Engineers as Managers/Leaders

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Engineering Leadership

- Only 26% of CEO's in the top 1000 companies had their first degrees in Engineering (more in foreign countries)
- Only 10% of university presidents are engineers
- Few engineers are in Congress
- President Jimmy Carter was the only engineer, but he did not get reelected

Why So?

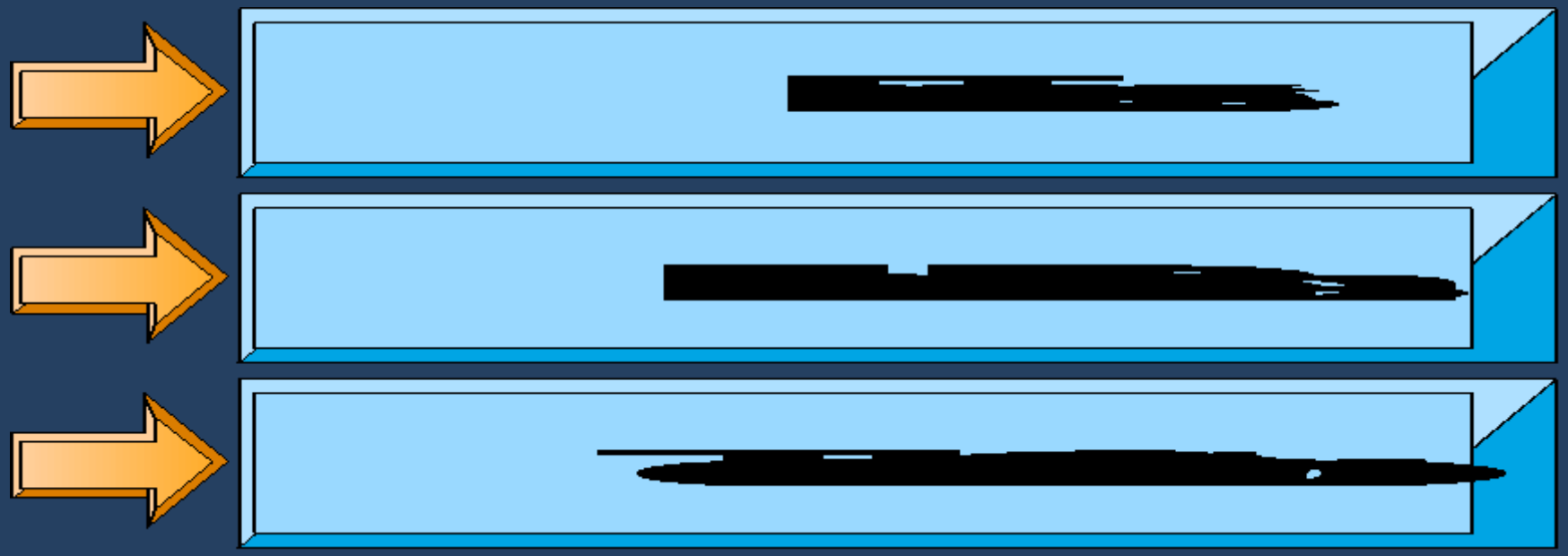
- Engineering mindset and attitude not compatible with management work?
- Education preventing engineers from becoming great leaders?
- Strengths in engineering have become weaknesses in management?
- Differences in work done by engineers versus that by managers?

CHARACTERISTICS	ENGINEERS	MANAGERS
Focus	Technical/scientific tasks	People (talents, innovation, relationships); resources (capital, knowledge, process know-how); projects (tasks, procedure, policy)
Decision Making Basis	Adequate technical information with great certainty	Fuzzy information under uncertainty (people's behavior, customer needs, market forecasts)
Involvement	Perform individual tasks	Direct work of others (planning, leading, organizing, controlling)
Work Output	Quantitative, measurable	Qualitative, less measurable, except financial results, when applicable
Effectiveness	Rely on technical expertise and personal dedication	Rely on interpersonal skills to get work done through people (motivation, delegation)

CHARACTERISTICS	ENGINEERS	MANAGERS
Dependency	Autonomous	Interdependent of others
Responsibility	Pursue one task at a time	Pursue multiple objectives concurrently
Creativity	Technology centered	People centered (conflict resolution, problem solving, political alliance, networks building)
Bottom Line	"How" (operational)	"What" and "Why" (strategic)
Concern	Will it work technically?	Will it add value (market share, financial, core technology, customer satisfaction)?

Adopted and revised from P. Morrison, "Making Managers of Engineers," *Journal of Management in Engineering*, Vol. 2, No. 4 (1986)

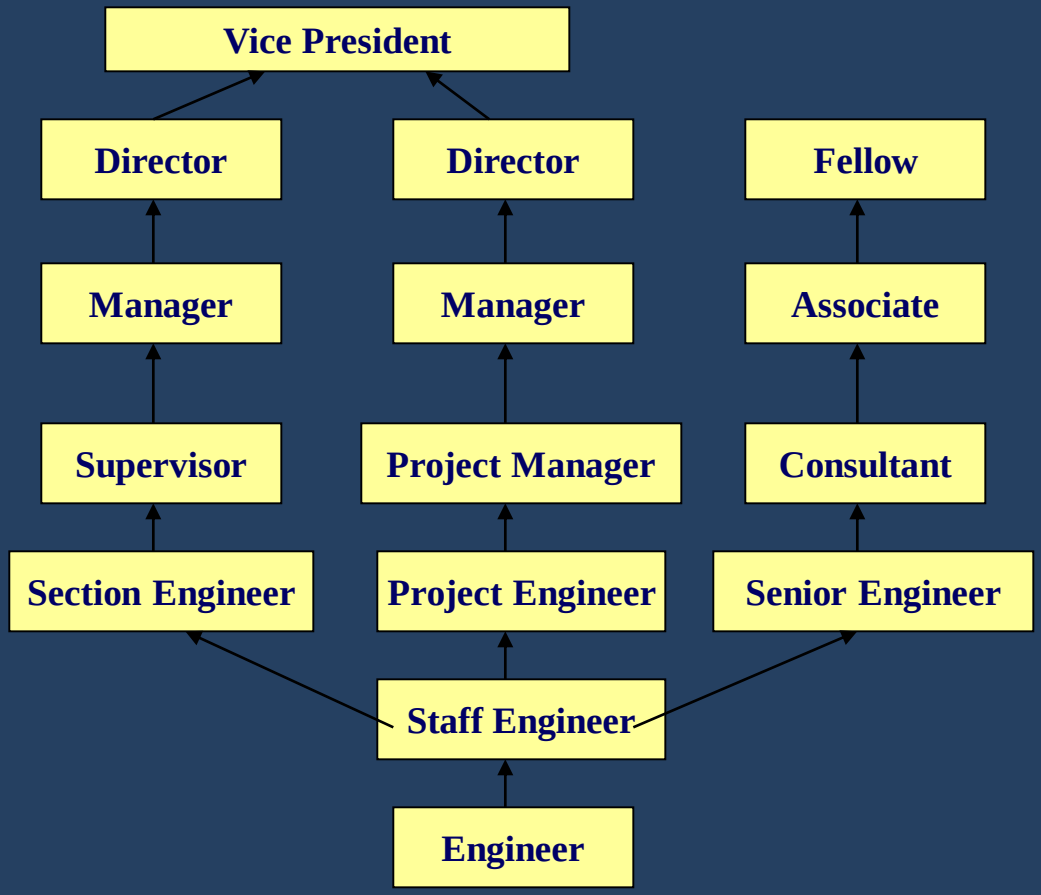
Career Path of Engineers



Mid-level Positions

- Dual Ladder System (1) **Technical** (senior engineer, consultant, associate, fellow) (2A) **Managerial** (section engineer, supervisor, manager, director) (2B) **Project Management** (project engineer, project manager, manager, director)

Dual Ladder


Vice President
Director
Director
Fellow
Manager
Manager
Associate
Supervisor
Project Manager
Consultant
Section Engineer
Project Engineer
Senior Engineer
Staff Engineer
Engineer

Mid-level Positions

- Mid-level positions are equivalent in ranking, mid-point salary and prestige
- Technical Ladder is capped at the Corporate Fellow level
- Managerial ladder, including Project Management positions, leads to Executive level positions (vice president, CTO)

Mid-level Technical

- Larger responsibility for programs of high technical contents but no managerial duty
- Add value by technical contributions, innovations, and technology applications
- Fellows are typically well-renowned both inside and outside of the company for technical expertise demonstrated in patents, publications and commercial success

Mid-level Managerial

- Larger responsibility of managing people, tasks, capabilities, functions and programs
- Devote increasingly less time on technology work and more on managerial work
- Success Factors (1) Established technical expertise, (2) Proficient in all management functions, (3) Problem solving and conflict resolution, (4) Strategic planning abilities

Remarks on Mid-level Positions

- Technical ladder positions are less quota-limited than the corresponding positions in managerial ladder
- Transfer from positions in technical to managerial ladder is somewhat more easier than the other way around

Executive Level Positions

- Positions such as vice president (VP) of Engineering and chief technology officer (CTO) demand leadership capabilities in creating and implementing technological strategies to capture new business opportunities
- Teamwork with other high level executives is a critical success factor

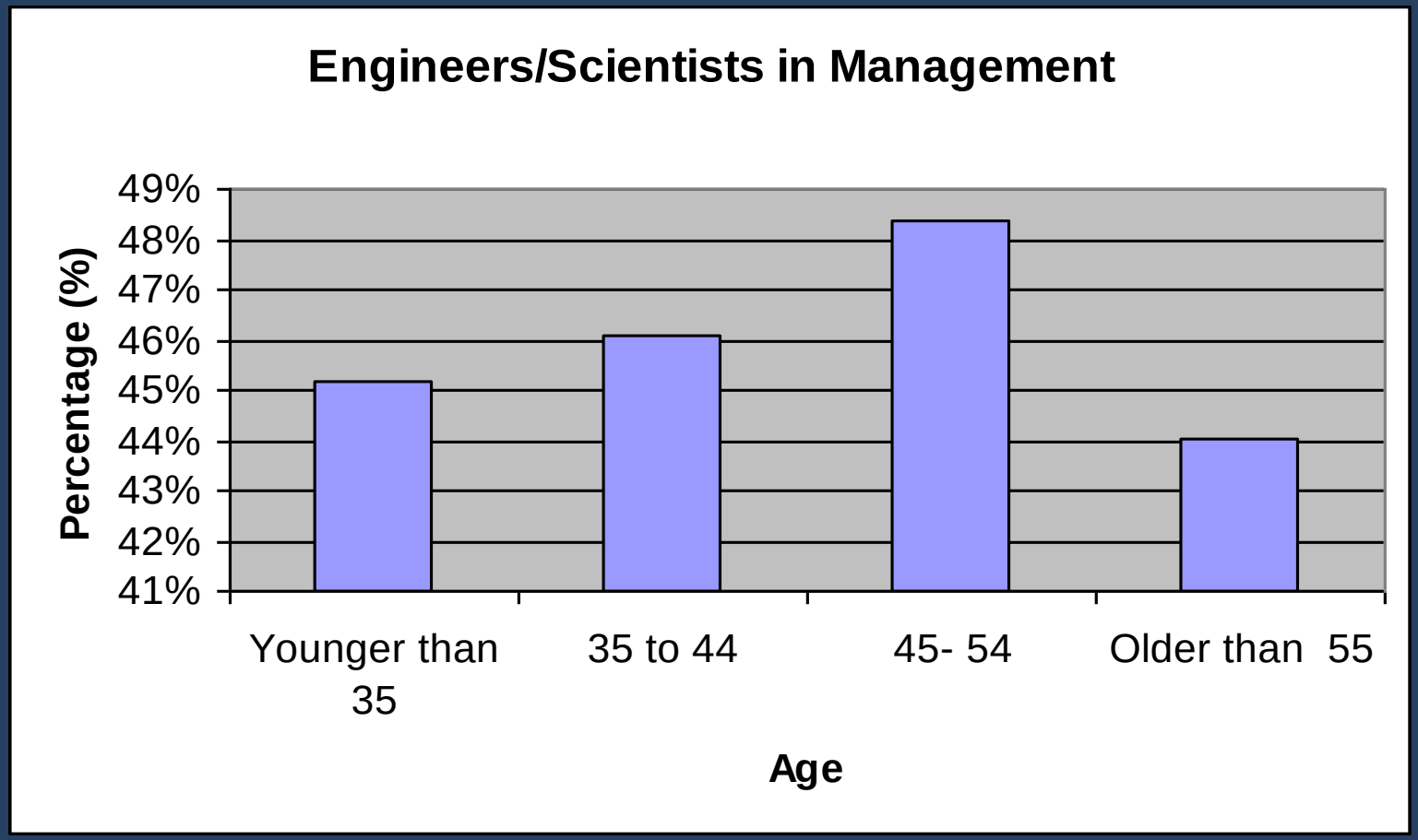
Work Contents

- Change of work contents with engineering career progression

	First-line Supervisor	Mid Manager	Executive
Technical	70%	25%	5%
Managerial	25%	50%	25%
Visionary	5%	25%	70%

Goals for All Levels: Add Value

National Science Foundation Study (2000)



To Manage or Not to Manage - Pros

- Financial rewards
- Authority, responsibility and leadership
- Power, influence, social status and prestige
- Career advancement, achievement and recognition
- Random circumstance

To Manage or Not to Manage - Cons

- Long hours and hectic life (overtime, travel)
- High stress level (pressure of deadlines, constraints of resources, political infighting, lack of peer cooperation, trivial personnel conflicts)
- Poor family life (not seeing family much)
- Health hazards (travel, unhealthy foods, physical stress)

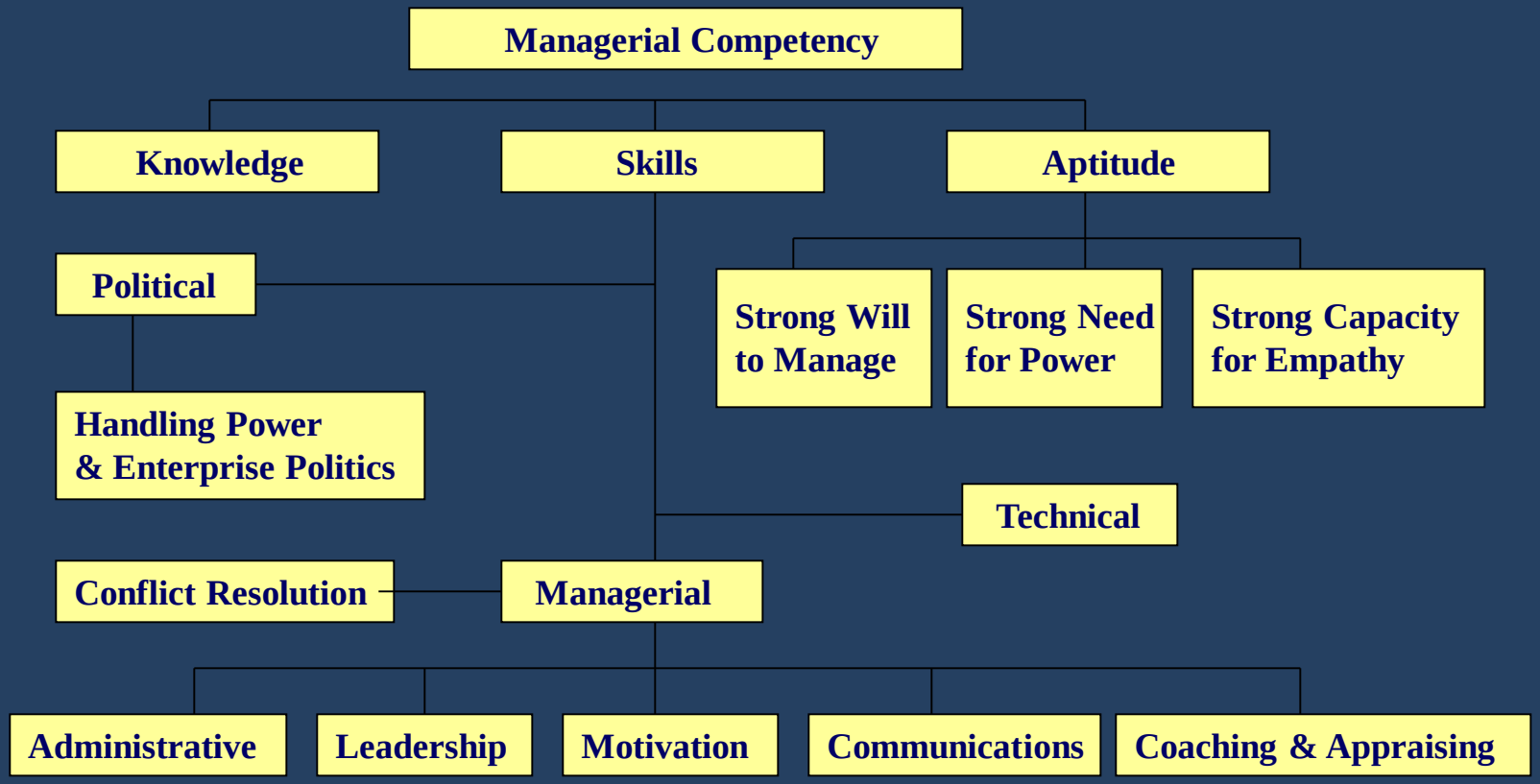
Success and Happiness

- Success in a management career contributes positively to happiness, but requiring certain sacrifices causing unhappiness - one must select a path to optimize happiness
- Happiness factors: (1) Wealth, (2) Social standing, (3) Professional achievements, (4) Peer recognition, (5) Quality of family life, (6) Health, (7) Absent of excess stress and anxiety, (8) Power, and (9) Others

How to Get Promoted

- Competence in current assignments - master current duties and responsibilities, gain respect of co-workers and get favorable recommendation from the boss
- Readiness and desire to become manager - handle larger and more challenging assignments (budget, people, impact)
- Good match with organizational needs

Managerial Competency



Question # 10.1

- Silverman, author of “The Art of Managing Technical Projects,” Prentice Hall (1978), argues that our college engineering curriculums might be a hindrance to engineers wanting to move into management, as they typically emphasize an orderly, predictable and pragmatic view of the world. Judging from the University at Buffalo’s 30-credit engineering curriculums at the Masters degree level, do you agree or disagree with Silverman, and why?

Leaders and Managers

- **Managers** – set goals, plan actions, secure resources, set up structures, exercise control and getting results (to keep organization functioning properly and create orderly results)
- **Leaders** – set vision and direction, create strategies to achieve vision, conceive actions steps to accomplish goals, align people and form coalition, motivate and inspire people to move forward (to promote future-oriented changes)

Characteristics	Managers	Leaders
Focus	Do things the right ways	Do the right things
	Administration, problem solving	Direction setting
	Reconcile differences	Creativity and innovation
	Seek compromises	
	Maintain balance of Power	
Emphasis	Rationality and control	Innovative Approach
	Accept and maintain status quo	Challenge status quo
	Putting out fires	Blazing new trails
Targets	Goals, resources,	Ideas
	Structures, people	
Orientation	Tasks, Affairs	Risk taking
	Persistence	Imagination
	Short-term view	Long-term perspective

Success Factors	Tough-mindedness Hard work Tolerance Goodwill Analytical capability	Perceptual capability
Points of Inquiry	How and when	What and why
Preference	Order, harmony	Chaos, lack of structure
Aspiration	Classic good soldiers	Own person
Favor	Routine Follow established procedure	Unstructured
Approach with People	Using established rules	Intuitive and empathetic

Personality	Team-player	Individualist
Relevance	Necessary	Essential
Thrust	Blend in Bring about compromise Achieve win-win	Stand out Lead Changes
Mentality	"If it isn't broke, don't fix it"	"When it isn't broke, this maybe the only time you can fix it."

Adapted from Abraham Zaleznik, "Managers and Leaders: Are they Different?" *Harvard Business Review* (March-April 1992), and Warren Bennis, "21st Century Leadership," Executive Excellence, Provo (May 1991).

Emotional Intelligence

- All leaders have a high degree of emotional intelligence

(1) Self-awareness

(2) Self-regulation

(3) Motivation

(4) Empathy

(5) Social Skills

Failure Factors for Engineering Managers

- Lack of political savvy
- Uncomfortable with ambiguous situation
- Tense personality
- Lack of risk-taking willingness
- Tendency to clinch on technology
- Lack of human relations skills
- Deficiency in management skills and perception
- Not cognitive of manager's roles and responsibility
- Narrow interest and preparation

Most Common Reasons for Career Failures for Engineers

(A) Poor Interpersonal Skills

- This is the single biggest reason for career failures. Every one needs to be

(1) Showing respect and sensitivity in dealing with others,

(2) Minimizing conflicts and disagreements,

(3) Giving and taking criticisms well,

(4) Striving to build team support,

(5) Becoming emotionally stable, and

(6) Behaving professionally

(B) Wrong Fit

- Not fitting to the cultural norms, core values, priority, profit motives, social/ environmental preferences, and others of the workplace
- Hard to adapt one's own abilities, styles, personality and chemistry to those of co-workers
- Solution is to move on quickly

(C) Not Able to Take Risks

- Staying in a position far too long for fear of losing control of own comfortable life
- Not willing to venture out (e.g., taking on a management position, relocation for a promotion, new job, different industry, etc.)

(D) Bad Luck

- Caught unexpectedly in an organizational restructuring situation (mergers and acquisition, downsizing, change of market conditions, economic downturn, outsouring strategies, formation of supply chain, etc.)
- Bad luck is not always avoidable
- Be ready for it by keeping oneself marketable: Value creation attitude, skills, and records

(E) Self-destructive Behavior

- Examples include: work in secret, resistance to change, being excessively aggressive, shown non-cooperative attitude, picking fights with people, becoming overly argumentative, being readily excitable about trivialities, and showing a lack of perspectives in things
- Must check own behavior often and modify

(F) Lack of Focus

- Try to be jack of all trades, but not good in any thing of value
- Having no expertise to be known for is dangerous for one's career (examples: work well with different people - getting things done effectively through teams; problem-solving – applying FMEA or root cause analysis techniques to complex problems)

(G) Workplace Biases

- Ideally, all workplaces should be free of any biases with respect to gender, age, color, national origin, religious beliefs and others
- In reality, some workplaces are indeed better and more progressive than others in this respect
- Take proactive steps to avoid getting hurt by such possibilities

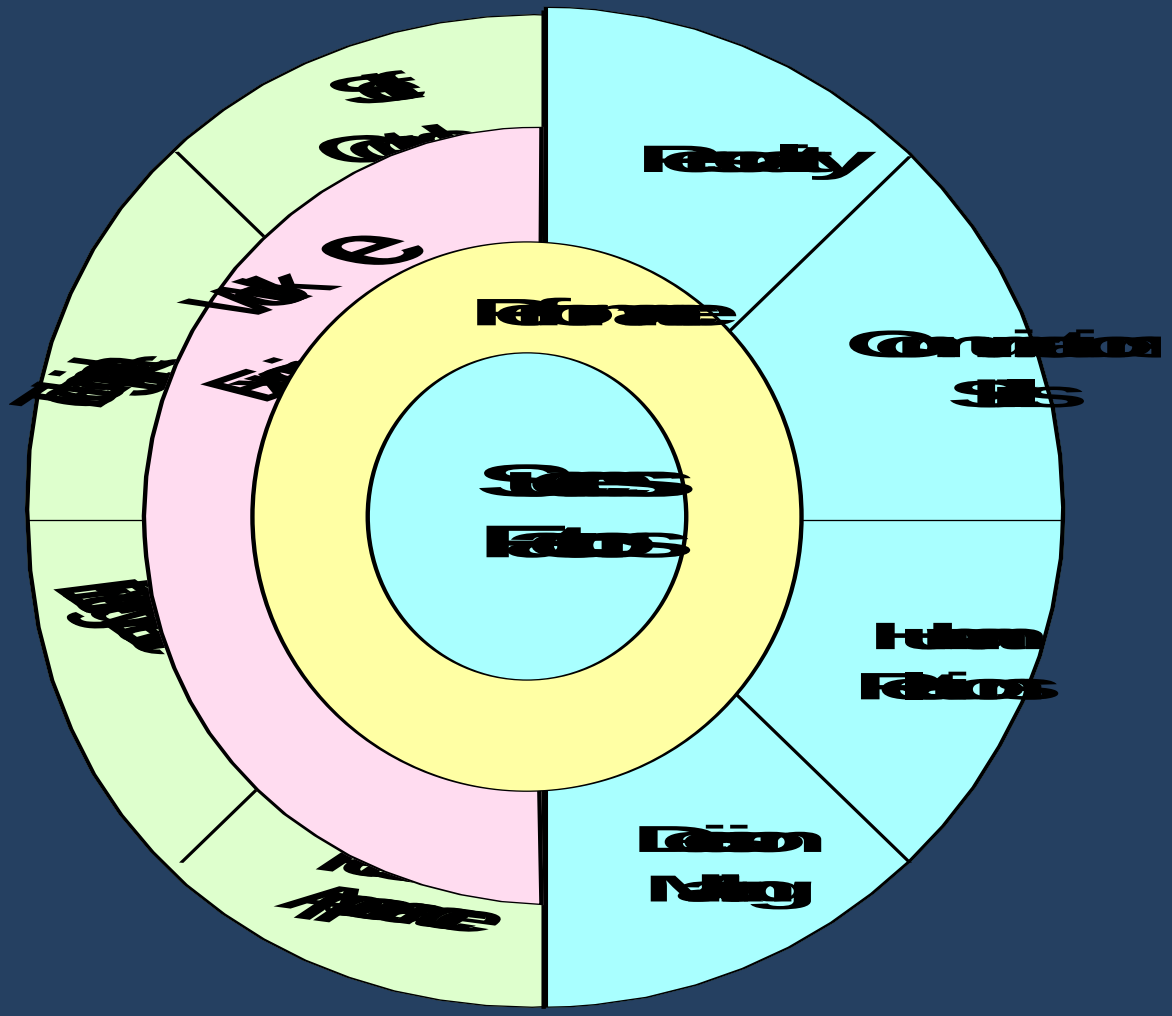
Question # 10.12

- Everyone works for a boss in industry. The boss factor is extremely important, as it directly affects a person's career progression. On the other hand, every one has specific values, basic beliefs and certain fundamental principles, which must be honored and upheld all the time and under any circumstances. Are there guidelines on how to effectively manage own boss?

Question # 10.14

- Some engineers and managers are known to have more difficulties in interpersonal relations than other. How can they improve their interpersonal skills?

What Takes to be Successful in Corporate America



Success Factors

- (A) **Performance** - Make sure that each and everyone of assignment is done well - "You are only as good as your last performance."
- (B) **Personality** - How one acts and behaves is important. One should project a mature, positive, reasonable and flexible personality

Success Factors (cont'd)

- (C) **Communications Skills** - Ability to communicate is important for promotability, particularly writing concerning readability, correctness, appropriateness and thought
- (D) **Human Relations Skills** - Interact with people to create and maintain acceptable working relationships, avoid being labeled "Not working well with people"

Success Factors (cont'd)

- (E) **Make Tough Decisions -** Take prudent risks and make the tough plays
- (F) **Work Experience** - Build up own work portfolio with diversified experience and high impact assignments
- (G) **Self Control** - Stay cool and be able to withstand pressure and stress, having high tolerance to frustration

Success Factors (cont'd)

- (H) **Technical Skills/Ability** - Capabilities need to be kept marketable
- (I) **Health and Energy Level** - Take care of own health and maintain physical vitality
- (J) **Personal Appearance** - To fit into the corporate image by following the boss's example

Career Strategy for the 21st Century

- Think, speak, act and walk like an entrepreneur - entrepreneurial mindset
- Embrace change as an opportunity for growth, “Eager to stay, yet ready to leave”
- Be visionaries and detail-oriented
- Know own strengths and weaknesses, be competitive, and set high standards for self
- Build alliances and stay connected

Career Strategy for the 21st Century(cont'd)

- Avoid specialization in favor of adaptability, cross-functionality, people skills, and a solid customer focus, learn fast to do new things or partner with someone who knows
- Stay professionally active and keep skills marketable
- Maintain work/life balance - "Earn a living, make a life"
- (Source: James F. Kacena, "New Leadership Directions," The Journal of Business Strategy, March/April 2002)

Summary and Conclusions

- “Rules of thumb” from experience are worth knowing
- Constantly reading to reinforce one’s conviction in the values of noted leadership profiles
- Practicing them until the preferred behavior becomes ones’ second nature

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Question # 10.3

- Hoffman, author of “Prescription for Transitioning Engineers Into Managers,” Engineering Management Journal (September 1989), believes that a management education program should have three elements:
- (1) **Behavioral** – People skills (motivation, team building, communications and delegation).
- (2) **Cognitive** (production, marketing, finance, control).
- (3) **Environmental** (markets, competition, customers, political, social and economical environment in which the organization operates) The first two elements appear to be self-evident. Explain why the third element, the environmental, is important?

Question # 10.4

- How is engineering management different from management in general?

Question # 10.5

- How to become a good boss? What are things the boss should and should not do?

The Engineer of 2020

- National Academy of Engineering, Washington D.C., <nas.edu>, Published a Phase 1 Report: "The Engineer of 2020"
- Eleven "Attributes of Engineers of 2020":

(1) Strong Analytical skills, (2) Practical Ingenuity, (3) Creativity, (4) Communication, (5) Business & Management, (6) Leadership,

The Engineer of 2020

(7) High ethical standards, (8) Professionalism, (9) Dynamism,

(10) Agility, resilience, and flexibility,

(11) Life-long learning

The Engineer of 2020

- May be reground into 4 major categories:

  (1) Leadership (high ethical standards, professionalism, communication)

  (2) Technical capabilities (strong analytical skills, practical ingenuity, creativity)

  (3) Business and Management

  (4) Drive to excel (dynamism, agility, flexibility, life-long learning)

- Indeed, these are the same attributes emphasized here