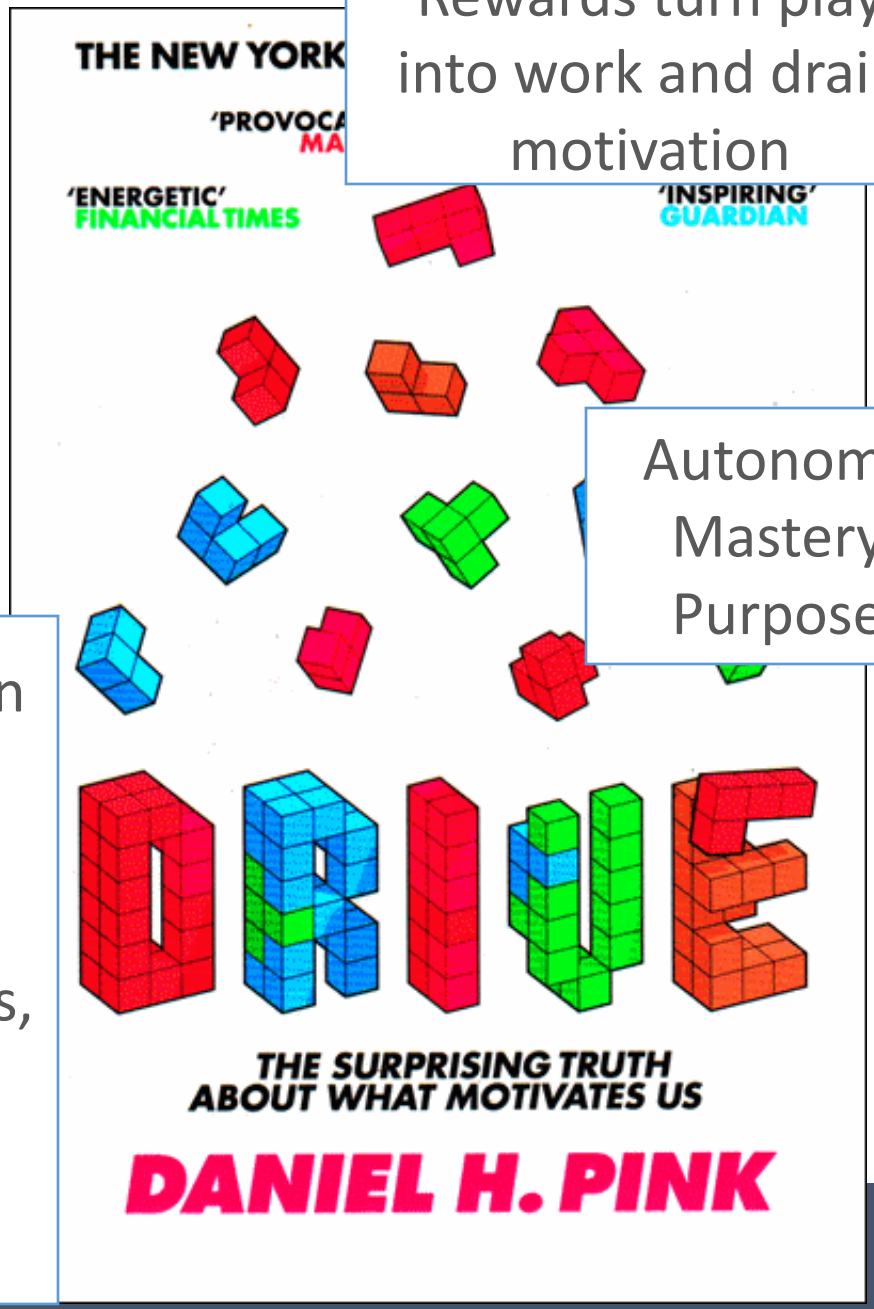
Reasons grouped by clustering analysis	Percent
Liked new team and/or technology (exciting, manager)	**85.8%**
Coworker asked me to join (new team, old team)	**37.8%**
Joined for better opportunities (location, domain, lack of other options)	**24.5%**
Followed my manager (former or current)	**14.6%**

Why do engineers want to leave their teams?

Reasons grouped by clustering analysis	Percent
Change is coming (technology, charter, re-org, turnover)	**52.6%**
Seeking new challenges or location (role, location, challenges)	**39.0%**
Dissatisfaction with manager (priorities, goals, person, actions)	**31.6%**
The grass is always greener on the other side (novelty, escape)	**12.3%**
Not a good fit (bored, no need for my skills)	**5.3%**
Poor team dynamics (dysfunctional, no career growth)	**4.4%**



Rewards turn play into work and drain motivation



Autonomy
Mastery
Purpose

Can extinguish intrinsic motivation
Can diminish performance
Can crush creativity
Can crowd out good behavior
Can encourage cheating, shortcuts, and unethical behavior
Can become addictive
Can foster short-term thinking

Rewards (aka grinding)

Tuckman, 1965: Forming, Storming, Norming, Performing

- Forming: team meets and learns about challenges, agrees on goals, begins to work.
  - Team members: (1) Behave independently. (2) May be motivated, but relatively uninformed about goals, (3) usually on their best behavior (albeit self-involved)
- Storming: participants form opinions about one another, possibly leading to conflict.
  - May voice opinions or question leader, especially if someone shirking responsibility or attempting to dominate.
  - Disagreements and conflicts must be resolved before team can progress; may regress if new challenges arise.
  - Stage can be destructive, but can lead to a better team in the long run if effective resolution tactics established.
- Norming: Resolved conflicts leads to a spirit of co-operation.
  - Team shares a common goal for which everyone takes responsibility.
  - Tolerate one another, move on from individual challenges.
  - Danger: too much avoidance of conflict can lead to avoidance of controversial ideas.
- Performing: group members focus on achieving common goals.
  - Everyone is now competent and can make decisions without supervision. Dissent is allowed if it's through acceptable channels.
  - Supervisors are almost always participating.
- Upshot: Preserve existing teams, resist project mobility.
  - Tradeoffs? Compared to practices you've seen in companies?

Further Reading

- Mantle and Lichty. Managing the Unmanageable. Addison-Wesley, 2013
  - Very accessible and practical tips at recruiting and managment
- DeMarco and Lister. Peopleware. 3rd Edition. Addison Wesley, 2013
  - Anecdotes, stories, and tips on facilitating teams, projects, and environments
- Pink. Drive: The Surprising Truth About What Motivates Us. Riverhead 2011
  - Detailed discussion of motivating factors for creative people
- Sommerville. Software Engineering. 8th Edition. Chapter 25