

**SYSTEMS**

<http://cba.unomaha.edu/faculty/mohara/web/LEAp11-SYSTEMS-handout.pdf>

*"For every complex problem  
there is an answer that is clear, simple, and wrong."*  
H. L. Mencken

*"Any intelligent fool can make things bigger and more complex.  
It takes a touch of genius - and a lot of courage to move in the opposite direction."*  
Albert Einstein

*"As far as the laws of mathematics refer to reality,  
they are not certain, and as far as they are certain, they do not refer to reality."*  
Albert Einstein

*"If people do not believe that mathematics is simple,  
it is only because they do not realize how complicated life is."*  
John von Neumann

*"Not everything that counts can be counted,  
and not everything that can be counted counts."*  
Albert Einstein

*"Two things are infinite: the universe and human stupidity;  
and I'm not sure about the universe."*  
Albert Einstein

*"Technological progress is like an axe in the hands of a pathological criminal."*  
Albert Einstein

*"Imagination is more important than knowledge."*  
Albert Einstein

*"We've taught you that the earth is round, That red and white make pink,  
And something else that matters more -- We've taught you how to think."*  
Dr. Seuss (*Hooray for Diffendoofer Day*)

Many, but far from all, of the items outlined below can be found discussed in:  
**Hayden, F. Gregory. *Policymaking for a Good Society: The Social Fabric Matrix Approach to Policy Analysis and Program Evaluation*. Springer: New York, 2006. ISBN-13: 978-0387-29369-1.**

- I. All excellent analysis focuses upon systems.
- A. Profit necessarily requires **at least three systems** ( $\pi = TR - TC$ ).
  - B. Ethics always involves **at least a multitude** of systems.
  - C. Complex socio-ecological systems necessarily engage complex socio-technological systems.
  - D. One tool for managing such analysis is the Social Fabric Matrix.<sup>1</sup>
- II. Systems analysis requires a **paradigm shift** away from **isolated transactions** and towards **interrelated processes**.
- A. Point of view is dependent upon a system of beliefs; and, that system of beliefs rarely either is inventoried or is acknowledged by the viewer.
    - 1. Context.  
An isolated zero sum transaction versus a linear flow versus a system (e.g.,<sup>2</sup> with feedback loops).
    - 2. Criteria.
      - a. What are the metrics of "good" and of "bad"?
        - i. For example, does "good" always increase when GDP increases?
        - ii. See also II.A.7.
      - b. Systems necessarily have competing arrays of explicit goals as well as competing arrays of implicit goals.
      - c. EXAMPLE: Sustainability.
        - i. **Strong sustainability.**  
Infinitely repeatable until an exogenous force alters the system.
- [I.] Does not require the assertion, but is totally consistent with the assertion, that human technology **can not** be a sufficiently close substitute for natural processes.  
(e.g., baby formula **can not** equal mother's breast milk)

<sup>1</sup> Hayden, F. Gregory. *Policymaking for a Good Society: The Social Fabric Matrix Approach to Policy Analysis and Program Evaluation*. Springer: New York, 2006. ISBN-13: 978-0387-29369-1.

<sup>2</sup> **NOTE: i.e. means that is whereas e.g. means for example.**

- II. A. 2. c. ii. **Weak sustainability.**  
 Is repeatability over a short long term  
 (i.e.,<sup>3</sup> *not* as long as an economist's long run).
- [I.] Weak sustainability does require the assertion  
 that human technology can be *at least* a  
 sufficiently close substitute  
 for natural processes  
 (e.g., baby formula *does* equal  
 mother's breast milk).
- [II.] An economist's *long run*  
 is an indeterminate clock time:  
 it is that period that starts when  
 fixed costs equal zero.
- [A.]  $TC = FC + VC$   
 (i.e., fixed cost plus variable cost)
- [B.] Recall I.A. and note II.A.4.b.
- iii. **Profitable.**  
 For period of firm's planning horizon  
 TR received equals TC paid.
- [I.] Recall that economists define profit in a variety  
 of ways. Recall specifically that economists  
 focus on the explicit and the implicit purchase  
 of four resources (i.e., land, labor, capital, and  
 entrepreneurial ability) and, respectively, the  
 four payments for those resources (i.e., rent,  
 wages, interest, and **normal profit**).
- [II.] To discuss "profitable"  
 requires specific attention to the following.
- [A.] Whether a mere accounting profit  
 (i.e.,  $\pi_A$ ) is obtained?
- [B.] Whether the obtained accounting  
 bottom line (be that an accounting profit  
 or an accounting loss) satisfies the  
 requirements of normal profit (i.e.,  $\pi_N$ )?
- [C.] Whether an economic profit  
 (i.e.,  $\pi_A > \pi_N$ ) has been obtained?
- [D.] Whether an economic loss  
 (i.e.,  $\pi_A < \pi_N$ ) has been obtained?
- [i.] Note II.A.5.d.i.[I.][A.].

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NOTE: i.e. means that is whereas e.g. means for example.

- II. A. 2. c. iii. [III.] Note particularly II.A.4. and II.A.6. and II.B.2.
  
- II. A. 2. d. Power, law, and ethics serve different functions as criteria.
  - i. In this document, the words "can" and "might" will be used to identify the criteria power to act.
  - ii. In this document, the words "may" and "may" will be used to identify the criteria law (i.e., authorized behavior).
    - [I.] A legal duty may exist when you can not act (i.e., you lack the power to act).
    - [II.] For a mere legal person (e.g., corporation) it is correct to write that the power to act requires legal authorization (e.g., *Ultra Vires* doctrine). Accordingly, resist the temptation to write "the corporation can" rather than write "the corporation may" except in those circumstances when it is critical to distinguish an unlawful exercise of physical power to act from a lawful authority to act.
  
- II. A. 2. d. ii. [III.] But, for a natural person (i.e., human) given the importance of II.A.2.d.iv. below it is very helpful to write "can" and "may" as appropriate for the context.
  - iii. In this document, the words "should" and "ought" will be used to identify the criteria ethics.
    - [I.] An ethical duty can not exist if you can not act (i.e., power to act is a prerequisite of an ethical duty).
  - iv. While creation of law routinely is guided by ethics, what is legal is not necessarily ethical; nor *visa versa*.
    - [I.] Creation of law routinely is both temporally remote and culturally remote from the application of law (i.e., what was ethical for "them" then is not necessarily ethical for "us" today).
    - [II.] Law is a tool designed to be applied to groups (e.g., legal duty is reasonable relative to the Reasonable Person) but law is applied to individuals (e.g., natural person within a corporation).

- II. A. 2. d. iv. [II.] [A.] When all persons are acting lawfully when a corporation acts, then, legally, typically, only the corporation "acts" even though acts of multiple natural persons are necessary for that corporate action.
- II. A. 2. d. iv. [II.] [B.] Recall the difference between II.A.2.d.ii.[I.] versus II.A.2.d.iii.[I.]
- [III.] Law usually focuses upon objective knowledge (i.e., either receipt of notice or reason to know) while ethics solely focuses upon subjective knowledge (i.e., actual knowledge [a.k.a., *scienter*]).
- 3. Consequences.
  - a. Feasible.
    - i. Reality.
    - ii. Reasonable expectations.
    - iii. Actually expected.
    - iv. Known knowns versus known unknowns versus unknown knowns versus **unknown unknowns**.
    - [I.] **If the set of unknown unknowns is not a null set, then is the set of known knowns a null set?**
  - b. Countable.
    - i. Ought we count 0, 1, 2, 3, 4;  
or,  
ought we count 0, 1.62, 2.72, 3.14, 4.67?
  - c. Counts.
- II. A. 4. Social: is it "us" versus "them"; or is it "us" and "them"?
  - a. Who are "us" and who are "them"?
    - i. Are "them" necessary for "us"?
    - ii. If II.A.4.a.i. is true, then is the distinction between "us" and "them" specious?
  - b. When are "us" and when are "them"?

- II. A. 4. b. i. Int**RA**-generational transfers (e.g., unemployment insurance).
- ii. Int**ER**-generational transfers (e.g., infrastructure).
- iii. Rule of 72: see, II.B.2.
- c. What are "us" and what are "them"?
  - i. Prioritization of life forms: but, recall II.A.4.a.ii..
- II. A. 4. d. Where are "us" and where are "them"?
  - i. To what extent, if any, are "us" three dimensional beings in a four dimensional time/space; and are "them" identical in that regard?
  - e. Be here now.  $\approx 11! * 20! * 13! \approx 6.0 \times 10^{36}$  meanings.
    - i. Note II.B.iii.
- 5. Technological.
  - a. **Technology** is a combination of idea(s) and physical embodiment(s).
  - b. **Technology** is the feasible combination of inputs.
    - i. Knowledge.
      - [I.] Recall the sources of "labor specialization" from economics: ability, time on task, and learning.
    - ii. Skills.
    - iii. Tools.
  - c. Implicit blinders (e.g., See {literally} *My Dinner with Andre*).
    - i. Can not see (e.g., II.A.3.a.iv.; especially [I.] )
    - ii. Acutely see.
      - [I.] The professional's blinders (e.g., thinking like a businessperson) facilitates focus both by minimizing distraction by low priority stimuli and by enhancing the visibility of high priority stimuli.
    - iii. Criteria of appraisal changed by change itself.
      - [I.] Unpredictable consequences.
        - [A.] Good idea experienced as bad consequence.

- II. A. 5. c. iii. [I.] [B.] Interplay of II.A.3.a.iv.[I.] with II.A.5.e.i. with II.A.5.f.i.[III.][A.][1.] with II.B.3. with III.A.1.a.
- [II.] *Contra*, Rawles' **veil of ignorance** supports creation of coherence across full range of known feasible changes.
- iv. **Coherent** criteria (i.e., stable across contexts) are superior criteria for appraisal.
- [I.] Money is objective rather than coherent.
- II. A. 5. c. iv. [II.] As scope of consequence increases both the coherence of objective criteria decreases and social urge to use objective criteria increases.
- [III.] Recall III.C.4.
- d. Implicit value structure.
- i. When is a technological change an "advance"?
- [I.] Schumpeter: creative destruction.
- [A.] Economic obsolescence involves use of the **Shut Down Rule**:  $TR < VC$ .
- [1.] Old technology becomes economically obsolete when  $AVC_{old} > ATC_{new}$ .
- [2.] Since economic obsolescence is triggered by events external to the firm it can arrive instantaneously and/or unexpectedly.
- [B.] Technological obsolescence is a functional question rather than a question of cost.
- [C.] Accounting obsolescence (e.g., terminal date of straight line depreciation) is an objective forecast of useful life that might or might not be linked in any way to either technological obsolescence or economic obsolescence.
- II. A. 5. d. i. [II.] Schumacher: contextual appraisal.

- II. A. 5. d. i. [II.] [A.] Far less than most often, bigger is cheaper (e.g., *Small is Beautiful*).
- [III.] Veblen: conspicuous consumption.
- [A.] Value is dependent both upon context and upon reflection within that context.
- ii. Which tool for change appraisal is correct?
- [I.] Static versus dynamic.
- [II.] Mechanical versus biological.
- [III.] Equilibrium versus chaotic.
- e. Law can not anticipate.
- i. Reasonable expectations are by definition historical.
- II. A. 5. f. Due to the relatively minimal constraints attributable to the physical embodiment component of technology, technology is an economically distinctive input.
- i. *Within bounds that are far less bounded than is ordinary, technological change often **incorrectly** is viewed as allowing economies of scale to be feasible.*
- [I.] Economies of **scale** = proportional increase in *all inputs* generates an increase in total cost but less than a proportionate increase in average cost; so that the LRATC falls as output rises.
- [A.] Recall economist's long run in II.A.2.c.ii.[II.].
- [II.] **Economies of size** = proportional increase in *most inputs* generates an increase in total cost but less than a proportionate increase in average cost; so that the LRATC falls as output rises.
- [A.] **MES**: minimum efficient size.
- [III.] Economies of **scope** (a.k.a., **network effect**) = proportional increase in the *market(s) generating and/or market receiving the inputs and/or the outputs* of a market participant generates a more than proportionate decrease in LRATC of that participant's output.

- II. A. 5. f. i. [III.] [A.] Within a process and across processes are linkages for obtaining inputs and sending outputs
- [1.] A **feedback loop** connects the past status of a system part both forward to one or more system parts as well as backward to that system part's future self.
- [B.] Feedback loops tend to accentuate other processes.
- [IV.] But, recall II.A.2.c.; especially recall II.A.2.c.i. versus II.A.2.c.ii.
- [V.] In these estimations of ATC (i.e., average total cost) how broadly (e.g., II.A.2.c.i.) is "total" estimated?
- II. A. 6. Ecological (i.e., relations and interactions between organisms and their environment [e.g., habitat], including other organisms).
- a. What is the priority ranking of every life form?
- i. Which life forms on Earth are *sine qua non* for human life?
- ii. Recall II.A.4. and recall II.A.5.f.i.
- II. A. 6. b. Can rape be stewardship?
- i. **Private goods**, generically, are notable for their characteristics of rivalry of consumption and exclusivity of possession.
- ii. **Public goods**, generically, are notable for their characteristics of externalities springing from muted characteristics of rivalry or of exclusivity.
- iii. Waste (i.e., real property law) is a breach of a legal duty or of legal duties.
- [I.] **Waste** is misappropriation of the ownership rights of either concurrent or subsequent owners.
- c. What are the minimum feasible number of generations for an evolutionary consequence in a life form (i.e., what is minimally necessary fraction of total population that must carry a gene; as well as what is the relevant average fecundity)?

- II. A. 6. c. i. Is it the "seventh generation of the seventh generation"?
- [I.] E.g., approximately 266 years if assuming Thomas Jefferson's generational estimate of 19 years times 14 generations.
- [A.] See, II.B.2.a.iv.[I.].
- ii. How does the metric "generation" vary across life forms?
- [I.] Which existing technologies have generated an evolutionary consequence in some life form (e.g., antibiotic resistance)?
- [II.] Which technologies have done so in humans (e.g., speech has; but not [?yet?] graphs)?
- II. A. 6. c. ii. [III.] Given how you answered II.A.6.c. and II.A.6.c.ii, relative to which other life forms on Earth, moving into the future, do humans have and do humans not have an advantage over most other life forms for gaining beneficial evolutionary consequence?
- II. A. 7. Positivist versus Normative.
- a. Recall Einstein counting.
- b. Science strives to be positivist and science strives to minimize being normative.
- c. **Positivism** (a.k.a., *scientific method*) seeks to avoid values (e.g., observer bias) and instead seeks to solely focus on **facts**.
- i. *Facts* are asserted to be objective (i.e., perception of a Reasonable Person) rather than to be subjective (i.e., natural person's personal perception).
- ii. *Facts* exhibit consistency of perception across different observers.
- [I.] Opinions are subjective; and the mean opinion has a relatively larger variance.
- [II.] In a court of law the opinions of experts are accepted as if *fact* because the opinions of experts cluster sufficiently tightly to warrant judicial acceptance.

- II. A. 7. d. **Normative**  
explicitly recognizes and seeks to inventory  
the values explicit and implicit in all *facts* (e.g., GDP, profit).
  - i. Normative asserts  
it is impossible to extinguish observer bias.
  - ii. Normative asserts  
that the *choice* of the *facts* is *inherently normative*.  
[I.] But note, New York Senator Daniel Patrick  
Moynihan, former U.S.A. Ambassador to the  
U.N., was fond of observing that  
*"Everyone is entitled to his own opinion,  
but not his own facts."*
- e. See also II.A.2.a.
- II. B. Each conception of time influences what is perceived.
  - 1. Stream of time.
    - a. Unidirectional causation (i.e., past then present then future).
    - b. **Clock time** is an artificial human abstraction created to  
foster positivist objective perceptions. See below, V.K.
      - i. An advantage of clock time is that its units are  
infinitely divisible and infinitely aggregatable.
  - II. B. 1. b. ii. A disadvantage of clock time is that the unit of clock  
time selected for use during a study need not bear any  
relationship whatsoever to the process cycles being  
studied.  
[I.] There is a clear risk of specifying a unit of clock  
time that precludes the ability to perceive a  
process cycle being studied because the unit of  
clock time is vastly different (either larger or  
smaller) than the process cycle (e.g. study days  
when process cycle takes place in seconds; or  
study days when process cycle takes place in  
decades).
  - 2. Discounting of the dollar value of time.
    - a. Dollar value varies with magnitude of temporal separation.
      - i. E.g., **Rule of 72:**  
 $72 / i =$  periods to double or to halve a quantity via  
interest earned or via interest owed.  
[I.] That simple period interest rate,  $i$ , is written as  
an integer (e.g., 7.2 rather than 0.072).
    - ii. Helps answer II.A.4.b.

- II. B. 2. a. iii. Typically ignores both II.B.3. as well as typically ignores III.A., III.B., and III.C.
- iv. Discounted present value routinely requires an implicit assumption that rarely is accurate: if ever accurate.
  - [I.] At 7.2% simple annual interest, a debt of \$1 borrowed today and payable at the end of 10 years is doubled as a debt by the debt's interest payment of \$1; similarly, in this way, at 7.2% simple annual interest a \$1.0 x 10<sup>6</sup> cost imposed 276 years in the future is today worth but \$1.0 x. 10<sup>-2</sup>.
- II. B. 2. a. iv. [I.] [A.] When a future cost (e.g., externality) is currently estimated and discounted, *rarely* is a **sinking fund** currently created and that penny deposited so in that future 276 years hence that future million dollar harm is compensated (e.g., II.A.4.b.ii.).
- II. B. 2. b. Time preference.
  - i. Discounting implicitly prefers the present over the future.
  - ii. Adequate deposits into a II.B.2.a.iv.[I.][A.] sinking fund *might* reflect a balanced time preference rather than a biased time preference.
- II. B. 2. b. iii. Given II.A.3.a.iv.[I.], use of II.B.4.b.i. might be required to demonstrate a balanced rather than a biased time preference.
- 3. **Synchronicity.**
  - a. *Sequencing* of process inputs and outputs.
    - i. Time is certain to be:
      - [I.] Linear;
      - [II.] Cyclical (e.g., feedback loop); **and/or**
      - [III.] Alternating (e.g., contextually defined directionality for a feedback loop).
  - b. *Punctuality* of process inputs and outputs.

- II. B. 3. c. *Duration* of process inputs and outputs.
- d. *Coordination* of process inputs and outputs.
- 4. Preferences for risk and preferences against risk.
  - a. Speaking technically, "uncertainty" does not equal "probability"; nor does "uncertainty" equal "risk".
    - i. Rarely will you encounter a human who consistently speaks technically about hazard, reward, uncertainty, probability, and/or risk; instead humans routinely substitute one for the other.
    - ii. **Hazards** and **rewards** are consequences, the former negative and the latter positive.
- II. B. 4. a. iii. **Uncertainty** (duh!) is a lack of certainty: that is, a context where it is not possible either to identify the different feasible consequences or it not possible to measure the relative frequency of the different consequences.
  - [I.] Recall II.A.3.a.i.[I.].
  - [II.] Some assert that randomness is a prerequisite for certainty and probability.
  - [III.] Is there ever certainty?
  - iv. **Probability** exists when it is both possible to identify the different consequences and possible to measure the relative frequency of the different consequences (e.g., likelihood).
  - v. **Risk** = deviation from expected probabilities mathematically coupled with the rewards and the hazards.
    - [I.] Does the Bayesian decision tree display risk, uncertainty, or neither?
- II. B. 4. b. **Risk Averse** = decision maker prioritizes avoidance of large hazards; thus, voluntary acceptance of large risks requires rewards to be disproportionately larger (since probabilities are assumed not alterable).

- II. B. 4. b. i. **Precautionary Principle** =  
for major risks shared broadly (e.g., externalities) the decision maker ought prioritize avoidance of worst case outcomes even if probabilistic assessment forecasts profitable risk taking both for the individual decision maker and for the broader social context.
- II. B. 4. c. **Risk Neutral** =  
voluntary acceptance of all risks as long as hazards and rewards track proportionally with the risk.
- i. Economics, seeking to be positivist, assumes a rational person and then assumes all rational persons are risk neutral.
- [I.] Based upon the flip of fair coin, what reward do you require for you to voluntarily accept your slavery as a hazard?
- [A.] Are you risk neutral?
- [B.] Are you rational?
- II. B. 4. d. **Risk Seeking** =  
decision maker prioritizes large rewards over smaller rewards, thus voluntary acceptance of large risks does not require rewards to be grow proportionately with risks.
- i. Small rewards tend to be assimilated by the current context without fundamentally transforming the current context; whereas, large rewards tend to transform the current context, and that change in context is what is desired rather than the reward itself.
- ii. PowerBall probabilities are 1 in  $2.0 \times 10^8$  with gross rewards rarely as good as  $\$1.0 \times 10^8$ ; and yet very many tickets are sold at  $\$1.0 \times 10^0$ : who buys PowerBall tickets and why?
- [I.] Note how PowerBall as an example of risk seeking incorrectly uses the concept of risk in the routine manner of that common error.
- II. B. 4. e. What is a **Black Swan**?
- i. What are the differences in consequences between a positive Black Swan and a negative Black Swan?

- II. B. 4. f. When is a characteristic:
- i. **random?**
- [I.] Recall II.B.4.a.iii.[II.].
- II. B. 4. f. i. [II.] The definition of *random* varies by the purpose of the definition. Generically, random means having no specific pattern, purpose, or objective. Statistically, random means of or relating to a type of circumstance or event that is described by a probability distribution. Here, *random* means a specific statistical pattern (i.e., normal curve).
- ii. **chaotic (e.g., *Butterfly Effect*)?**
- [I.] Some assert the *Butterfly Effect* necessarily violates Newton's Laws of Motion (i.e.,  
 1st inertia;  
 2nd  $f=ma$ ; and  
 3rd equal and opposite reaction)  
 and/or  
 violates Newton's Laws of Thermodynamics (i.e.,  
 1st conservation of energy;  
 2nd entropy in a closed system; and  
 3rd absolute zero not reached).  
 Instead, the *Butterfly Effect* functions via processes that are context dependent (e.g., H<sub>2</sub>O solid below 0° C and gas above 100° C) due to catalytic agents and feedback loops.
- II. B. 4. f. ii. [II.] **Chaos theory** posits that dynamic systems (simple or complex) exhibit a system characteristic of sensitivity to initial conditions; such sensitivity being very responsive to any uncertainty. Risk rapidly escalates and compounds.
- [A.] Some systems have predictable properties, others do not.  
 An example of a predictable property is the *Butterfly Effect*: a major variation in consequence due to a minute variation in inputs.
- [B.] Recall, opposite view in *Coase's Theorem* at III.D.4.
- iii. unpredictable?
- [I.] *Uncertainty* is only one form of unpredictable.

- II. B. 4. f. ii. [II.] Recall II.A.5.c.iii.[I].
- iv. Recall II.A.3.a.iv.[I].
  
- III. A network as a context for consequence alters the array of feasible consequences.
  - A. *Size.*
    - 1. Maximum size of an individual part is exceeded by aggregation of individual parts.
      - a. Across multiple dimensions, ***the whole is greater than the mere sum of the parts.***
    - 2. Recall relative consequences discussed in II.B.2.a.iv.[I.] as well as in II.B.4.b.i.
  - B. *Scale.*
    - 1. Proportional increase in output with proportional increase in *all inputs* is more feasible and more likely with aggregations of units versus with individual units.
  - C. *Scope.*
    - 1. Classic definition of *network effect* springs from scope.
    - 2. *Proximately caused* (i.e., reasonably foreseeable) consequences both on distant processes and in distant systems via alteration of *synchronicity* across *feedback loops*.
  
- III. C. 3. *Scope* consequences alter:
  - a. parts,
  - b. subunits,
  - c. aggregations of parts and of subunits, and/or
  - d. the whole.
  
- III. C. 4. *Scope*, with no change in technology, can be similar in consequence to a change in technology (i.e., change in the *feasible* combination of inputs).
  - a. *Feedback loops* can alter positively and can alter negatively what is feasible.
  - b. Recall II.A.5.
  
- D. Optimization.
  - 1. Whose utils are to be maximized?
    - a. Recall II.A.4.
  - 2. Benefit / Cost Analysis.
    - a. What are the implicit values expressed when the ratio is phrased as benefit/cost versus phrased as "cost/benefit"?

- III. D. 2. b. Is the mathematical interpretation of the ratio benefit/cost substantially similar to the interpretation of the ratio cost/benefit?
3. *Pareto Optimality*:  
change only is "good" if improve one without harm any.
- a. Contrast with *Pareto Principle*:  
20% of inputs yield 80% of outputs.
4. *Coase Theorem*:  
**if** few transactions  
**and if** small transaction costs individually and in aggregate,  
**then** (*but not so if either of the above ifs is not satisfied*)  
initial allocation does not preclude efficient end allocation  
via market transactions.
- a. *Coase Theorem* helps define the efficient boundary between  
the firm and the market.
- b. Coase Theorem is routinely ***mis***applied  
to justify gross inequalities coupled with  
governmental non-response (e.g., externalities).
- III. D. 5. Cobb-Douglas function:  
 $Y = A L^\alpha K^\beta$   
where  
Y = total production; A = *total factor* productivity;  
L = labor;  $\alpha$  = elasticity; K = capital; and  $\beta$  = elasticity.
- a. These elasticities are used to define economies of scale.
- III. D. 6. Subunit optimization at the expense of the whole becomes a  
discrete source of subunit "profit".
- a. Also known as the ***principle / agent problem***.
- b. Can be explored from the perspective of ***rent seeking***.
- E. *The Tipping Point: How Little Things Can Make a Big Difference* by  
Malcom Gladwell. ISBN: 0316346624. HM1033 .G53 2002.
1. **Law of the Few.**
- a. ***Connectors*** to facilitate transmission.
- i. In Milgram's Omaha-to-Boston  
***six degrees of separation*** a few connectors were  
responsible for half of the deliveries.

- III. E. 1. a. ii. The age of information, paradoxically, also is the *age of isolation*.
  - [I.] As information flow increases, especially when the flow exceeds the channel capacity *immunity* to communication via that channel sets in.
    - [A.] A decrease in the cost of a mode of communication tends to trigger both an increase in the quantity of communication via that mode as well as an increase in the *immunity* of recipients via that mode.
      - [1.] *Fax effect* and *law of plenty*.
    - [II.] As immunity sets in the relative importance of *word of mouth* communication increases.
    - [III.] Immunity is stimulated when the recipient of a communication experiences conflict between the recipient's internal word view and the external world view being communicated.
  - b. **Mavens** collect and transmit a vastly disproportionate amount of information.
    - i. The relative importance of *mavens* increases as *immunity* increases along with *isolation*.
  - c. *Salesmen* perform the function of persuasion that is necessary for adoption.
- 2. **Sticky concept.**
  - a. Information washout via flooding unless information is memorable.
- 3. **Power of Context.**
  - a. Environmental conditions welcome or oppose transmission (e.g., seasonality in transmission of STDs).
  - b. Environmental conditions signal (e.g., *broken window effect*) receptivity to some transactions (e.g., crime).
  - c. Group awareness and involvement preserves, cultivates, and transmits stimuli.
    - i. Channel capacity constrains and focuses transmissions.

- III. E. 4. The interplay of the law of few, stickiness, and the power of context control the process of *diffusion*.
  - a. The sequence of adoption is:
    - [i] innovators;
    - [ii] early adopters;
    - [iii] early majority;
    - [iv] late majority; and finally
    - [v] laggards.
  - b. Early adopters perform the function of *translation* of the innovators' vision into a conceptualization concordant with the main stream so that the early majority feels comfortable making the adoption decision.
  
- IV. General Systems Analysis (GSA) prioritizes a focus on relationships, structure, and interdependency rather than a focus on constant attributes of objects.
  - A. Openness, complexity, wholeness, hierarchy, and regulation set up those relationships, structure, and interdependence.
  - B. Within a dynamic whole a part functions differently than when the part is examined in isolation.
  
- V. Twelve Principles of Systems.
  - A. A system is a set of objects together with relationships between objects and their attributes.
    - 1. Objects are elements (e.g., parts, subparts).
    - 2. Attributes are properties (e.g., trigger levels and tolerance levels).
    - 3. Relationships connect with iterations (e.g., cycles of cycles).
      - a. Due to our Bounded Rationality we are prone to tell ourselves the lie of uni-dimensionality.
  - B. All systems are open (but, recall II.B.4.f.ii.[I.]).
    - 1. Openness is a flow (i.e., typically both inputs and outputs) between the system being examined and its environment.
    - 2. State of system influenced by flows.
    - 3. Environment routinely viewed as a *black box* that is source of:
      - a. Recall II.A.2.c.
      - b. Natural good production (e.g., forest);

- V. B. 3. c. Natural resources (e.g., oil);
  - d. Living Systems (a.k.a., Life Support Services [e.g., atmosphere]);
  - e. Sink Function (e.g., absorb and process human pollution).
- C. Systems are nonisomorphic (i.e., whole is greater than sum of parts).
  - 1. a.k.a., holistic.
  - 2. Rejects reductionist thinking of objects viewed in isolation.
- V. D. Systems stress equifinality.
  - 1. Posits multiple feasible paths rather than focus on equilibrium.
    - a. Forecasting the future (e.g., start with an ice cube and end with ?) is far easier than forecasting the past (e.g., now a puddle of water having started with ?).
  - 2. Recall *can* versus *may* versus *should* (i.e., power v. law v. ethics) at II.A.2.d.
- E. System components interact.
  - 1. Cultural values (e.g., Golden Rule versus invisible hand versus golden rule [there are two rules known as the "golden rule"]).
  - 2. Social beliefs (e.g., free will versus fate).
  - 3. Personal attitudes (e.g., risk preference).
- V. E. 4. Technology: recall II.A.5.
  - 5. Natural Environment (e.g., wild versus depleted).
- F. Systems operate within constraints imposed by the system's controls and the system's regulations.
  - 1. Magnitude of constraints vary.
    - a. Necessary.
      - i. If system part #A is necessary for system part #B, and if part #A is present, then part #B might or might not be present; but, if part #A is absent, then part #B is absent.
      - ii. Recall II.A.2.b. and recall II.A.3.a.iv.[I.]
    - b. Sufficient.
    - c. Adequate.
    - d. Viable.

- V. E. 2. Subsystem linkages provide additional venues for control and regulation.
- 3. Rules of control and rules of regulation are both alterable and interactive.
- V. F. 4. *Technology* interacts with control and regulation in a multitude of ways (e.g., *mechanism* for control versus *alters* controls).
  - i. Recall II.A.2. and recall II.A.5. and recall II.B.3. and recall III.C.4.
- V. F. 5. Social beliefs interact with control and regulation in a multitude of ways (e.g., view of what is feasible [e.g., USA racism prior to Martin Luther King]).
  - a. Law assumes a Reasonable Person. Recall II.A.5.e.
  - b. Economics assumes a Rational Person. Recall II.B.4.c.i.
  - c. Who is more likely to succumb to **group think**: a natural person, a legal person, a Reasonable Person, or a Rational Person?
- V. G. Systems contain hierarchies.
  - 1. Outputs of subsystems provide inputs to other subsystems and/or systems.
  - 2. Hierarchies increase scope of reasonably foreseeable (i.e., proximate cause) consequences.
- H. A system can be viewed via its flows, its deliveries, and its sequences.
  - 1. Threshold levels trigger reaction within or outside of the system.
  - 2. Tolerance levels when exceeded trigger transformation within or outside of the system.
  - 3. Recall II.B.3. and recall II.B.4.f.ii. and recall V.F.1.
- I. Feedback loops can be positive or negative.
  - 1. Positive feedback is self reinforcing.
    - a. If the flow is both above the threshold and below the tolerance levels, then the feedback loop fosters growth.
      - i. But, tendency towards instability and/or decay.

- V. I. 1. a. ii. A positive feedback loop can aggregate flow until the flow exceeds the tolerance level; potentially triggering unrestrained growth that collapses the system if that flow either consumes to exhaustion a source of inputs or produces outputs that swamp the system.
- b. Positive feedback often serves as both intra-system and inter-system communication.
- 2. Negative feedback is self-regulating and fosters goal direction.
  - a. The dampening consequences of a negative feedback reduce the likelihood of a run-away process.
    - i. Easily confused with Newton's 2nd law of thermodynamics at II.B.4.f.ii.[I.].
- V. I. 3. Stimulation of a system's feedback loops (either positive or negative) by a force external to the system can magnify the scope of consequences; feasibly triggering multiple system collapse if necessary subsystems either are starved of inputs or are swamped by inputs.
  - a. Recall II.B.4.f.ii.[I.] and recall II.A.5.c.iv.[II.] and recall II.A.5.f.i.[III] and recall III.C.
- V. J. Systems foster differentiation and elaboration.
  - 1. Evolution towards complexity (i.e., not entropy).
    - a. Note, Newton's 2nd law of thermodynamics at II.B.4.f.ii.[I.], uses the assumption of a closed system which is contrary to principle at V.B.
- V. K. Systems use real time rather than classical time.
  - 1. Newtonian time relies upon strict deterministic causality.
    - a. Contrast with equifinality, above in principle at V.D.
  - 2. Time is a social construct rather than a natural phenomena.
    - a. Focus on process synchronicity; not clock time.
      - i. Recall II.B.3.
- L. Evaluation of a system's objects, attributes, and relationships requires prior specification of values.
  - 1. Recall II.A.2. and recall II.A.7.
  - 2. System viability typically requires both sufficiency and redundancy.