Concept Design: Analysis & Evaluation

- Analyzing alternative designs
- Evaluating ""
- Information flow & storage
- Intellectual property protection

Design concept

Def- abstract embodiment of a: physical principle, material, and geometry.
Analyzing = “predicting” and “screening”)

(Roughly) predict / estimate how each alternative might perform.

1. 1st order calcs. (back of the envelope)
2. Proof of concepts (physical principle “tests”)
3. Bench top/pilot plant (subassembly/system tests)

Screen infeasible alternatives (screening criteria include)
1. likely function (i.e. not violate laws of nature)?
2. likely satisfy other customer requirements?
3. likely satisfy important company requirements?

Next step?
What does it mean to “evaluate” feasible concept designs?

feasible concept designs

“evaluate”

best alternative concept design

However: e-“valu”-ate = values? whose?
Pugh’s evaluation method

1. Select criteria,
2. Establish datum column,
3. Rate alternatives (+, -, S) against datum
4. Select best, or better alternatives

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Concept Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gears</td>
</tr>
<tr>
<td>high efficiency</td>
<td>+</td>
</tr>
<tr>
<td>high reliability</td>
<td>+</td>
</tr>
<tr>
<td>low maintenance</td>
<td>+</td>
</tr>
<tr>
<td>low cost</td>
<td>-</td>
</tr>
<tr>
<td>light weight</td>
<td>-</td>
</tr>
</tbody>
</table>

| Σ +                  | 3     | NA      | 2    |
| Σ -                  | 2     | NA      | 2    |
| Σ S                  | 0     | NA      | 1    |

group discussion and decision

Modified Pugh’s method

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Importance Wt. (%)</th>
<th>Concept Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gears</td>
<td>V-belts</td>
</tr>
<tr>
<td>high efficiency</td>
<td>30</td>
<td>+</td>
</tr>
<tr>
<td>high reliability</td>
<td>25</td>
<td>+</td>
</tr>
<tr>
<td>low maintenance</td>
<td>20</td>
<td>+</td>
</tr>
<tr>
<td>low cost</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>light weight</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Σ +</td>
<td>75</td>
<td>NA</td>
</tr>
<tr>
<td>Σ -</td>
<td>25</td>
<td>NA</td>
</tr>
<tr>
<td>Σ S</td>
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<td>NA</td>
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</tbody>
</table>

Add new column
Weighted Rating evaluation method

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Importance Weight (%)</th>
<th>Gear Rating</th>
<th>Weighted Rating</th>
<th>Belt Rating</th>
<th>Weighted Rating</th>
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<tbody>
<tr>
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<td>30</td>
<td>4</td>
<td>1.20</td>
<td>2</td>
<td>0.60</td>
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<tr>
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<td>4</td>
<td>1.00</td>
<td>3</td>
<td>0.75</td>
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<tr>
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<td>4</td>
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<td>3</td>
<td>0.60</td>
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<td>4</td>
<td>0.40</td>
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<tr>
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<td>2</td>
<td>0.20</td>
<td>4</td>
<td></td>
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<tr>
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<td>3.50</td>
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</table>

Rating Value
Unsatisfactory 0
Just tolerable 1
Adequate 2
Good 3
Very Good 4
Information flow & storage

- photocopies of archival matter,
- printouts from the Internet,
- vendor catalogs and data sheets,
- preliminary test results,
- first-order calculations,
- patent abstracts,
- minutes of meetings,
- concept sketches,
- concept screening sheets
- concept evaluation matrices
- expert interview notes

Design information protection

Is design “information” property?
Whose property is it?
Can it be protected?
Types of Property

Real property – land, buildings
Personal property
  Tangible – trucks, machines, office equip.
  Intangible -
    contracts
    copyrights
    trademarks
    patents
    trade secrets

How can we protect each?

Contracts

Def.: Written/oral agreement between two parties.

Examples:
Non-disclosure, confidentiality agreements
Copyrights

Def.: Exclusive right to the publication, production, or sale of the rights to a literary, dramatic, musical, or artistic work.

Examples: book, sheet music, software, dramas, sermons

Trademarks

Def.: A symbol, design, word, or letter used by a manufacturer or dealer to distinguish his products from those of his competitors.

Examples: IBM, GE, XEROX, COKE, Pentium
Trade Dress is a distinctive, nonfunctional feature, which distinguishes a merchant's or manufacturer's goods or services from those of another. (appearance)

The trade dress of a product involves the "total image" and can include the color of the packaging, the configuration of goods, etc... Even the theme of a restaurant may be considered trade dress.

Examples include the packaging for Wonder Bread, the tray configuration for Healthy Choice frozen dinners, and the color scheme of Subway sub shops.

(http://www.amerilawyer.com/trademark/tm_tradedress.htm)
**Patents**

Def.: A document granting monopoly rights to produce, use, sell or get profit from an invention, process, plant(biological) or design.

Examples:
- **Utility** patent - Xerox copying, Canon Laser engine, household appliances, light bulbs, cameras.
- **Process** patent - polymers such as Lexan, Rayon, Delrin
- **Design** patent - ornamental aspects of a product such as shape, configuration, and/or any surface decoration.

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**Trade Secret**

Def.: A method used to make a product, that is kept secret by the company manufacturing the product.

Examples: Coca-Cola, Coors beer, other food recipes
### Protection Summary

<table>
<thead>
<tr>
<th></th>
<th>Protects</th>
<th>Length</th>
<th>Application Required</th>
<th>Registration Available</th>
<th>Costs</th>
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<tbody>
<tr>
<td>Trade Secret</td>
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<td>no</td>
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<td>appearance</td>
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<td>$500&gt;</td>
</tr>
</tbody>
</table>

### How will you protect your company’s intellectual property?

- Contract
- Copyright
- Trademark
- Patent
- Trade secret
Summary

- Concept Design Review
- Analyzing alternative designs
- Developing “product” alternatives
- Evaluating “
- Information flow & storage
- Intellectual property protection