Case Study 1.2: Wheelchair Design as a Multidisciplinary Endeavor

Wheelchair, courtesy of Sunrise Medical Equipment Co.

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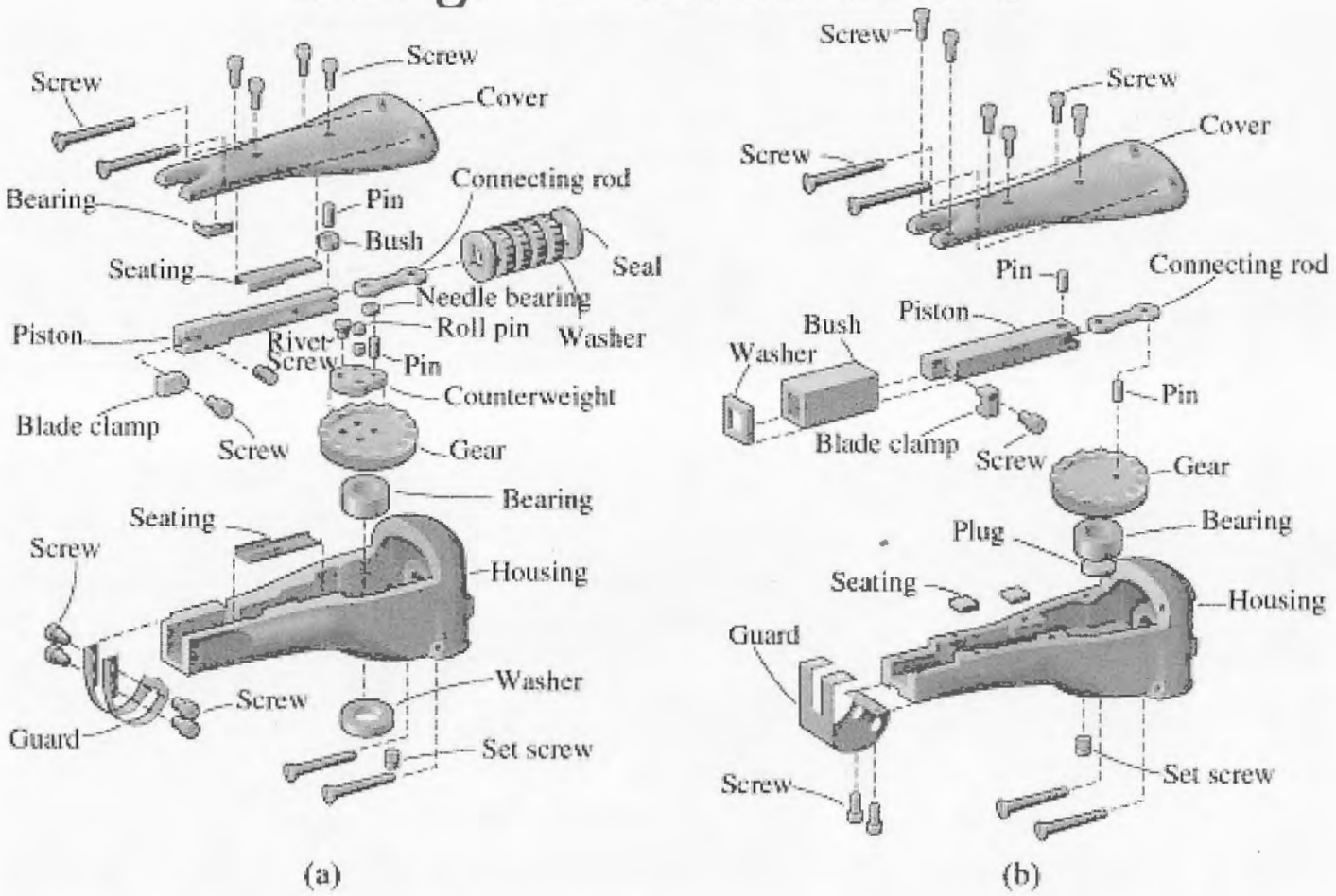
Text Reference: Figure 1.4, page 21

Design for Manufacture



Effect of manufacturing and assembly on design of reciprocating power saw.
(a) Original design, with 41 parts and 6.37 min assembly time. (b) modified design, with 29 parts and 2.58 min assembly time. [From Boothroyd (1992)].

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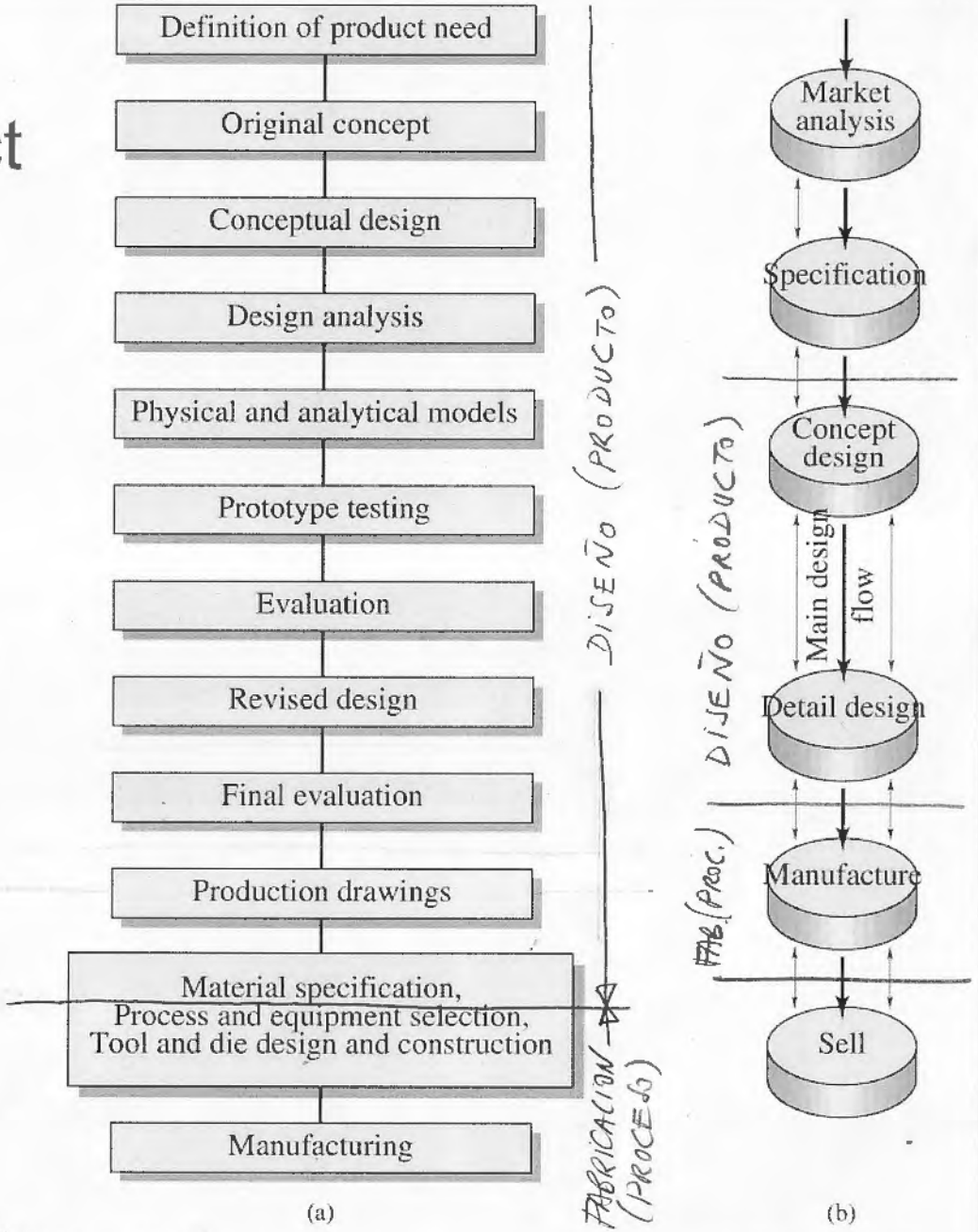
Text Reference: Figure 1.2, page 14

Approaches to Product Development

- (a) Over-The-Wall Engineering Approach (From Kalpakjian [1997]).
- (b) Concurrent Engineering Approach (adapted from Pugh [1996]).



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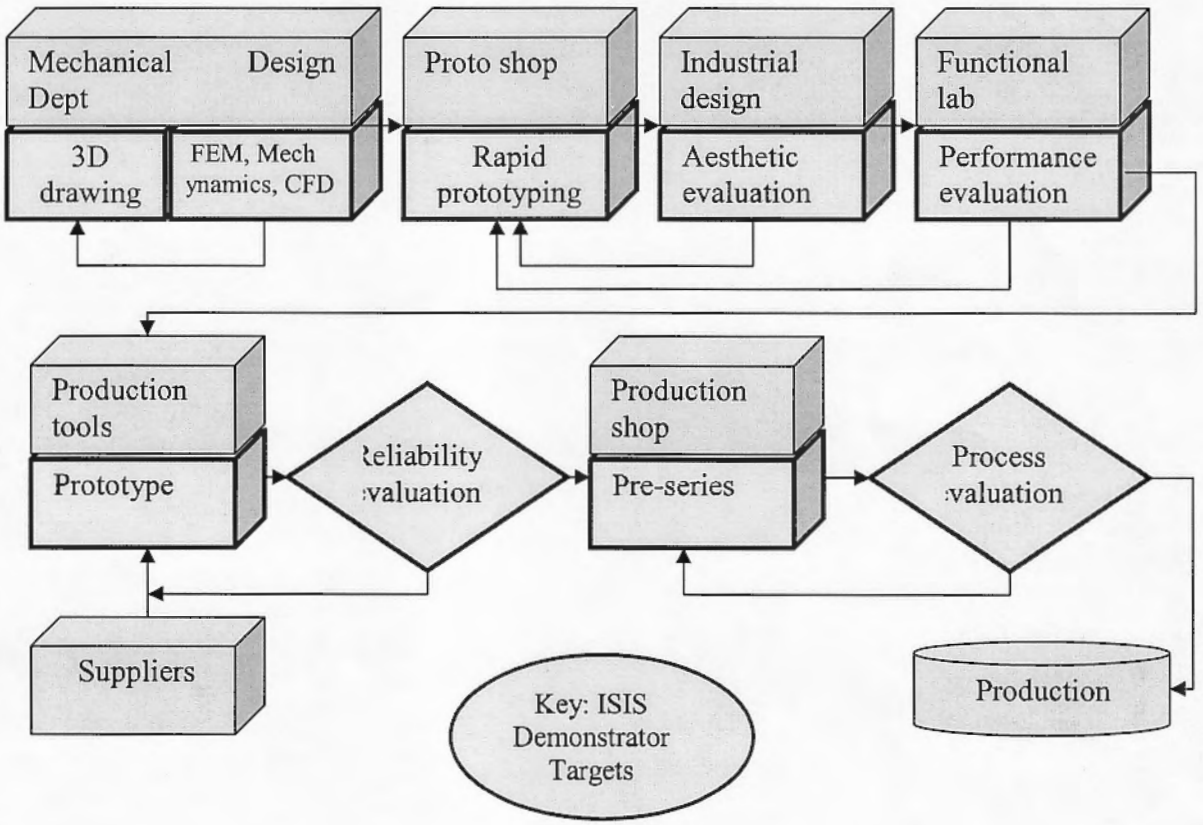
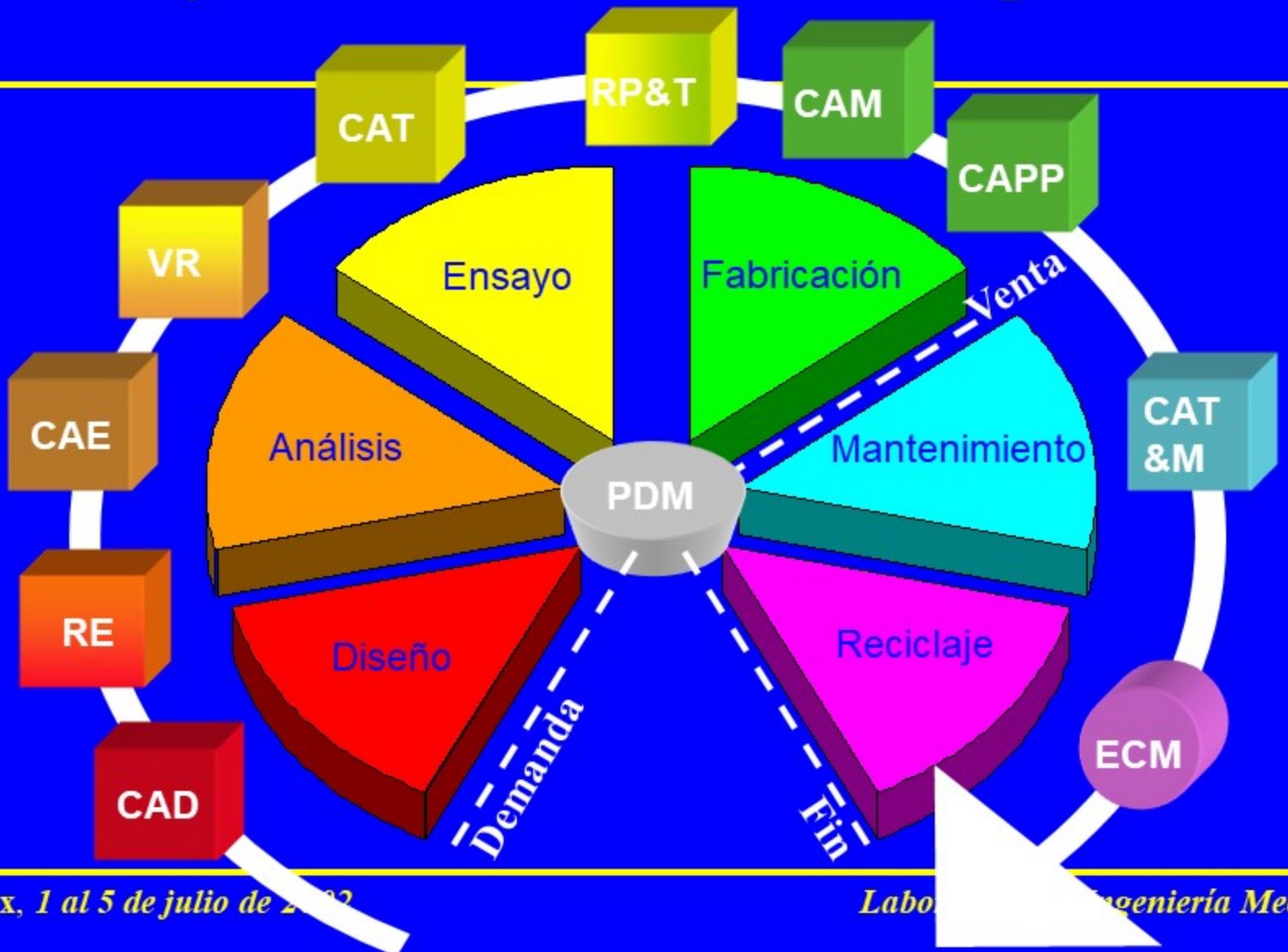
Text Reference: Figure 1.1, page 5

Hamrock, Jacobson and Schmid

PRODUCT ENGINEERING PROCESS



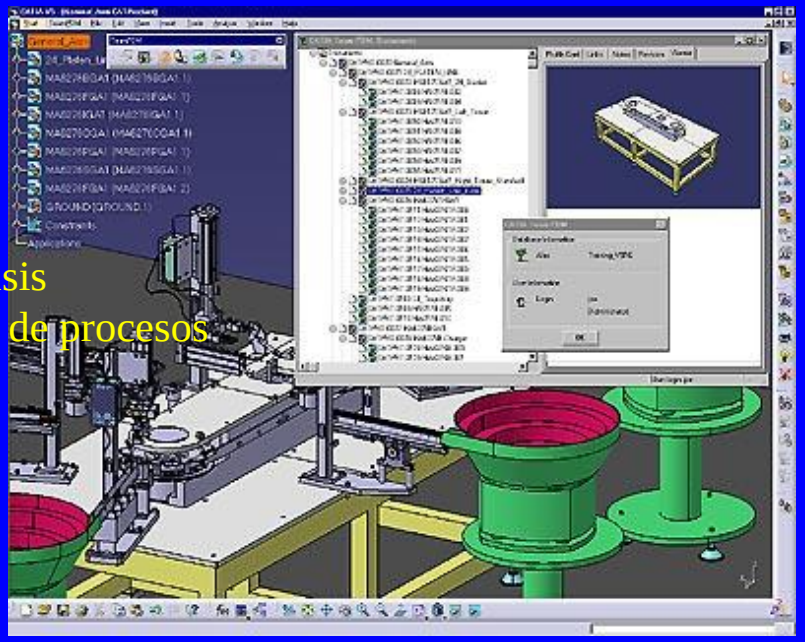
CAx y el ciclo de vida del producto



PLM: Product Lifecycle Management

- Permite manejar la enorme cantidad de información que genera una compañía en torno a un producto:
  - Geometría
  - Planos
  - Ficheros sobre piezas
  - Esquemas de montaje
  - Especificaciones
  - Programas de CN
  - Resultados de análisis
  - Diagramas de flujo de procesos
  - Correspondencia
  - Listas de material

  asegurando que la información llega a las personas adecuadas (confidencialidad) en la forma adecuada



- La información se mantiene siempre actualizada y se sabe qué modificaciones se han realizado y por parte de quién
- Realización de búsquedas
- Facilita la colaboración entre los distintos departamentos

PUGSLEY

~~Pugsley~~ Safety Factor Approach

Table 1.1 Safety Factor Characterisics A, B, and C

Characteristic[a]			B=			
			vg	g	f	p
A=vg	C=	vg	1.1	1.3	1.5	1.7
		g	1.2	1.45	1.7	1.95
		f	1.3	1.6	1.9	2.2
		p	1.4	1.75	2.1	2.45
A=g	C=	vg	1.3	1.55	1.8	2.05
		g	1.45	1.75	2.05	2.35
		f	1.6	1.95	2.3	2.65
		p	1.75	2.15	2.55	2.95
A=f	C=	vg	1.5	1.8	2.1	2.4
		g	1.7	2.05	2.4	2.75
		f	1.9	2.3	2.7	3.1
		p	2.1	2.55	3.0	3.45
A=p	C=	vg	1.7	2.15	2.4	2.75
		g	1.95	2.35	2.75	3.15
		f	2.2	2.65	3.1	3.55
		p	2.45	2.95	3.45	3.95

[a]vg=very good, g=good, f=fair and p=poor
A=quality of materials, workmanship, maintenance and inspection
B=control over load applied to part
C=accuracy of stress analysis, experimental data, or experience with similar parts

Table 1.2: Safety Factor Characteristics D and E

Characteristic[a]	D=		
	ns	s	vs
E=ns	1.0	1.2	1.4
E=s	1.0	1.3	1.5
E=vs	1.2	1.4	1.6

[a]vs=very serious, s=serious and ns=not serious
D=danger to personnel
E=economic impact

Usage:

$$n_s = n_{s,x} n_{s,y}$$

n_s=safety factor
$n_{s,x}$ is obtained from Table 1.1
$n_{s,y}$ from Table 1.2

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