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# Function-Based Competitive Product Design Analysis

2014 International Forum  
on DFMA



# Problem Statement

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- Redundant teardown activities
- Uni-functional
- Lots of information ...  
not a lot of intelligence
- Limited sharing
- Poor retention



Minimum four separate  
events ... >\$50,000

# Competitive Intelligence

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*Simply defined, **intelligence** is information that has been analyzed and refined so that it is useful to policymakers in making decisions*

Federal Bureau of Investigation

**Competitive Intelligence:** *A systematic and ethical program for gathering, analyzing, and managing external information that can affect your company's plans, decisions, and operations.*

Strategic and Competitive  
Intelligence Professionals (SCIP)

# Value Proposition

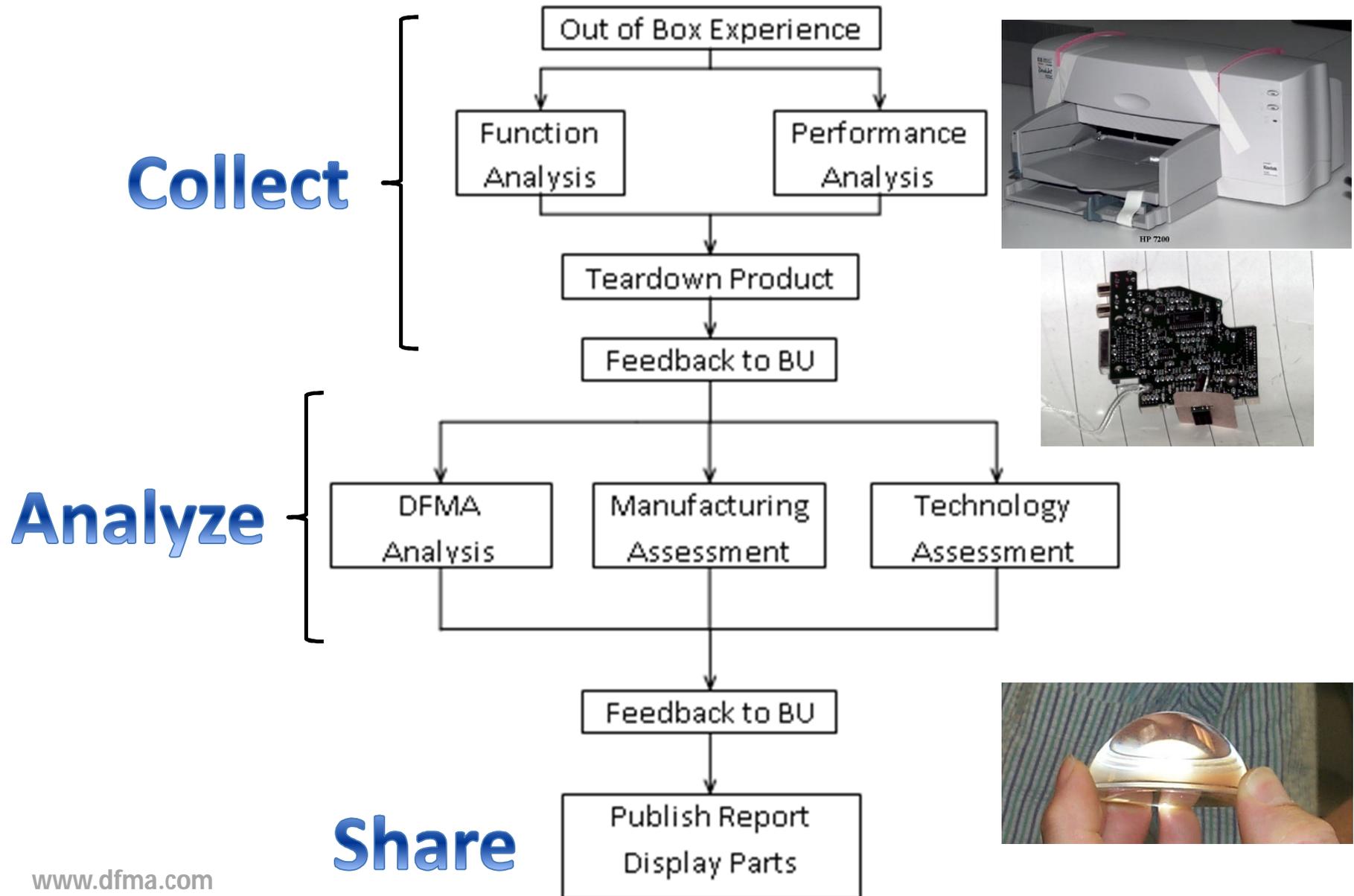
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$$\text{Value} = \frac{\text{Function}}{\text{Cost}} = \frac{\text{Performance} + \text{Delivery}}{\text{Cost}}$$

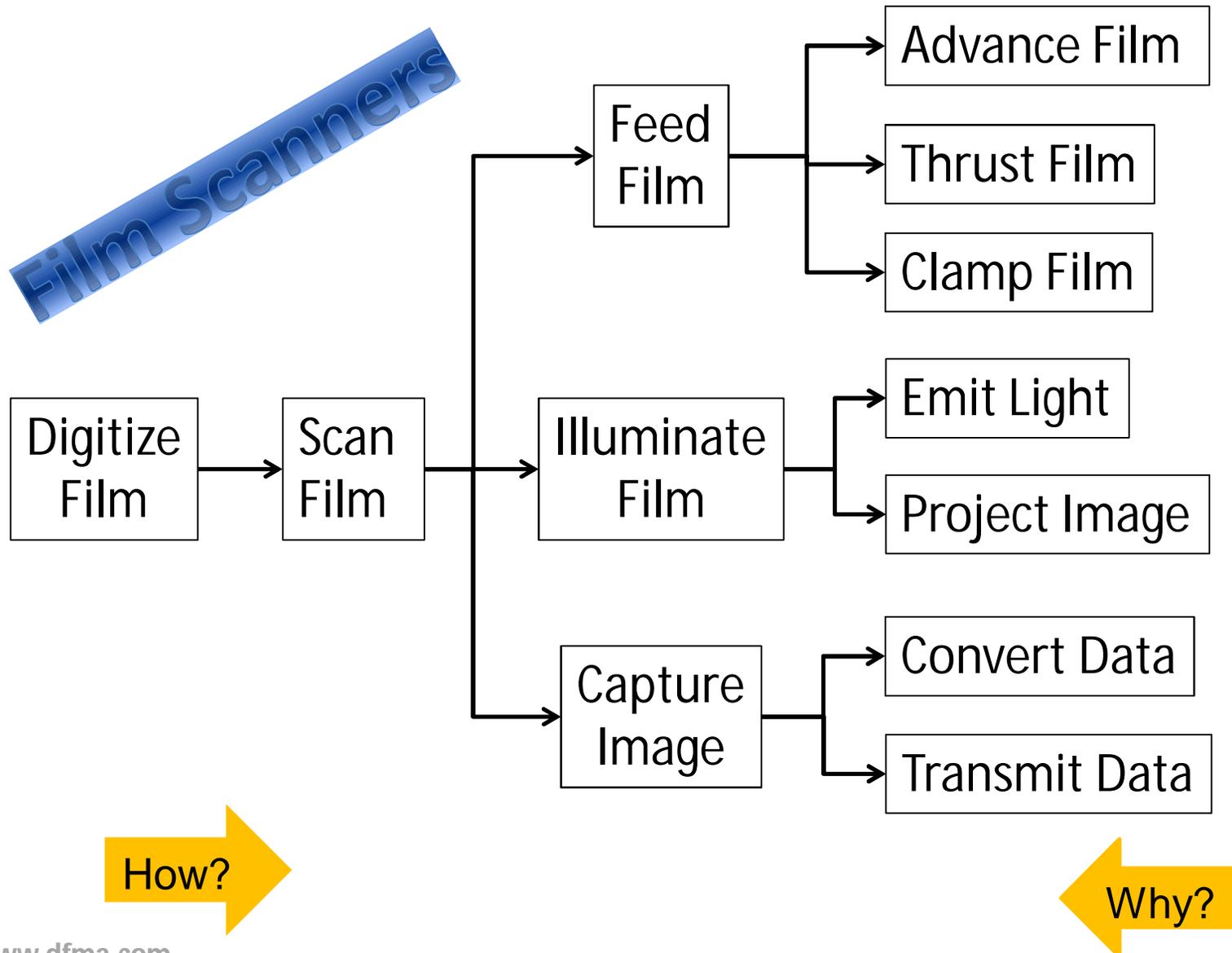
- Financial Analysis (D&B)
- Technical Analysis i.e. patent portfolio
- Manf. Analysis i.e. location, capacity, etc.
- Landscape Analysis
- **Function-Based Product Design Analysis**



# Teardown Process



# Product Category FAST Diagram



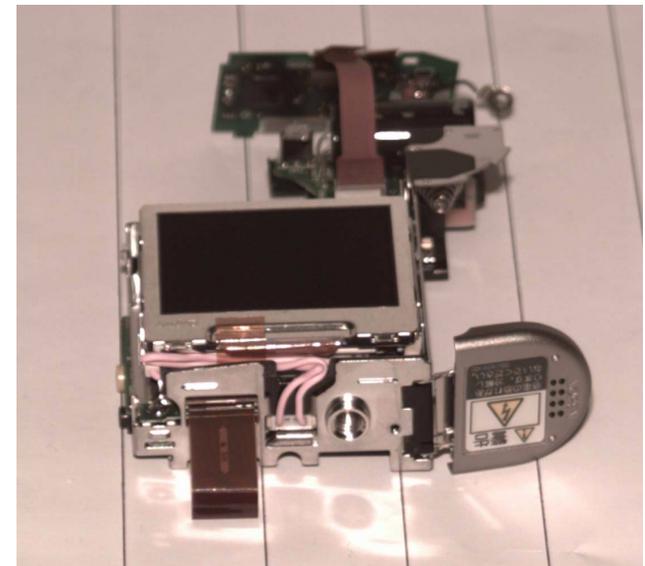
How?

Why?

# Teardown Event

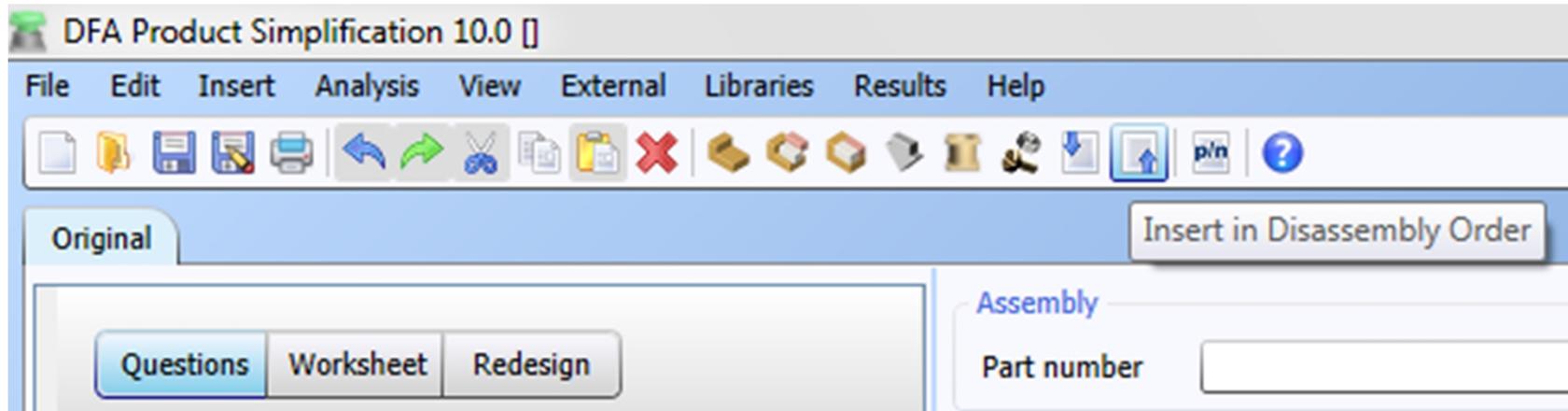
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- Scope the effort carefully
  - Products
  - Subsystems/Functions
  - Expected Deliverables
- Cross-functional team
  - Designated facilitator
  - Designated disassembler
  - Designated DFA analyst
- Designated imaging area
- Optional: video entire disassembly



# DFMA

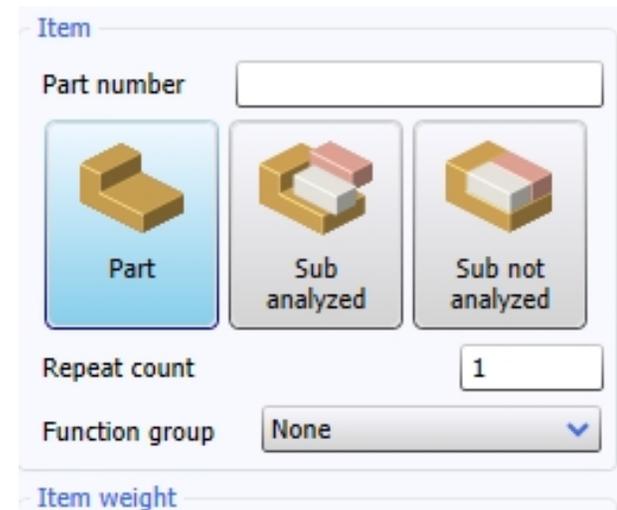
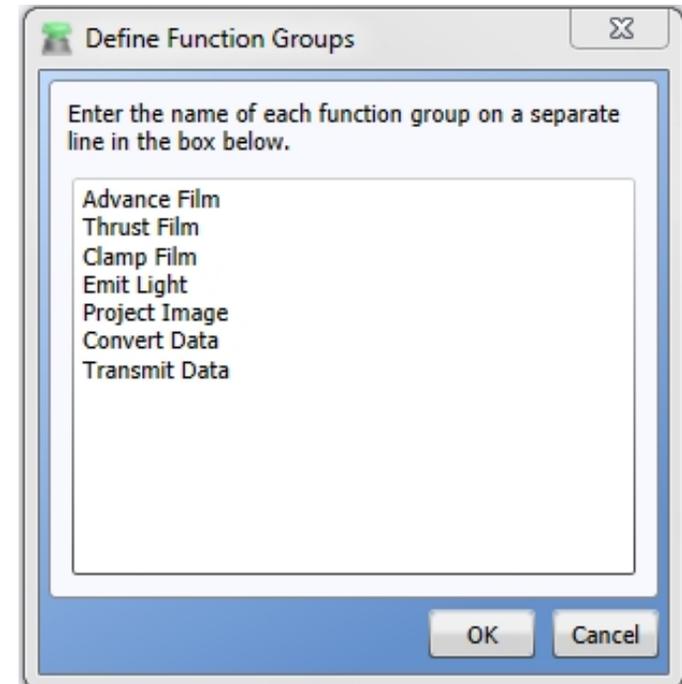
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- Build structure chart in order of disassembly
- Capture all operations
- Capture handling & insertion difficulties
- Minimum Part Criteria is optional
- DFM cost estimate the “Pareto parts”

# DFA 10.0 Function Groups

- List of System Functional Requirements
  - Analysis → Define Function Groups
- One Function Per Part, Subassembly, or Operation
- Functional Breakdown standard reports
  - Total Count
  - Assy. Time
  - Assy. Cost
  - Total Cost



# Design Analysis Examples

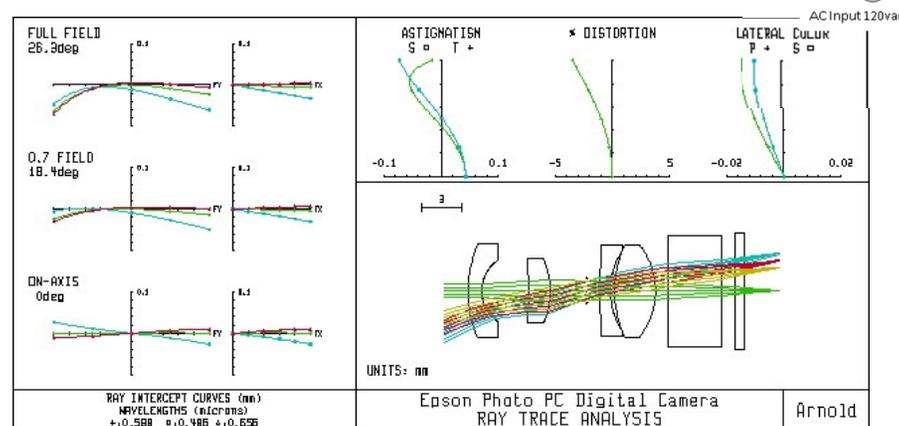
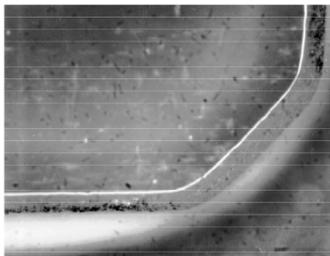
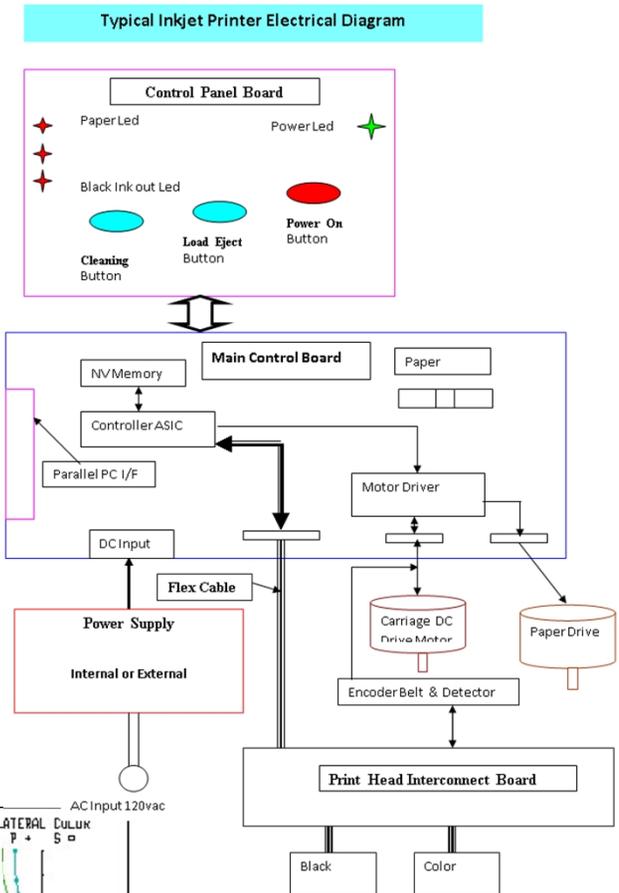
TECHNOLOGY	NO. OF UNIQUE PARTS	TOTAL USAGE
Sheet Metal	14	14
Plastic	26	26
Labels	5	5
Printed Circuit Board	6	6
Misc. Electrical Parts	6	9
Lens Manufacture	5	5
<b>Total Custom Parts</b>	<b>61</b>	<b>64</b>
Standard Hardware	4	43
<b>Grand Total</b>	<b>66</b>	<b>108</b>

FUNCTION	NX	NIKON
POSITION FILM	\$5.84	\$12.34
ILLUMINATE FILM	\$16.03	\$141.55
IMAGE FILM	\$82.35	\$153.39
SENSE IMAGE	\$31.45	\$232.28
DIGITIZE IMAGE		\$50.00
SCAN TRANSPORT	\$24.32	\$147.53
FOCUS IMAGE	\$7.96	\$128.72
PROCESS IMAGE		\$50.00
CONTROL SCANNER		\$50.00
TRANSFER IMAGE	\$40.25	\$69.00
POWER	\$30.29	\$35.14
EMI CONTROL-REGULATORY	\$3.86	\$0.61
THERMAL		\$2.25
CASE	\$9.96	\$26.92
SERVICE, ASSY, TEST		
ASSESSORY INTERFACE	\$0.33	\$0.67
SOFTWARE		\$5.08
USER EDUCATION	\$13.26	\$5.00
SHIPPING-PACKING	\$10.00	\$9.30
	\$275.90	\$1,119.78

	Fuji	Konica	Olympus
DFA Index	11.12%	8.24%	7.68%
Total Number of Parts	289	146	146
Theoretical Min. No. Parts*	92	45	32
Number of Operations**	81	57	23
Estimated Assembly Time (sec.)	2848.09	1901.61	1317.47
No. of Different Fasteners	12	8	15

# Technology & Manf. Analysis Examples

- Electrical: board construction, custom ASIC, interconnect
- Mechanical: materials, process, part complexity, design reuse, tooling
- Optics: materials, coatings, robustness



# Function-Based Database

## Customer-Oriented Product Concepting

PRODUCT: VCR  
 TASK: Play Video on TV  
 DELIVERABLE: Electronic (TV) Image  
 BASIC FUNCTION: Display Electronic Image

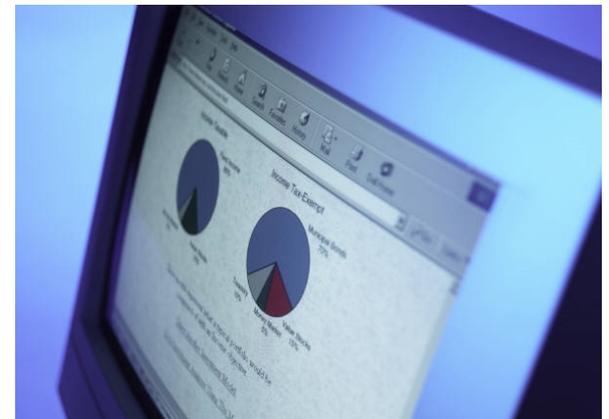
COUNTRY: U.S. Only  
 MARKET: Video  
 SEGMENT: Home Entertainment  
 USER: Family  
 DECISION MAKER: Primary Income Producer

Operational Functions	MARKET/CUSTOMER								MANUFACTURING/DESIGN										
	CUSTOMER REQUIREMENTS		COMPETITIVE ANALYSIS				PLANNING		MANUFACTURING CRITERIA		TECHNOLOGIES (HOW TO)								
	Features	Importance	Current Us	OM1	OM2	OM3	Desired Us	Improve Ratio	Sales Point	Score	Percent Score	Mfg Criteria	Percent Weight	Tech 1 Mfg.	Tech 1 Cust.	Tech 2 Mfg.	Tech 2 Cust.	Tech 3 Mfg.	Tech 3 Cust.
Load Tape	Ease to Load Ease to Orient Instructions	10 10 8	5 9 7	8 9 8	7 9 8	10 8 8	10 9 8	2.00 1.00 1.14	1.5 1.2 1.0	30.00 12.00 9.12 51.12	58.7 23.5 17.8 100.00	Cost Dev Time Durability Time to Complete Quality Reliability Maintainability	15 10 15 5 20 20 15 100	5 3 5 1 5 4 4	7 9 5 5 4 4 4	5 5 5 5 4 4 4	10 9 6 4 4 4 905	5 5 5 4 4 4 440	10 10 9 4 4 4 982
Transport Tape																			
Record Image																			
Playback Image																			
Rewind Tape																			
Remove Tape																			

# Sharing and Utilization

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- Facts vs. Inferences
  - Facts ... data/info. that is verifiable as true
  - Inferences ... opinion/hypothesis based on facts
- Web, presentation, & technical report
  - Still and video images
  - Summarized data & conclusions
  - Detailed analysis and data supporting conclusions
- Function-Based Database
  - Comparison across landscape
  - Extrapolation/Prediction
  - System design input



# Key Lessons

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- Slow is fast
- “Many hands make light work”
- “A picture is worth 1000 words”
- Don't wait ... it's never perfect & it's never done
- Track utilization of intelligence
- Constancy of Purpose



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# Questions