SETTING PRODUCT REQUIREMENTS

As practiced in ME 4054

(Ref: Chap. 5, Ulrich & Eppinger text)
SETTING PRODUCT REQUIREMENTS

When?

Identify customer needs → Establish target requirements → Generate concepts → Select concept → Refine requirements → Detail design, test, prototyping
Would you buy this stereo?

THX Ultra2 Certified • THX Surround EX; DTS Extended Surround Discrete 6.1; DTS ES Matrix 6.1; DTS Neo:6 Cinema & Neo:6 Music Matrix Decoding; Dolby Digital; Dolby Pro Logic; Dolby Headphone; DTS • Ultra2 7.1 Cinema and Music modes • Lucasfilm Home THX Cinema 4.0, 5.1 and 6.1ES post-processing; THX Surround EX decoding • DVD-Audio decoding with Adjustable Digital Bass Management, Delay, Channel Levels and Tone Controls, through DENON Link or External Analog Inputs • DDSC-Digital featuring New dual Analog Devices HammerHead SHARC 32-bit floating point DSP processors • 7 Channels equal power amplifier section • 170 watts per channel (8 ohms, 20 Hz-20 kHz, <.05%THD) • 200 watts per channel (6 ohms, 20 Hz-20 kHz, <.05%THD) • 24 bit, 192 kHz A/D conversion (Burr-Brown PCM-1804 x 4) on all analog inputs, including External 7.1 inputs • 16 Burr-Brown PCM-1738E 24-bit, 192-kHz highest resolution DACs, with DSD compatibility - each audio channel operating in differential mode • Pure Audio mode, features 4 DACs per audio channel in dual-differential mode • ALPHA 24 Processing Plus in Stereo/Direct/Pure Direct modes (left/right channels) • 4 24 bit,192 kHz Digital Interface Receivers • 3 sets component video inputs, compatible with wideband (480p, 720p, 1080i) response for progressive DVD, DTV (100 MHz) • 8 sets composite and "S" video inputs • Video Conversion of Composite to S-Video and/or to Component • 1 AC-3 RF digital input for laser disc • TWO sets of 7.1 external wide bandwidth (100 kHz) inputs for multi-channel formats with full Bass Management(defeatable) • 11(5 Coax, 6 Opt.) assignable digital inputs • 8 Channel Digital External Inputs • 13 analog inputs including built-in AM/FM tuner • Multi-Zone 1 stereo pre-amp outputs with video output • Multi-Zone 2 outputs, pre-amp outputs or speaker outputs • RS-232C port for external controllers • Remote In/Out Ports • 12 and 5 volt triggers • DENON Link, for connection to DVD-9000 • Variable high/low pass Crossover 40/60/80/100/120 • Audio Delay adjustment to match audio signals with video signals(0-200ms) • Digitally regulated volume control with .5dB increment adjustments and step range of -80 to +15 • Delay time adjustment increased to 20 feet per speaker in .1 foot increments • Auto Surround Mode stores modes by signal type(analog or digital) in memory • AKTIS RC-8000 LCD touchpanel remote with IR and RF transmission capability included • AKTIS RC-8001ST Charger/RF Base Station included • Download the owner's manual in PDF format • Dimensions: 17.1"w x 8.5"h x 19.1"d • SRP $4300
DEFINING PRODUCT REQUIREMENTS
(a.k.a. Product Specification or Product Design Specification)

- A documented statement of what the product is to do
- Living document, but defined early
- Driven by customer needs
- Shows what you are trying to achieve
- Contains:
  - List of Customer Needs
  - Design Specifications
Establishing Target Specifications

1. Prepare a list of metrics
2. Collect competitive benchmarking information
3. Set *ideal* and *marginally acceptable* target values
4. Reflect on the results and process
METRICS (I)

- The design criteria
- Should be:
  - Practical
  - Achievable
  - Easy to understand
  - Derived from a customer need
### METRICS (II)

#### “Hard”

<table>
<thead>
<tr>
<th>Need</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Must fit in a toolbox</td>
<td>Size</td>
</tr>
<tr>
<td>Wants to pick up</td>
<td>Weight</td>
</tr>
<tr>
<td>Concerned with cost</td>
<td>Cost</td>
</tr>
</tbody>
</table>

#### “Soft”

<table>
<thead>
<tr>
<th>Need</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>For DIY market</td>
<td>Easy to assemble</td>
</tr>
</tbody>
</table>
Target values

- **Numeric....with units**
  - 4.0 lbs, or 2 by 2 ft, or 20$

- **Express target as:**
  - Exact ($20)
  - Less than (< $20)
  - Greater than (> $20)
  - Range ($20-$30)
Example: Product Specifications for Cordless Screw Driver

<table>
<thead>
<tr>
<th>Metric #</th>
<th>Need #’s</th>
<th>Metric</th>
<th>Importance</th>
<th>Units</th>
<th>Marginal Value</th>
<th>Ideal Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Battery capacity</td>
<td>4</td>
<td>V</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Size: length</td>
<td>3</td>
<td>cm</td>
<td>&lt;20</td>
<td>&lt;18</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Size: width/diameter</td>
<td>3</td>
<td>cm</td>
<td>&lt;8</td>
<td>&lt;6</td>
</tr>
</tbody>
</table>
# SOME MORE METRICS

<table>
<thead>
<tr>
<th>Time-to-market</th>
<th>Manufacturing facility</th>
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</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Prototyping facility</td>
</tr>
<tr>
<td>Users</td>
<td>Regulatory environment</td>
</tr>
<tr>
<td>Storage life</td>
<td>Reliability</td>
</tr>
<tr>
<td>Service life</td>
<td>Patents</td>
</tr>
<tr>
<td>Product life</td>
<td>Test protocol</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Safety</td>
</tr>
<tr>
<td>Warranty</td>
<td>User interface</td>
</tr>
<tr>
<td>Shipping size</td>
<td>Mfg cost</td>
</tr>
<tr>
<td>Packaging</td>
<td>End-user price</td>
</tr>
<tr>
<td>Materials</td>
<td>Delivery time</td>
</tr>
</tbody>
</table>
Establishing Target Specifications, redux

1. Prepare a list of metrics
2. Collect competitive benchmarking information
3. Set *ideal* and *marginally acceptable* target values
4. Reflect on the results and process
Establishing Final Specifications

1. Develop a technical model of the product
2. Develop a cost model of the product
3. Refine the specifications, making trade-offs where necessary
4. Flow down the specifications as appropriate
5. Reflect on the results and the process
Bottom line

- The design requirements must:
  - reflect customer need
  - differentiate the product from the competition
  - be technically and economically feasible

Sandy Cutler, CEO of Eaton, asks his engineers:
- Is the customer asking for it?
- What differentiation does it offer Eaton?
- What value does it offer the customer?