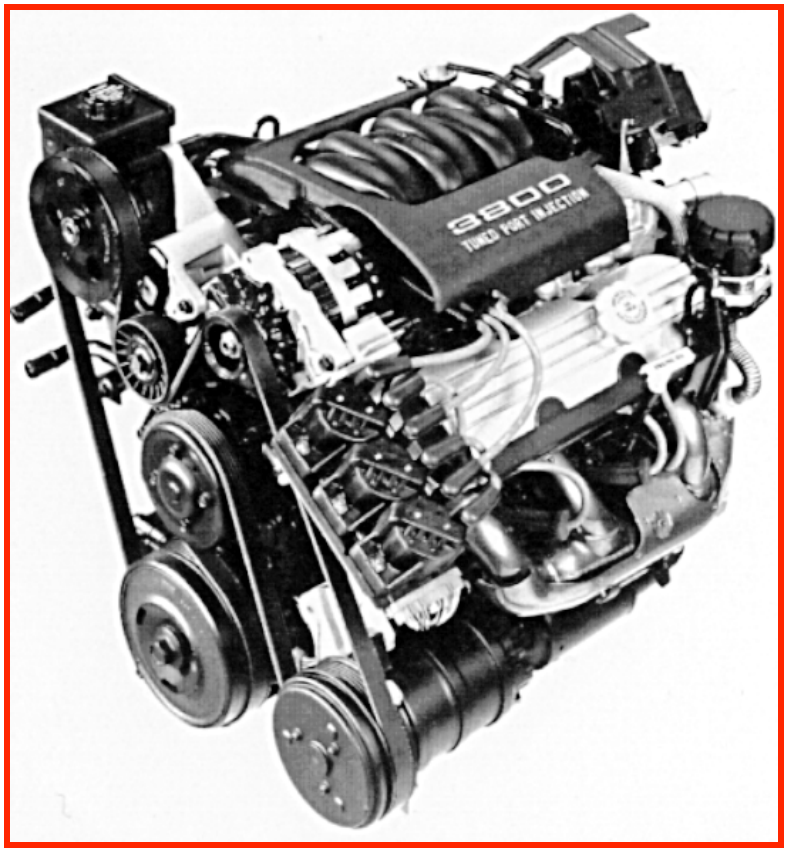
Design for Manufacturing

Teaching materials to accompany:

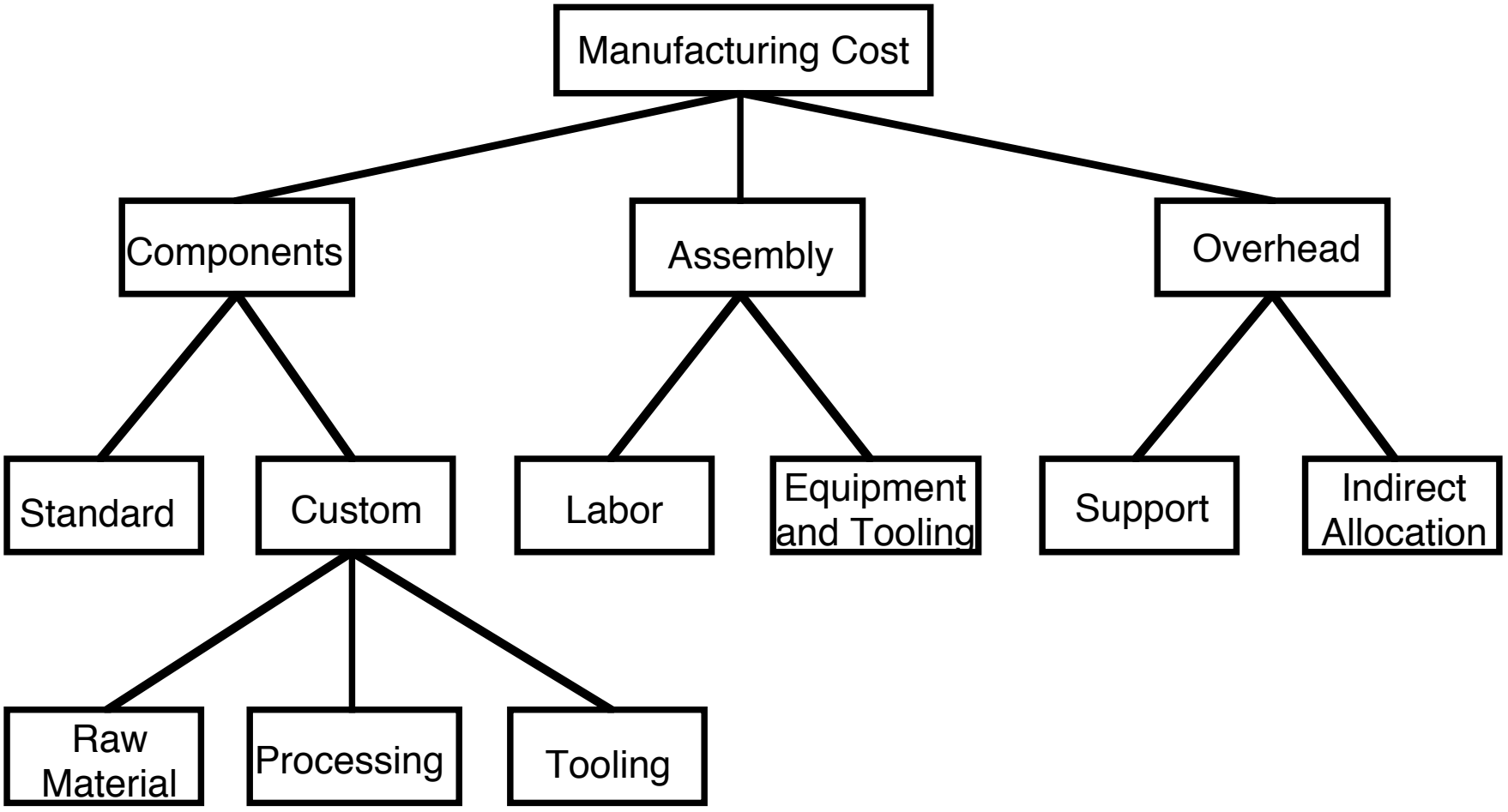
Product Design and Development
Chapter 13

Karl T. Ulrich and Steven D. Eppinger
5th Edition, Irwin McGraw-Hill, 2012.

Design for Manufacturing Example: GM 3.8-liter V6 Engine



Understanding Manufacturing Costs



Definition

- **Design for manufacturing (DFM) is a development practice emphasizing manufacturing issues throughout the product development process.**
- **Successful DFM results in lower production cost without sacrificing product quality.**

Three Methods to Implement DFM

1. Organization: Cross-Functional Teams

2. Design Rules: Specialized by Firm

3. CAD Tools: Boothroyd-Dewhurst Software

Design for Assembly Rules

Example set of DFA guidelines from a computer manufacturer.

1. Minimize parts count.
2. Encourage modular assembly.
3. Stack assemblies.
4. Eliminate adjustments.
5. Eliminate cables.
6. Use self-fastening parts.
7. Use self-locating parts.
8. Eliminate reorientation.
9. Facilitate parts handling.
10. Specify standard parts.

Design for Assembly

- Key ideas of DFA:
  - Minimize parts count
  - Maximize the ease of handling parts
  - Maximize the ease of inserting parts
- Benefits of DFA
  - Lower labor costs
  - Other indirect benefits
- Popular software developed by Boothroyd and Dewhurst.
  - http://www.dfma.com

To Compute Assembly Time

Handling Time

+ Insertion Time

Assembly Time

Method for Part Integration

- Ask of each part in a candidate design:
  1. Does the part need to move relative to the rest of the device?
  2. Does it need to be of a different material because of fundamental physical properties?
  3. Does it need to be separated from the rest of the device to allow for assembly, access, or repair?
- If not, combine the part with another part in the device.

Dated example: Videocassette DFM Exercise

- 2 billion worldwide annual volume
- 7 major producers of 1/2” cassette shells
- JVC licenses the VHS standard
  - dimensions, interfaces, light path, etc
- VHS cassette shells cost ~$0.25 each
- What is a $0.01 cost reduction worth?

DFM Strategy is Contingent