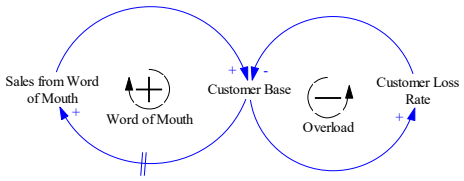
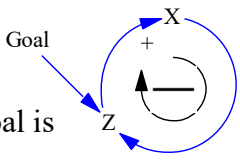
Business Dynamics Chapter 5-Causal Loop Diagrams (CLD)

- Notations
  - Variable
  - Link, Polarity and delay (+/- or **S**ame/**O**pposite), the rate of change comparing to ***what it would have been***
  - Loop (+/- or **R**einforcing/**B**alancing)



- Guidelines
  - Distinguish between Causation and Correlation
    - Ice cream sales, murder rate, and average temperature
  - Label link polarity with (+ or -), and label the loop polarity with  or 
    - Determine loop polarity (count number of "-" or trace the loop)
    - Loop polarity ::: the sign of the open loop gain: multiplying the partial differentials along the causal chain
    - Links should have unambiguous polarity (example: pressure to motivation)
  - Name and number the loops (e.q., B1 Corner Cutting, R2 Burnout, etc)
  - Indicate important delays (eq. Gasoline price and consumption)
  - Variable names should be nouns or noun phrases, use positive terms when possible.
  - Arrange CLD layout properly
    - Use curved lines (cured lines are easier to read than straight ones)
    - Arrange important loops as circles or oval paths
    - Minimize crossed lines
    - Don't put any other non-informative symbols
    - Redraw and iterate the modeling process
  - Choose right level of detail (Make it comprehensible to readers)
  - Do not put all loops in one diagram (the magic number 7±2)
  - Make the goals of negative loops explicit (explicitly specify how the goal is calculated)
  - Distinguish between actual and perceived conditions



- The Modeling Process
  - Problem definition
  - Identify key variables, along with their unit of measure

    - Develop the reference mode (depict the behavior of key variables with graphs or data)
    - Develop causal diagrams
- Limitations of CLD
    - Doesn't distinguish variable types (eq. stocks and flows)
    - There are tradeoffs between comprehensiveness and comprehensibility
    - In many circumstances CLD are shown for communication and discussion
- Cases:
    - Workload management (Ant vs. Grasshopper)
    - Adam Smith's invisible hand (modeling the loops of supply and demand)
        - Oil crises
        - Speculative bubbles
        - Market failure, adverse selection, and the death spiral (Medigap case)
    - Policy resistance in Traffic Congestion (Open loop (linear) mindset vs. Compensating feedback)
        - Build more roads
        - The Death Spiral to Mass Transit System
        - Impacts of technology

id est (i.e.): that is
in situ: in the original place
exempli gratia (e.g.): for example
et alii (et al.): and others
et cetera (etc.): And the rest
per se: through itself
ante meridiem (a.m.): before midday
post meridiem (p.m.): after midday
ceteris paribus: other things being equal

quod erat demonstrandum (Q.E.D.): which was to be demonstrated, 證明完畢

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voila: that's it
v.s. : versus
ps: post script
aka: also known as
cv: curriculum vitae

FYI: for your information 給你參考

ASAP: as soon as possible 愈快愈好

btw: by the way 順便一提

cc: carbon copy 副本抄送

répondez s'il vous plaît (RSVP): Respond if you please, Please reply