

# Lecture 2

## WRI Technology Lectures

### PRODUCT DESIGN

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# This Lecture

- Products in Industry
- What is a New Product?
- Major Factors in New Products Management
- Engineered and Formulated Products
- Products from Recycled Materials
- Product Development: Concept Generation

# Products in Industry

Products – whether assembled goods, software, processes or services are typically composed of discrete functions that work together to provide users with the overall characteristics and functionalities that distinguish a given product in the market place.

## Product Categories (A)

- Hardware,
- Software,
- Processes,
- Services,
- Combinations

## Product Categories (B)

- Raw materials,
- Chemicals/consumables,
- Components/parts,
- Tools,
- Equipment/machinery,
- Subsystems,
- Systems,

## Product Categories (C)

- Simple/complex,
- Consumable/durable,
- Single sector/multi-sector,

# What Is a New Product (1)?

Commonly accepted categories:

- **New-to-the-world products:** Products that are inventions; e.g., Polaroid camera, the first car, the laser printer.
- **New category entries:** Products that take a firm into a category new to it. Products are not new to the world; e.g., first shampoo, prepaid telephone card.
- **Additions to product lines:** Products that are line extensions to firm's current markets; e.g., liquid detergents, liquid fertilizers

# What Is a New Product (2)?

- **Product improvements:** Current products made better; virtually every product on the market today has been improved, often many times.
- **Re-positionings:** Products that are retargeted for a new use of application; the classic case in baking soda, which was repositioned several times as drain deodorant, refrigerator deodorant, etc.
- **Variations not commonly accepted as new products:** New to a country, new channel of distribution, packaging improvements, and different resource or method of manufacture.

# Chemical Products-Example

Category	Class	Example	Key Product
<i>Specialty Chemicals</i>	Surfactant	Ammonium lauryl sulfate	Molecular structure
<i>Formulated Products</i>	Cosmetic	Exfoliating gel	Microstructure
<i>Biobased Concepts</i>	Drug	Alendronate sodium	Biological activity
<i>Devices</i>	Biomedical device	Blood oxygenator	Materials and assembly
<i>Virtual Chemical Products</i>	Simulation software	Aspen Plus™	Computational performance
<i>Services Management</i>	Environmental	Advice on disposal and reuse of waste	Value for money

# Questions you should ask about each product

## Q1. How are they designed?

- Formulated Products
- Engineered Products

## Q2. Let us take one example and try to answer the following:

- What are the ingredients?
- What are the ingredients used for?
- What are the characteristics of the product?
- What is the science behind the product?
- Why is this product desirable?
- Why does the product sell?



# Engineered Products, few examples

- Hand Warmer
- Air freshener
- Stainless steel for odor removal (soap-like)
- Aroma/Insect Repellant Wall Plugs

# Example 1: Hand Warmers

- **Hand warmers** are small (mostly disposable) packets which are held in the hand and produce heat on demand to warm cold hands. They are commonly used in outdoor activities such as hiking and skiing to keep extremities warm and assist insulated clothing. Other types of warmers are available to provide soothing heat for muscular or joint aches.
- Depending on the type and the source of heat, hand warmers can last from 30 minutes (re-crystallisation) up to 24 hours (platinum catalyst).
- Crystallisation types of hand warmer generate heat through the exothermic crystallisation of supersaturated solutions (typically sodium acetate) and are usually reusable

source:Wikipedia



A pair of air-activated disposable hand warmers, US quarter for scale



Crystallisation-type hand warmer with scale showing metal disc trigger

# Air Freshener

- Oil mixture
- Heated
  - Selective Evaporation of oil mixture
  - Partial Pressure as a function of Temperature



# Stainless steel for odor removal



## About the Product

- Removes onion, garlic, seafood, meat, smoke, gas, ect. odors
- Removes hand odors instead of masking with fragrances
- Never loses its odor eliminating power & lasts forever
- Safe, environmentally friendly, non-toxic, odorless
- To use, just rinse hands under cold water with OdorBar™

# Mosquito Liquid Electronic repellent

- Mosquito Liquid Electronic Repellent (no sound), 1 bottle lasts for about 30 nights
- 110v, Revolving US-Plug, indoor use only, US
- Active ingredient: Dimefluthrin 1.5%, Stabilizer 0.5%, Solvent Oil 98%
- Kills mosquitos and some other bugs, harmless for human beings and pets



REFILL for Mosquito Liquid Electronic Repellent

★★★★★ 2

\$16.59

see AMAZON.com



GreenGuard Ultrasonic Pest Repeller (2-Pack), Optimal Pest Repeller for Mice, Mosquito,...

★★★★☆ 342

\$24.95 ✓Prime



Mosquito-Go Duo Refill

★★★★★ 1

\$5.65



Pest Ninja Ultrasonic Pest Control Plug In Repeller - 3 Pack Repel Pests: Mouse, Mosquito, Ant, Bug

★★★★★ 111

\$44.99 ✓Prime



Go Travel - Design Go Mosqui Duo Trans Cont Plug In Mosquito Killer System 120V 7W

★★★★☆ 4



# Formulated Products, few examples

- Toothpaste
- Shampoo
- Deodorant
- Mouthwash
- Dish soap

# Products from Recycled Materials

# Products from Recyclables

**Plastics**



Beverage bottles

=



Backpack



Carpet



Polar fleece

**Paper**



Waste paper

=



Cards



Memory stick



Paper bags

**Cans**



Waste paper

=



Appliances



Bicycle



Car parts



Steel beams



Rebar



## Plastic flakes from fluffy waste



# New solid fuel product

Cross-Linked PE: Non-thermoplastics



*No recycling application  
Direct combustion; difficulties in handling  
In transportation, storage, and feeding to a boiler.*

+



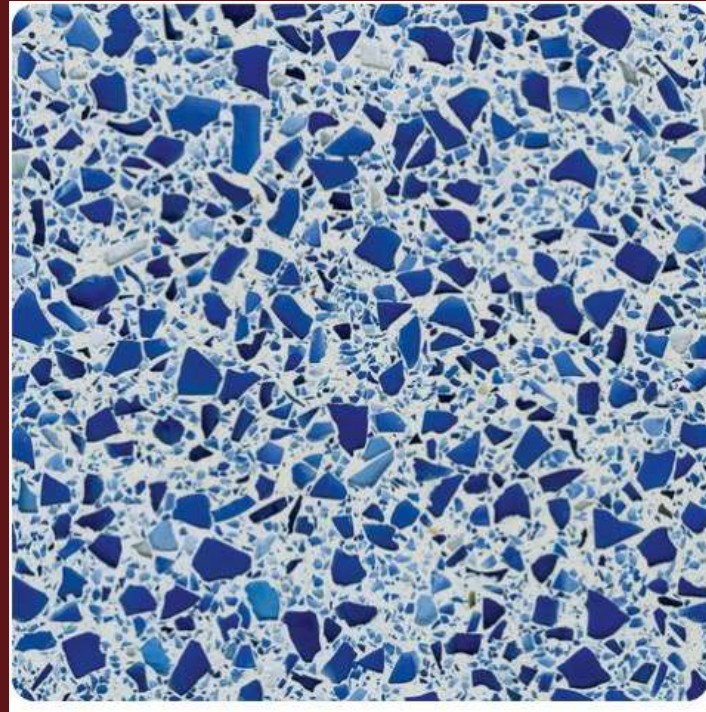
Sawdust



**New Clean Solid fuel**  
*Expecting the higher commercial values than the conventional solid fuel.*



# Countertops from recycled glass



# Products from recycled tires 1



**Umbrella Stand or Linen Basket  
from recycled tyres**



**Recycled tyre shoes**



**Recycled Tyre Flip Flops - Cipo  
Black**



# Products from recycled tires 1



# Products from recycled paper



Embossed pattern of coarse paper made from recycled paper.





The San Francisco footwear brand sells women's seamless round-toe flats (\$125) and pointed-toe flats (\$145), made using recycled PET plastic yarn in a 3D knitting process. The soles are described as "carbon free" and the outsoles are recycled as well. Likewise, the UK makers of barefoot shoes Vivobarefoot introduced models for men and women made with a canvas of 50 percent PET bottles and 50 percent cotton with each pair diverting 17 water bottles from the landfill.



**Product:** Rothy's shoes

**Price:** \$120-\$145

**Bottles used:** 17

Available as a the Hamilton Perkins Collection Earth Bags are convertible duffel-to-backpack vessels made from 100% recycled plastic bottles. Other pluses: They're made in the U.S. and lined with repurposed vinyl billboards, so each lining is unique.



**Product:** Hamilton Perkins Earth bags

**Price:** \$95 and \$295

**Bottles used:** about 16



# Product design development

There are four main steps towards a product design

(1) Identify Customer Needs:

- Engineering rather than marketing is important
- How large a product improvement is feasible and can be achieved

(2) Generate Ideas to meet Needs:

- For one successful idea we need numerous ideas : Brainstorming
- DuPont: 300 ideas for 1 success (for commodities)
- 3M: about 20 ideas for 1 success (for specialties)
- Generally : ~ 100 ideas for 1 product success

(3) Select among Ideas: very difficult to select 2-3 best ideas

(4) Manufacture Product: generally steps for process design

# Product design factors:

## Example: Drug Cream Formulation

Quality Factor	Performance Index	Material Physico-Chemical Properties	Product Structural Attributes	Property Function	Process Variables	Process Function	Key Usage Variables	Usage Function
Controlled release of active ingredient	<ul style="list-style-type: none"> <li>• Percent of active ingredient in plasma</li> <li>• Partition coefficient of active ingredient between continuous and dispersed phases</li> </ul>	Diffusion coefficient of active ingredient through continuous phase	Droplet size	Model for mass transfer of active ingredients from ointment to blood, via interphase equilibria and diffusion	<ul style="list-style-type: none"> <li>• Mixing speed</li> <li>• Mixing time</li> </ul>	Droplet break-up model that balances interfacial tension and disruptive forces	<ul style="list-style-type: none"> <li>• Time between applications</li> <li>• Quantity applied</li> <li>• Skin surface of application</li> <li>• Patient blood volume</li> </ul>	Dynamic model to predict concentration of activities in plasma, depending on values used for usage conditions

# The Grand Product Design Model

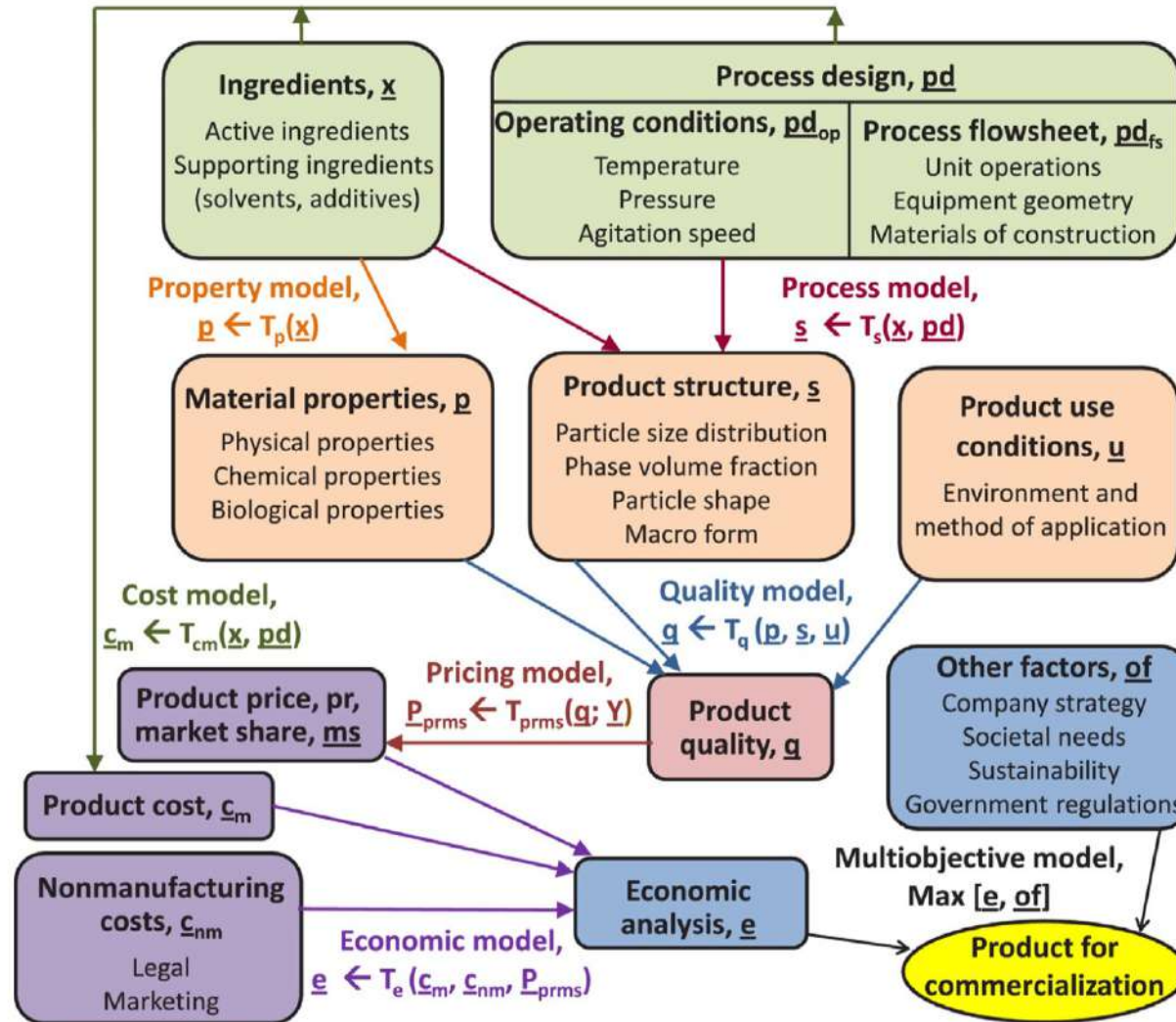


Fig. 1. The Grand Product Design Model.