FUZEHUB

# Hardware Prototyping Workshop

August 9, 2023

SUNY New Paltz

# Welcome

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# Introductions

- Name
- Company
- Product/Project

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# Workshop Goals

Provide participants with actionable takeaways that can be implemented short term to improve your product.

- Optimize your product design
- Lower product costs
- Increase your team's manufacturing knowledge for more confident discussions with suppliers
- Better product/process understanding for funding pitches
- Identify where you need resources outside of your team

# Agenda

1. Design Principles
2. Available Resources
3. Product Development Process
4. Bill of Materials
5. Business Support
6. Funding
7. Contract Manufacturing
8. Marketing for Manufacturers

**Plus:**

- **4 Workshops**
- **Facility Tour**

# Design Principles

Eric Fasser

FuzeHub

8:45 am

# Design Principles: Design for “X”

Consider your product’s design from many perspectives to optimize sales potential and profitability:

1. Customer Use / Market Acceptance
2. Manufacturability / Assembly
3. Durability / Reliability
4. Installation
5. Maintenance
6. Logistics / Packaging
7. Sustainability

# Case Study

- Successful product: high-end features, good margin
- In 2004, resin costs increased over 200%
  - Gross margin dropped to -30%
- Analysis revealed product was over-engineered
  - Extra thick components
  - Fastened with screws

# Case Study

- Option 1: Discontinue product (forfeit shelf space at retail)
- Option 2: Re-design product to lower cost
  - $Engineering
  - $Tooling
  - $New assembly procedures/training
  - $Testing
  - $Packaging
  - $Inventory replacement

# Case Study

**Tapered Shape** (nesting)

**Folding Handle** (shipping)

**Reverse Handle Rotation** (ergonomics)

**Gear Reduction Mechanism** (easier winding)

**Wrought Iron Design** (high-end, less resin, less pigment)

**Snap-Together Construction**

**Ground Level Hose Entry** (ease of use)

# Case Study: Design for “X”

1. Customer Use, Market Acceptance (aesthetics, ergonomics)
2. Manufacturability, Assembly (fewer parts, snaps)
3. Durability, Operating Environment (robust water system)
4. Installation, System Integration (swivel hose attachment)
5. Maintenance, Serviceability (2-piece basket)
6. Packaging, Logistics (nesting design, folding handle)
7. Sustainability (less resin, recycled packaging)

# Design for “X”

1. **Customer Use, Market Acceptance**
   - Does your product design consider the customer’s safety, comfort, ease-of-use, and ergonomic factors?
   - Are there any market regulations your product needs to comply with?
   - Does your product require any certifications, or are there certifications which (though not required) will help set you apart from competitors?

# Design for “X”

1. Customer Use, Market Acceptance
2. **Manufacturability, Assembly**
   - Are your components efficient to manufacture? Evaluate material trade-offs, alternate components, etc. using the Bill of Material (BOM).
   - Is your product efficient to assemble? Consider the Bill of Process (BOP) or Process Steps to evaluate things like labor requirements, both in-house (during the manufacturing process) and in the field (if any assembly is required by the customer).
   - Have you considered capital equipment and tooling costs associated with making custom parts, versus using off-the-shelf parts?
   - Have you thought about how you will deal with getting rid of scrap that is generated during the manufacturing of your product?

# Design for “X”

1. Customer Use, Market Acceptance
2. Manufacturability, Assembly
3. **Durability, Operating Environment**
   - Does your product design consider the potential impact of noise, vibration, and harshness (NVH) in the environment it’s intended to operate?
   - Have you considered loading conditions on your product from external sources?
   - Does your product need to be designed to handle things like extreme temperatures, excessive humidity/moisture, or exposure to UV light?

# Design for “X”

1. Customer Use, Market Acceptance
2. Manufacturability, Assembly
3. Durability, Operating Environment
4. **Installation, System Integration**
   - Is your product designed to be easily integrated into its intended setting?
   - Is it easy to install (example: interchangeable, symmetric parts that can be installed frontwards or backwards)?
   - Does the form, fit, and function of your product design meet all requirements of the environment/system it will be installed in?
   - Is your product designed to work with any related or dependent sub-systems?
   - Will any operating dynamics or transient impacts from connected components affect your product in a negative way?

# Design for “X”

1. Customer Use, Market Acceptance
2. Manufacturability, Assembly
3. Durability, Operating Environment
4. Installation, System Integration
5. **Maintenance, Serviceability**
   - Is your product designed in a way that makes it easy to replace high-wear components (like batteries)?
   - Is your product designed to be easily maintained and serviced?
   - Conversely, if you want your product to be a consumable, have you designed it to be difficult to repair versus being entirely replaced?

# Design for “X”

1. Customer Use, Market Acceptance
2. Manufacturability, Assembly
3. Durability, Operating Environment
4. Installation, System Integration
5. Maintenance, Serviceability
6. **Packaging, Logistics**
   - Is your product properly protected from damage and harsh environmental conditions (temperature, humidity, vibration, etc.) during shipping/storage?
   - Is your product optimized to ship efficiently (how many units per box /crate /pallet, how many will fit in a 53 ft tractor trailer, have you considered weight limits, etc.)
   - Have you considered how your product will make if from the shipping carton to the store shelf (if relevant)?

# Design for “X”

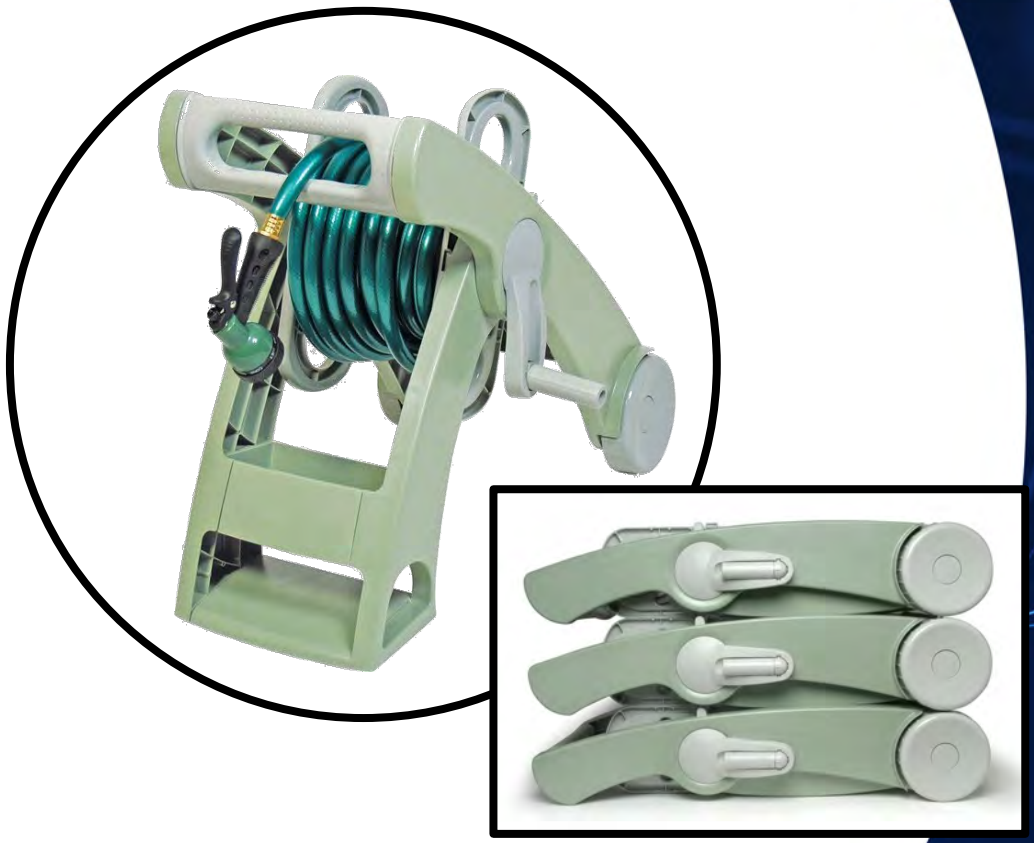
1. Customer Use, Market Acceptance
2. Manufacturability, Assembly
3. Durability, Operating Environment
4. Installation, System Integration
5. Maintenance, Serviceability
6. Packaging, Logistics
7. **Sustainability**
   - Is it important that your product uses bio-based materials or biodegradable components (especially packaging)?
   - Have you considered how your product would be recycled, reused, or refurbished?

# Design for “X”

1. Customer Use, Market Acceptance
2. Manufacturability, Assembly
3. Durability, Operating Environment
4. Installation, System Integration
5. Maintenance, Serviceability
6. Packaging, Logistics
7. Sustainability
8. **Other considerations specific to your product**
   - Think about other factors that are important in your industry, especially things that could set you apart from competitors, and incorporate features into your product design that take advantage of these.

# Design for “X”: More Examples


- Customer usage



- Logistics/Shipping

# Design Importance

- By making design adjustments / improvements **before** going into production, you will:
  - Save rework time
  - Minimize retooling costs
  - Avoid inventory scrapping costs
  - Ultimately sell more product

**Note about Intellectual Property (IP):**

- The process of making design improvements may uncover a feature or process that is novel, unique, or patentable