

330:135g Design for Manufacturing

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MIT Product Design course web site

- http://web.mit.edu/2.009/www/fall2001/pages/gallery_frameset.htm



Little Green wagon

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Snow Blower

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Folding scooter



Product Development Process

- Identify customer needs
- Establish target specifications
- Generate product specifications
- Select product concepts
- Test product concepts
- Set final specifications
- Plan manufacturing process

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Goals of customer need identification

- Ensure that the product is focused on customer needs
- Identify latent or hidden needs as well as explicit needs
- Provide a fact base for justifying the product specification
- Create an archival record of the needs activity of the development process
- Ensure that no critical customer need is missed or forgotten
- Develop a common understanding of customer needs among members of the development team

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Identify customer needs

- Gather raw data from customers
- Interpret the raw data in terms of customer needs
- Organize the needs into primary, secondary and tertiary needs
- Establish the relative importance of the needs
- Reflect on the results and the process

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Gather raw data from customers

- Interviews
 - Audio recording
 - Notes
 - Video recording
- Focus groups
 - Group of 8 to 12 customers
- Observing the product in use
- Written survey

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Interpret the raw data in terms of customer needs

- Express the need in terms of what the product has to do, not in terms of how it might do it.
- Express the need as specifically as the raw data
- Use positive, not negative phrasing
- Express the need as an attribute of the product.

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Establish target specifications

- Prepare the list metrics, using the needs metrics, if necessary
- Collect the competitive benchmarking information
- Set ideal and marginally acceptable target values for each metric
- Reflect the result and the process

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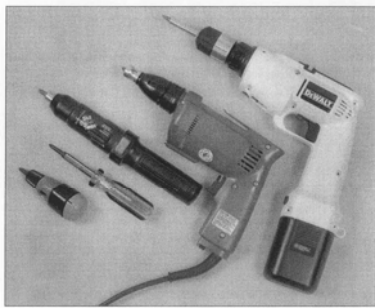
Problem

- A successful hand tool manufacturer is exploring the growing market for hand-held power tools
- After the initial research, the firm decided to enter the market with a cordless screwdriver

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(Stuart Cohen)

EXHIBIT 4-1

Existing products used to drive screws: manual screwdrivers, cordless screwdriver, screw gun, cordless drill with driver bit.

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EXHIBIT 4-3 Mission statement for the cordless screwdriver.

Mission Statement: Screwdriver Project	
Product Description	<ul style="list-style-type: none"> • A hand-held, power-assisted device for installing threaded fasteners
Key Business Goals	<ul style="list-style-type: none"> • Product introduced in fourth quarter of 2002 • 50% gross margin • 10% share of cordless screwdriver market by 2004
Primary Market	<ul style="list-style-type: none"> • Do-it-yourself consumer
Secondary Markets	<ul style="list-style-type: none"> • Casual consumer • Light-duty professional
Assumptions	<ul style="list-style-type: none"> • Hand-held • Power-assisted • Nickel-metal-hydride rechargeable battery technology
Stakeholders	<ul style="list-style-type: none"> • User • Retailer • Sales force • Service center • Production • Legal department

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Project team

- **Product Manager:** The Product Manger is an individual appointed by the CEO from his/her staff for a particular product development.
- The Product Manager will, throughout the project, have the primary responsibility for the performance of the product development and conformance with the product needs. He/she is responsible for the Product Development File.

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Project team

- **Product Design Engineer:** The Product Design Engineer is an individual appointed by the CEO from his/her staff for a particular product development.
- The Product Design Engineer will have primary responsibility for the design of the product, to release to production (assuming the product reaches production).

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Project team

- **Designer/drafter:** The Designer/drafter is responsible for the documentation of the design.
- This includes all drawings of the design, parts lists, and Product Changes Notices (PCNs).
- He/she is also to assist of the Product Design Engineer in the development of the design.

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Project team

- **Manufacturing Manager:** The Manufacturing Manager is responsible for assurance that the design is manufacturable.
- Additionally, he/she is responsible for developing Process Instructions for the assembly of the device.
- If manpower is limited, then the duties of the Manufacturing Manager will be combined with those of the Designer/drafter.

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Product Development Report

- This is a group produced file covering the history of the design.
- Documents that should be in the Product Development File are:

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Problem Appraisal Phase

- **Understanding the Problem**
 - Description of Customers To be completed
 - Customer's Requirements by Feb. 11th
 - Weighting of Customer's Requirements
 - Competition's Benchmarks Versus Customer's Requirements
 - Engineering Requirements
 - Competition's Benchmarks Versus Engineering Requirements
 - Engineering Targets

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Problem Appraisal Phase

- **Planning the Project** To be completed
by Feb. 18th
 - Task Titles
 - Objectives of each Task
 - Personnel Required for Each Task
 - Time Required for Each Task
 - Schedule of Tasks

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Conceptual Design Phase

- **Concept Generation** To be completed
by March 24th
 - Functional Decomposition
 - Literature and Patent Search Process and Results
 - Function-Concept Mapping
 - Sketches of Overall Concepts

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Conceptual Design Phase

- **Concept Evaluation** To be completed
by April 7th
 - Assessment of Technology Readiness
 - Identification of Failure Modes
 - Identification of Critical Parameters
- **Concept Selection**
 - Decision Matrices to Determine Best Concepts
 - Analysis, Experiments and Models Supporting Evaluation

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Product Design Phase

- **Product Generation** To be completed by April 14nd
 - Usable Off-the-Shelf Products
 - Shape Development Driven by Function
 - Material(s) Selection
 - Manufacturing Process(s) Selection

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Product Design Phase

- **Product Evaluation** To be completed by April 21th
 - Comparison to Engineering Requirements
 - Functional Changes Noted
 - Design for Assembly Evaluation
 - Cost Evaluation
 - Analysis, Experiments and Models Supporting Evaluation

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Product Design Phase

- **Final Product Documentation** To be completed by April 28th
 - Layout Drawings
 - Detail Drawings of Manufactured Parts
 - Parts List (Bill of Materials)
 - Assembly Instructions

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