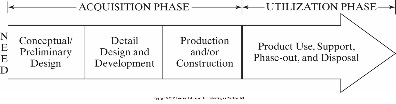
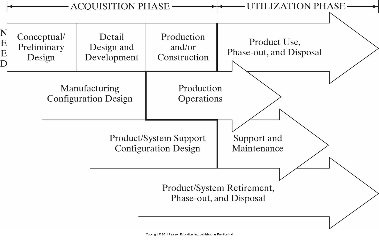
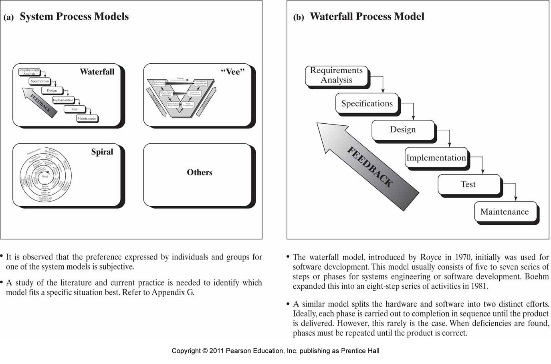
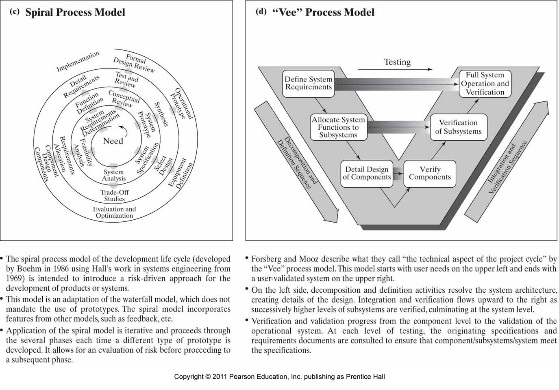
**System**

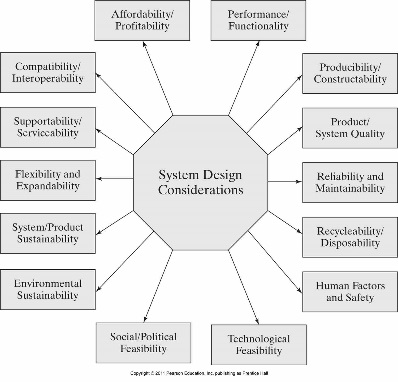
* elements are: a) *components*, b) *attributes*, and c) *relationships*
* *alter* either energy, information or materials
* can be either *natural*, or *man-made*
* can be either *physical* or conceptual
* are typically *static* or *dynamic*
* A set of interrelated components











**Problem statement**

* [relatively] non-technical
* Uses “language” of customer
* Non-complex

**Q’s to get well-made prob. stmt.**

* Q the customer
* Differentiate their needs and wants
* Explore project boundaries
* Do I/O analysis
* Preview user interface
* Survey design attributes
* Identify conflicting needs
* Prepare draft operations manual

**Sections of prob. stmt.**

* Background/overview
* Overall design [not detailed]
* Deliverables

**Prob. stmt. defines**

* Who, what, why (insight)

**Chars. of good prob. stmt.**

* Short, avoids defining soln., not short list of reqs.
* Captures essence of prob./ need, includes qual. & quant.

**Needs analysis**

* When, what (sys. do & primary & secondary functions), where, how often?

**Operational Requirements**

* Mission def, environ. factors, oper. lifetime/deployment, utilization reqs. (freq. of use, hrs. of oper., capacity), perf. params. (mass, volume, range, velocity), effectiveness (MTBM, MDT, MTBF)





**Identifying Technical Measures (TMPs)**

* *Quantitative* values describe performances that stem from op. reqs., are Design Dependent Parameters (DDP) [e.g., MTBF, MTTR, MDT, MTBM, etc.], include weight, envelope, availability to perform/function as designed

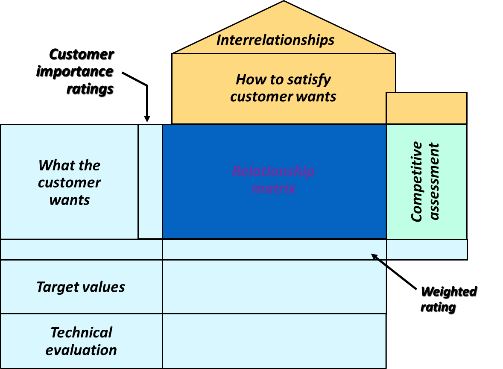
**Quality Function Deployment (QFD)**

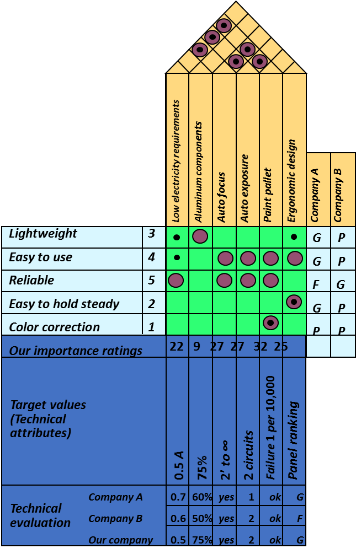
* (Dated) method to identify & capture prime desires of customer
* Uses cross-referenced matrices to perform comparisons of technical & design features resulting in weighted values for TMPs
* *Goal*: identify what customer wants, *predict*: how good/service/process will satisfy customer wants, *relate*: cust. wants to sys. hows, *evaluate*: importance ratings/values, *compare*: performance to desirable TPMs
* *Leads* designers into *preliminary design phase*, *paves* way for functional req. devel. (FFBDs), *allows* for functional allocation by partitioning major sys. elems., *permits* ident. of HW & SW items that multiple functions -> simplify overall sys. arch.

**System Design Flow**

* Abstract notion -> systemic form/function -> repeatable, producible system/product
* 4 design stages: concept.; system; prelim; critical (w/reviews)
* Design revs.: formal method of checking proposed design, provide common baseline for all project stakeholders, permits solving of any interface issues, creates record of design decisions & rationale, leads to greater prob. of a mature design for when production starts
* Reduces risk associated w/prod. phase w.r.t. meeting reqs.

**QFD “House of Quality”**





**Requirements**

* Statement that identifies a capability or function that is needed by a system to satisfy its customer’s needs
* *Functional*: what, how well, under what conditions one or more inputs must be converted to one or more outputs @ boundary in question to satisfy customer’s needs
* Customer’s needs: solve prob., achieve obj. (cntrct, stanrd, spec)
* 3 sys. eng. Tasks: get reqs; design; verify
* No two sys. are alike but uniform & identifiable process for logically discovering reqs.
* *Process is iterative*: reqs. emerge throughout sys. life cycle and change, customer: “I’ll know it when I see it”, stakeholder priorities change, low-level -> other reqs. become priority

