
**On an index card, in five lines or less
write your definition of:**

“PROTOTYPE”

PROTOTYPE

“Anything which approximates
the final product”

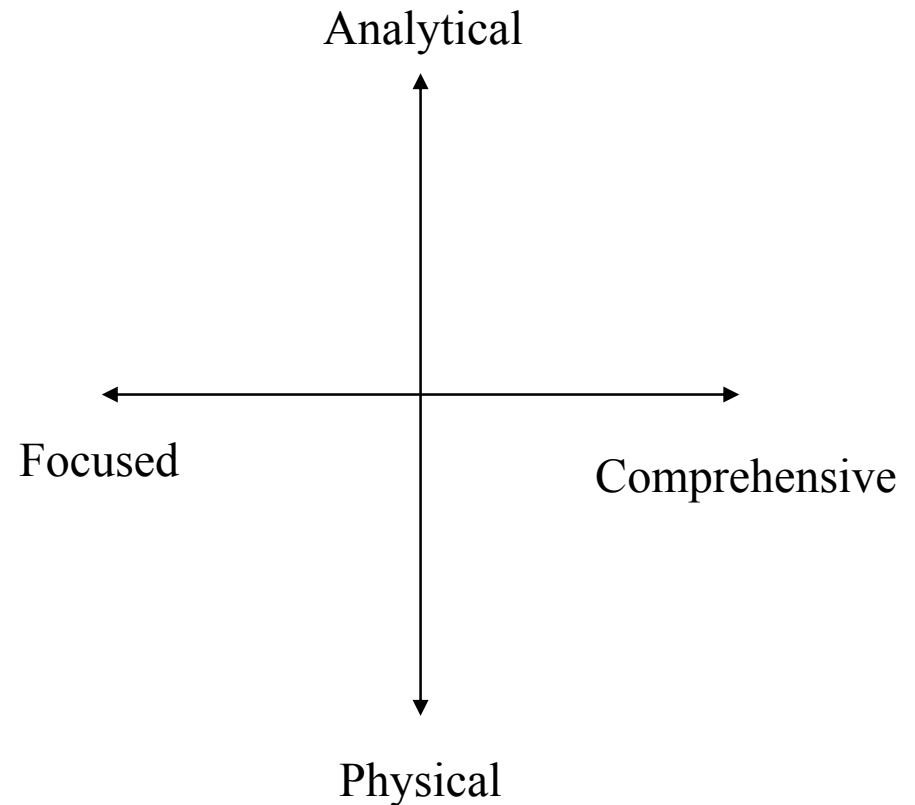
Ulrich & Eppinger, Chap. 10

WHY PROTOTYPE?

- **Because you wish you had final product...but are not there yet**
- **To reduce risk, increase probability of success**
- **But....cost time and \$....consider carefully**

ALL KINDS OF PROTOTYPES

- **Anything and everything can be called a “prototype”**
 - Sketch
 - Carved foam
 - Pro/E model
 - Computer simulation
 - Wire-wrapped board
 - Double (or half) scale
 - Functional/non-functional
 - Engineering model
 - Display model



EXERCISE

From Ulrich & Eppinger, Chap. 10

A furniture maker is considering a new line of chairs fabricated from large sheets of a new plastic which can be cut, bent and bonded. Using sheets of 8-1/2 x 11 card stock, create at least one prototype of a possible new chair design. You may sketch first, or just start in with the paper.

Do in sub-teams, max of 3 (preferred) or 4 per group.

Report back with results in 12 minutes.

STEPS TO SUCCESSFUL PROTOTYPING

- **Define the purpose(s) ⇒⇒⇒WHY**
- **Establish what is to be approximated (and what is not) ⇒⇒⇒WHAT**
- **Determine form of prototype ⇒⇒⇒HOW**
- **Set design/construction plan, determine cost
⇒⇒⇒WHEN**
- **Test, gather data ⇒⇒⇒TEST**

EXERCISE

Determine the PURPOSE of your next prototype(s).

Do as a team and write results in five lines or less on an index card. Report back with results in 4 minutes.

PURPOSE

- **Technical feasibility (internal)**
 - Convincing team that it will work
 - Fine tuning, working out the bugs
 - Typically done for a subsystem
 - “Engineering bench” model, “works-like” model
 - Prototype subsystem you have lease confidence in (strength, wear, speed, noise...)
- **Concept communication (external)**
 - Convincing outside stakeholders, or testing customer reaction
 - Focus group, trade show, upper mgmt meeting

WHAT/HOW TO PROTOTYPE

- **PURPOSE defines what**
- **Determine if works-like, looks-like or both**
- **Determine if more efficient to write equations, draw on computer....or just to get down in shop and build?**
- **Consider “virtual prototyping”**
- **Cheap/fast is good, and usually sufficient for purpose**
- **Watch out for time/\$ costs. Avoid hardware swamp**

PROTOTYPING THOUGHTS

- Dual prototypes common
- Better if designers can prototype (vs. techs)
- All stakeholders need to know what is real...and what isn't
- Do it early and often.
- Go for simple/cheap
- Foam-core, carved foam very effective for looks-like prototypes
- Don't mix PROTOTYPE with PRODUCT
- Test and/or gather customer reaction
- Try 1/2 or twice scale prototype

RAPID PROTOTYPING

- **New technology (~1990)**
- **“Art-to-Part”**: CAD model to physical model
- **Competing technologies, companies**
- **Good resolution; limited size and strength**
- **Best for small plastic parts with complex shapes**
- **U has Stratasys FDM 1650. For details consult MechE web page.**
- **WARNING:**
 - Time consuming (“rapid” is relative)
 - Can take several iterations

EXERCISE

Determine what your Design Show booth will look like. Highlight the prototype(s).

Do as a team. Draw a quick, annotated perspective sketch. Take 6 minutes then turn in.