

## NUGGETS OF KNOWLEDGE - "KNUDGETS"

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Useful perspectives and questions, but not:

Sayings:

s1 -- A word to the wise is sufficient.

s2 -- 62.5 grams of prevention is worth 1 kg of cure.

s3 -- There is no limit to the amount of good you can do if you don't care who gets the credit.

Mottos:

m1 -- be prepared

m2 -- think, then act

Rules:

r1 -- do unto others as you would have them do unto you

Not taught in:

standard MIT courses, political or religious organizations

Topics:

Professional ethics, using and providing professional expertise, start-up activities, organizations, strategies

s4 -- tempus fugit

### K1 -- WHAT IS ETHICS?

1. Webster's dictionary: "discipline dealing with what is good and bad and with moral duty and obligation". "Ethical"..."conforming to accepted professional standards of conduct."
2. Some children asked their father "what is ethics?"  
The grocer replied: "I'll tell you. A loyal customer last week bought \$18.50 worth of small items and paid me with what we thought was a \$20 bill. Later I realized it was actually \$50. Now--the ethical question. Should I tell my partner?"
3. Ethics includes ranking of loyalties. Here the puzzle was:  
[partner/family/customer] vs [family/partner/customer] vs  
[customer/family-partner]

### K2 -- WHAT IS "ETHICAL BEHAVIOR"?

1. Three steps:
  - a) rank loyalties

- b) evaluate options (r1 - "do unto..", etc.)
  - c) M2 ("think, then act"; also S3 - "there is no limit...")
2. Ranking is difficult
    - a) rank vs size, e.g.:
      - world / nation / organization / subgroup / family / self vs
      - self / family / subgroup / organization / nation / world ("larger is loftier" vs "nearer is dearer") (beliefs, etc. may enter the hierarchy too)
    - b) rank vs time, e.g.:
      - now-and-certain vs long-term integrated consequences (discount rate = ?)
    - c) quality of life vs quantity
  3. Reasonable people differ
  4. Differences can yield conflict

### K3 -- PROFESSIONAL ETHICS

1. Professions include: doctors, lawyers, priests, engineers, CPA's, scientists, journalists, teachers, etc.
2. Success of profession promoted by a reputation for:
  - client confidentiality
  - professional quality control: registration, certification, ethics codes, performance codes, continuing education, disciplinary and decertification boards, public support: laws, administrative, finance
3. Ethical conflict type A: client/self vs public interest
  - e.g. psychiatrists for habitual criminal offenders, lawyers and accountants for crooks, engineers for corner-cutting clients, scientists pressured to publish prematurely
4. Ethical conflict type B: self interest vs client
  - e.g. insider trading, excessive services and billing, shoddy work for naive clients, obligation for public service (doctors, lawyers, ...)
5. Prime test is legality; obligation to know the law

*(B) (A)*  
*client: prefers, pub*

### K4 -- EXAMPLES OF ETHICAL CONFLICTS

1. Type A: client/self vs public interest
  - a) predatory technology development -- e.g. oligopoly firm kills recycling and maximizes new-unit sales.
    - legality? (e.g. antitrust)
    - certainty?
    - disclosure of proprietary information?
  - b) unsafe products
    - what is "unsafe"?
    - certainty, legality, proprietary information
2. Type B: self interest vs client

- a) negotiator privately pursues (explores) opportunity his firm abandoned, without permission
- b) corporate officer leases space in building he owns
- c) professional recommends firm in which he has interest

3. Issues

- a) duty to inform, "full disclosure" (inform whom?)
- b) duty to investigate
- c) rule of law
- d) rule of reason; the "reasonable man"
- e) issues of fact vs issues of perception; risk of ex-post-facto ethics

K5 - DISHONESTY

1. Dishonesty can be: external (deliberate) and internal (self deception )
2. Example of external dishonesty-image compression beyond Shannon limit
  - a) sold licenses and r&d partnerships; market allocation permitted many buyers.
  - b) fraud promoted by:
    - greed
    - technical unsophistication, arrogance
    - fear (of lawyers)
    - naivete ("no one so solid would do this")
  - c) fraud protected by:
    - non-disclosure agreements, threats of lawsuits, threats of libel and slander suits
    - embarrassment of principal victims (CEO's, firms)
    - cult of paranoia in perpetrator
    - clever engineering
    - negotiated tests (paranoia legitimized this request)
  - d) fraud validated by employee detective work and telephone conversation with technical entrapment

K6 - EXAMPLE OF INTERNAL DISHONESTY

1. Internal dishonesty - self-deception, selective blindness
2. Example: plasma torch (good concept, high thermal efficiency)
  - a) power factor problems fooled inventor and promoter into thinking device had "cold fusion" potential
  - b) sold shares and pursued leads partly on this basis
  - c) main opportunities were under-promoted or lost
2. Fraud promoted by:

- a) greed and desire for fame and thrill of success
  - b) fear of economic embarrassment, unemployment
  - c) inoperative protective mechanisms: soliciting and heeding expert opinion (secrecy, fear, jealousy, laziness)
3. Most internally dishonest people function well until their personal interests are at stake, then judgement warps

### K7 - CORPORATE CULTURE OF HONESTY

Classic problem - shortage of respect

- 1. Company vs competitors
  - a) misrepresentations - performance, competitors, terms
  - b) theft - personnel, ideas, kickbacks, predatory subsidies
- 2. Company versus customers and public
  - a) misrepresentation (truth in advertising), predation
  - b) unsafe or shoddy goods, hidden defects, pollution
  - c) predatory product design - unrepairable products, deliberately underdesigned "razor-blade" repair parts
- 3. Company vs employees - pensions, safety, salaries, promotions
- 4. Employee versus employee - kind, fair, truthful, helpful
- 5. Imperatives of the marketplace - self defense
- 6. Like companies and like people attract - corporate culture. Ethical flexibility is sometimes a hiring & promotion issue

### K8 - ART OF INVENTION

- 1. Webster's definition - to fabricate mentally; create or devise in the imagination
- 2. An invention combines elements - many possible combinations. for m fields (electrical, mechanical, etc.), n phenomena per field, and  $\infty$  elements per invention, the number k of possible inventions is:  $k = \sim(mn)^{\infty}$ . for m =  $\sim 10$ , n =  $\sim 100 - 1000$ , and  $\infty = \sim 3+$ ,  $k = \sim 10^9 - 10^{12}$ . Now  $\sim 10^7$  patents; so  $\sim 10^{-2}$  to  $10^{-5}$  of combinations are interesting.
- 3. Compare inventor with m = 1, n = 1000, to one with n = 500:  $10^9$  vs  $1.2 \cdot 10^8$  inventions possible (factor of 8). chance of novelty greater with m = 2, n = 500, and  $10^9$  inventions possible. Thus breadth increases novelty.
- 4. Inventor productivity improves by starting with key novel concepts and important applications. technology vs application-driven invention. build

mental inventories; read, listen, ask, and think voraciously.

### K9 - WHAT IS A PROFESSIONAL?

1. Webster's definition - learned professions: law, medicine, engineering, etc. also, avocations yielding income (sports, etc.)
2. Client/professional relationship  
(confidentiality, no conflict of interest) >>information>>  
the problem, expertise      client      professional expertise  
contacts      <<judgement<<      contacts  
resources      resources
3. Object is to invent solutions to problems
4. Combinatorics: compare  $2n^3$  to  $(2n)^3$ ; factor of  $>4$  more productive for client and professional to pool information n. Need for confidentiality and avoiding conflicts of interest is one barrier. Trust is therefore key.
5. Good professionals understand clients' environment, specialize
6. Smart clients understand professionals' business enough to serve as astute observer, poser of questions, and information resource; i.e. to be a true partner in problem definition and solution invention. Wise to become one's own doctor, lawyer, engineer etc. for problem definition only.

### K10 - PATENTING

1. Main steps
  - a) inspiration
  - b) evaluation and extension (and more inspiration, iterated)
  - c) documentation
  - d) evaluation by others
  - e) patenting (search, further documentation, invention)
  - f) utilizing invention
  - g) defending patent
2. Cost of patent = ~\$2K + \$100 per claim (varies)
3. Probability of success,      hours required, 3¢/hr @ \$10K
  - a) high      10 hrs?
  - b) 0.3? (0.2 total)      20      (30hrs cumulative)
  - c) 0.3? (0.06)      20      (50)
  - d) 0.3? (0.018)      10      (60)
  - e) 0.2 (0.0036)      40      (100)
  - f) 0.1 (0.0004)      40      (140)
4. Successful inventors usually:
  - a) work in company where applications are more certain ( $f \Rightarrow 1$ )
  - b) work in lab where technology is key and novel ( $d, e \Rightarrow 1$ )

- c) document clearly, swiftly, patent-like (legal \$ decrease)
- d) inventory hot applications, technology, experts to consult

### K11 - AGREEMENTS AND CONTRACTS

1. Critical elements
  - a) empowered parties (owners, officers, not minors, etc.)
  - b) meeting of the minds (no ambiguities, misunderstandings, coercion)
  - c) framework for enforcement and conflict resolution (written record, incentives, penalties, arbitration, law)
2. Avoid ambiguity; write agreement so that it can:
  - a) be understood
  - b) not be misunderstood
  - c) not be misunderstood by a hostile person
  - d) not be misunderstood by hostile person with a straight face
3. Use ambiguity (with discretion)
  - a) when the future is unpredictable (e.g. high-risk technology)
  - b) commit to "best effort" or fee for service hours (share risks)
  - c) provide milestones, decision points (seek, preserve options)
  - d) imprecisely define method, success, resources, schedule, performers, cost, peripheral obligations
  - e) have reserves in one or more categories; hidden, if necessary
  - f) to trigger later negotiations, re-rationalized agreement
  - g) to avoid fatal outcomes due to small prediction errors

### K12 - REVOLUTIONARY ACTIVITIES

1. Evolutionary vs revolutionary
  - a) most failures at interfaces for product/process elements (e.g. engine/transmission/safety/marketing/casting/etc.)
  - b) evolutionary - product/process with solved interfaces and few element changes requires few interface analyses.
  - c) revolutionary - all elements novel: market, product, process, suppliers, competitors, regulations, finance, management, technologies employed, etc.
2. Interface combinatorics can be daunting
  - a) number  $m$  of 2-element interfaces for  $n$  elements  $= n(n-1)/2$
  - b) number of 3-element interfaces  $m = n(n-1)(n-2)/6 = \sim n^3$
  - c) if  $n=6$  or 60,  $m=15$  or 1770 (2-elemnts);  $m=20$  or 34,220 (3-elemnts.)
3. Productivity improvement through reducing  $n$ 
  - a)  $n$  can be reduced by working harder, smarter, and broader
  - b) say  $n$  is reduced by a factor of 1.5 in each category (60, not 40-hr weeks, etc.); then  $m$  reduced by factor of  $\sim 3.38^2 = 11.4$  (2-el.) or  $\sim 3.38^3 = 38.4$  (3-el.); delays, chances for error reduced too.
4. Conclusions
  - a) use small dedicated first-class teams linked to experts.
  - b) ethics, trust, competence, motivation, and openness are keys to

revolutionary successes.

### K13 - START-UP SUCCESS (V. BUSH)

1. Need a great idea--offers unique value to market
  - a) new technology in old market, or old technology in new market easier than new technologies for new markets.
  - b) idea must be protectable: patents, trade secrets, speed in evolving novelty, exclusive rights, obscurity.
  - c) beware self-deception, popular opinion; fundamentals key
2. Need a promoter, finance
  - a) during risk reduction and start up, credit is usually needed before break-even is reached. Selling ideas is an art.
3. Need a good manager
  - a) team leader for technology, marketing, finance, vision, ethics
  - b) strategic vision key: build organization (play for breaks of the game) or product? size versus loss of control? pursue low-cash options?
  - c) multiple tough decisions--show stoppers once per week (hire/fire, deals, big sales, legal questions, etc.)
  - d) example 1: RCA, GE, etc. boycotted Raytheon tubes (predatory); so Raytheon violated patents, keeping plant open; antitrust vs patent suit settled later. Co. survived.
  - e) Example 2: venture capitalist seeks all data and delays at last minute to force punitive deals--Co. keeps secret reserves to foil VC strategy.

### K14 - TEAM BUILDING

1. Core team -- typically 2-5 people
  - a) test the core via vision definition and validation
  - b) assess "great-idea" team, management, promoter
  - c) identify internal dishonesty; if significant, stop or alter team. external dishonesty is even more serious.
  - d) measure self deception by exploring negatives aggressively, calmly, creatively, logically, persistently, using hard evidence. Test vision against respected discrete open-minded experts; understand and circumvent concerns.
  - e) identify each member's short and long-term objectives: are they satisfied? Are they consistent with skills and contributions?
2. Expand core team around vision carefully, filling voids
  - a) seek out the very best, for if effort grows, better if most core grow with it. Participatory ownership aids recruiting.
  - b) ethics and corporate style are key.

### K15 - TESTING A VISION

1. Is there truly a great idea? management? promoter?
  - a) does it make a real contribution?
  - b) peer assessment
  - c) what are the difficulties and solutions?

2. Market analysis
  - a) who wants the product? price? quality? quantity? pace?
  - b) channels and cost of sales?
  - c) analyze fundamentals
3. Competitor analysis; why (how) are we better?
  - a) why has it not been done? or done successfully?
  - b) why can't others do it now?
  - c) why can't others copy?
  - d) examples: ERT and PictureTel
4. Does the concept fit the team? can it be improved?
  - a) technical challenges need technical team
  - b) non-technical challenges need non-technical team
  - c) risks, rewards, scope, challenges, personal objectives and skills must all match

#### K16 - RECRUITING AND INTERVIEWING

1. Employee assets
  - a) experience: technical, business, culture, contacts
  - b) potential: intelligence (breadth and depth), creativity, vision, focus and completion, judgement, perfectionism.
  - c) character: ethics, flexibility (adaptability), responsibility, stability, risk propensity, personability, energy
2. Challenges to the interviewer and interviewee
  - a) lack of time
  - b) lack of specialized knowledge
  - c) reticent character references, over praise
3. Remedies
  - a) preparation: read information; ask "what is most important to them, me?", "What can be learned or conveyed only in this interview?" (How can I learn or convey the rest?), "What is improper or illegal to ask?"
  - b) interaction--test hypotheses by experiment: e.g. character; review career and business plan, choices, and consequences in sequence; focus on self-consistency. e.g. technical skills; what questions are asked? can be answered? Test hypotheses. Be respectful.

#### K17 - PREDICTED FAILURE--A CRITERION FOR SUCCESS

1. If most experts predict success without deep thought:
  - a) the idea has been or is being done by others, some large
  - b) it is not very promising or worth doing (or others would)
  - c) multiple competitors may soon reduce rewards
2. If most experts predict failure without deep thought:
  - a) they are right (most of the time)
  - b) it may be a good concept, less likely to have competitors
  - c) understand why failure is predicted falsely
  - d) test explanations against open-minded experts, experiments

3. Evidence that predicted failure can be success criterion:
  - a) Seward's folly (purchase of Alaska)
  - b) Fulton's steamship
  - c) semiconductor lithographic equipment (R. Henderson)
  - d) ERT Inc.
  - e) PictureTel

#### K18 - NEGOTIATING

1. Between equals
  - a) rank objectives of parties, be creative, assign values
  - b) hypothesize best fit, independent of where line is drawn
  - c) determine best alternative to a negotiated agreement (batna) for each party
  - d) guess where line may be drawn for most likely opponent's objectives
  - e) open negotiations, observe carefully and revise hypotheses and batna's; close to best advantage
2. With weaker party:
  - a) same as (1), plus
  - b) consider ethics and law carefully
3. With stronger party:
  - a) same as (1), plus
  - b) consider defenses; protect information and assets, knowledge of full reserves (example of venture capital and end-game twisting)