Product Development Economics

Teaching materials to accompany:

Product Design and Development
Chapter 13

Karl T. Ulrich and Steven D. Eppinger
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Product Development Process

- Planning
- Concept Development
- System-Level Design
- Detail Design
- Testing and Refinement
- Production Ramp-Up

- Go/No-Go Decision Gates
- Sensitivity and Trade-off Analysis
Product Development Economics Example: 
Polaroid Color Photo Printer
Product Development Cash Flow

Cumulative Cash Inflow or Outflow ($)

Sales Revenue
Operating Costs
Operating Profit
Investment (–)

Time

Development Time
Payback Time
Break Even Time

Investment
Project Financial Analysis
(also Business Case Analysis or Product Economics)

- Most common method is NPV analysis of project cash flows.
- Base case model computes nominal NPV.
- Sensitivity and trade-off analysis supports development decisions.
- Qualitative factors also influence decisions.
Net Present Value

\[ NPV = \sum_{\text{periods}} \frac{\text{period cash flow}}{(1 + \text{discount rate})^{\text{period}}} \]

\[ NPV = \sum_{i=1}^{N} \frac{C_i}{(1 + r)^i} \]
Inputs for NPV Base Case

- Development cost and timing
- Testing cost and timing
- Tooling investment and timing
- Ramp-up cost and timing
- Marketing and support cost and timing
- Sales volume and lifetime
- Unit production cost
- Unit revenue
- Discount rate
Example: Stanley Hammer

- Designed in 1995 by Product Genesis for Stanley Tools
- Contractor Grade™
- Graphite composite shaft
- Soft rubber grip
Getting a Handle On Hammer Markets

HAMMER MAKERS are trying to get a better grip on their market.

Plumb Tool's invention of the fiberglass handle in 1954 and Estwing's solid steel hammer in 1925 were revolutionary. Now Stanley Tools, a subsidiary of The Stanley Works, is offering an evolutionary grip.

Designed with Product Genesis, Cambridge, Mass., Stanley's new Contractor are meant to provide better traction and a place for sweat to run off. The traditional elliptical handle has given way to a rounder shape — thinner toward the end, thicker in the middle. The grip's end is more flared to keep the hammer from flying out of the hand.

All hammers represent a compromise between strength and comfort. Estwing's solid steel model almost never breaks but creates a lot of vibration. So the company covers its steel handle with a blue nylon/vinyl grip that absorbs the shock.

In the early 1980s, Hart Tool of Huntington Beach, Calif., mated a curved hickory hatchet handle to a steel hammer head to produce its California Special, which has a strong following among West Coast house framers. "Wood absorbs shock better but is the weakest," says John Reid, a Hart principal.

Not all pros like the new Stanley grip. "My hand is big, but the new Stanley over fills it and threatens to break my grip," says Bill Greene, an East Bridgewater, Mass., carpenter and cabinet maker.

But Dennis Pitts, an installer for Midland Seamless Gutters, Warwick, R.I., prefers his new Stanley hammer over his old Stanley. "It doesn't slip," he says.

Left, Stanley's new hammer with its softer grip. Right, an older model.

Grade hammers have grips of softer, light-grey vinyl. Concentric, wavy grooves
Inputs for Hammer Base Case

- Development cost and timing
  $120k, 9 months
- Testing cost and timing
  $100k, 1 year
- Tooling investment and timing
  $200k, 6 months
- Ramp-up cost and timing
  $50k, 3 months
- Marketing and support cost and timing
  $250k + $80k/year for 2 years
- Sales volume and lifetime
  200k units/year, 5 years (actually not flat)
- Unit production cost
  $4/unit + $2/unit overhead
- Unit revenue
  $12/unit wholesale
- Discount rate
  10%/year
Excel Spreadsheet Model