Pfizer Surgical Scissor project
Developed scale, size, key features and get customer feedback with foam models and renderings
Primary Drivers of the Creative Process

- Materials
- Manufacturing Processes
- Manufacturing Cost

Pfizer Laparoscopic Scissor project

CAD Model

3D Printed Prototype
Innovation: Flexshaft

resulted from Cost Reduction Brainstorming
RTV Molding

Fully functional prototypes for field testing

Pfizer Case Study
Creare inc.
Ultrasonic Surgical Transducer
Hon Industries
Home Office Chair

University of Illinois Team

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Product Interaction Research Laboratory (PIRL)
University of Illinois Urbana-Champaign
Agenda

- Project review
- Market Research
- Ideation
- Initial Concepts
- Proof of concept test models
- Final concepts
- Final design
- Cost estimate
- Discussion
Market Research

- Demographics and Telecommuting
- Personalization and Ergonomics
- Innovation
- EchoTech
- Manufacturing
- Interiors
- Aesthetics
- Color
- Alternative Concepts
Demographics

- Dramatic growth of middle age population
- Decline in household size
- Growth of single and two person households
- Growing diversity
- Dramatic growth of sunbelt population
- More sophisticated offices in new and remodeled homes
- In-home services for aging residents
Telecommuting

- 4.2 million telecommute Michael Caggiano, CEO True Careers
- 35% of these work at home at least half of the week
- Provides flexibility, spend time with family, eliminates stressful commute
- Growing in popularity
Personalization

- Individuality/Personalization important
- New product lifestyle is unobtrusive
- Ergonomics increasingly important
Ergonomics

- Chair and work surfaces that are friendly to workers
- Europeans are raising the bar
- Workplace napping; theme: make relaxation and rest an integral part of everyday working life
Innovation

- Innovation is expected
- Consumers want something new
- More features at lower price; more for less
- Adjustment features on chairs a commodity
- Mass merchants launch designer lines
- New products toward funky and functional
- Large wheels roll better
Echo-Tech

- Ecologically conscious products
- Interest in natural materials to counter the influx of technology in our lives
- Appreciation for natural materials
- Advancements in material and production technologies creating new interest
- Metallic polypropylene chips abandoned for reconstituted wood fibers and biodegradable resins
Manufacturing

- Quest for most comfortable cheapest chair
- Natural material to counteract cold technology
- Technology is enabling products
- Increased competition; overseas manufacturing
- Dissociation between well designed and well manufactured
- Risk of compromising quality and integrity
- More features at lower price; more for less
- Pressure on manufacturers to be sustainable
Interiors

- Consumers have more options of style, prices, finishes and colors
- Basic styles: Casual, Formal, Contemporary, Traditional
- Styles: French Country, Paris Apartment, Rustic, Shabby Chic, Tuscan and Western
- Color themes: b & w; chocolate browns and denim blues
- More options for decorating; wire and wicker popular
- Possible blurring of lines between home office chair and computer chair; Kitchen aesthetic a possibility
- New lifestyle is comfortably understated; unobtrusive
Interiors
Interiors
Aesthetics

- Shifting US aesthetic; "new modernism of crispness and sharpness; sharp edges, tight corners and straight lines.
- Renewed appreciation for quality and enduring aesthetics
- “Away from rounded see-through forms of the 90’s and toward a tougher sensibility”  
  
  Bruce Nussbaum, Businessweek
- Consumers appreciate understated products
- Asian influence increasing
- 2002 Ford Taurus and Lincoln Navigator typical
- Natural material to counteract cold technology
Color

- Consumer product colors are darker and bolder
- Stainless is now a color; titanium increasingly popular
- Nickel is becoming very popular
- Satin metal finishes are in
- Home interior: Black and white, chocolate browns and denim blues
- 80 “staple” colors
Image Map
Sketch Ideation (aka - Idea Development)
Initial Concepts

- Simple
- Absorb
- Spring
- Uno
- Joint
- Maestro
Simple

- Height adjustment with column of rings
- Tilting achieved with flexible mounting bracket
- Utilizes existing tubing capabilities
- Height adjustment with large threaded shaft/collar
- Forward seat pivot
- Off the shelf parts used to create a new look
Spring

- Coil spring seat support for shock reduction
- Height adjustment with rings
- Tilting achieved with a spring steel mounting bracket
- Head could be detachable
Uno

- Minimal number of parts
- Variable spring rate to accommodate different users
- New look of integral molding for main structure
- Ball casters with recirculating bearings
Joint

- Blow molded backrest
- Cushion inserts into backrest
- Integrated neck rest
- Height adjustment with pin and holes
Maestro

- Elegant tail look
- Height adjustment with column of rings
- Forward seat pivot
- Backrest storage pocket
Maestro Tilting Mechanism
Pivoting in the base
Maestro Under Load
Spring
Variable spring rate

Support

Tilting Arm
Final Concepts

Uno  Joint  Absorb (Shock)
Uno Tilt Mechanism

Base

Variable spring rate

Polypropylene Back Spring

ABS Front: adjustable for initial conditions

Front

Back
Joint Tilt Mechanism

Pivoting in the base

To separated parts made of wax in a 3D ThermoJet printer

TILTING ARM

Part created in a Stereolithography machine for rapid prototyping for casting

SUPPORT
Joint
Absorb
Ball caster concept (any chair)
Ball Casters

Four bearing balls
Ball Casters

Six bearing balls sliding in elliptical housing
Ball Casters

Re-circulating bearing balls
Final Design Selection

Uno  Joint  Absorb (Shock)
Joint

Piece Part Costs:

- Seat to Backrest bracket: $1.35
- Control unit support: $5.50
- Control unit arm + cover: $7.44
- Elastomeric Spring: $0.80
- Hinge pin: $1.00
- 4700 base, casters, + standpipe $5.72
- Cylinder (3.15” stroke) $2.29
- Seat $6.00
- Backrest $4.91
- Outer back cover $3.73

Total piece part cost: $38.74
Tooling Investment

- Seat to Backrest bracket (Die Set) $33,000
- Control Unit Support (2 plate mold, 2 moving side cores) $31,000
- Control Unit Arm (2 plate mold, 2 moving side cores) $42,000
- Control Unit Cover (2 plate mold) $18,000

All single cavity tooling

Total tooling investment: $124,000

2yr. Payback: 26,000 units 1st year
27,000 units 2nd year

Add $2.34 cost per chair
<table>
<thead>
<tr>
<th>Joint</th>
<th>Good: $89</th>
<th>Better: $119</th>
<th>Best: $139</th>
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<tbody>
<tr>
<td>- Leather + all other fabric coverings</td>
<td>- Leather + all other fabric coverings</td>
<td>- Leather + all other fabric coverings</td>
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</tr>
<tr>
<td>- Height adjustable</td>
<td>- Height adjustable</td>
<td>- Height adjustable</td>
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<tr>
<td>- No armrests</td>
<td>- Standard casters</td>
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<tr>
<td>- No tilt lock</td>
<td>- Arm rests</td>
<td>- Tilt lock</td>
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<tr>
<td>- Standard casters</td>
<td>- No tilt lock</td>
<td>- Upgraded casters</td>
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</table>
Joint

Human factors
Etienne Grandjean “Fitting The Task To The Man”

Recommendations:

- Backrest height of 480-520mm (18.9-20.4”) above seating surface
- Backrest width of 320-360mm (12.6-14.1”)
- Backrest angle of 104-120 degrees
- Lumbar between the third vertebra and sacrum, 100-200mm (3.9-7.8”) above seat
- Seat width of 400-450mm (15.7-17.7”)
- Seat depth of 380-420mm (14.9-16.5”)
- Seat angle or 4-6 degrees