Team Members

Mechanical Engineers:
- Travis Fisher
- Matt Lampe
- Justin Reilly

Industrial Engineers:
- Elizabeth Carter
- Burcak Guclu
  Lead Engineer
- Ryan Hastrich
  Manager
Project Description

• Statement of Work
  • Design a portfolio of 3 – 5 products

• Manufacture in Brinkman Lab

• Sell on Campus

• Complete Documentation

• By Commencement 2004
• Capabilities & Constraints
• Concept Development
• Survey Data
• Concept Selection
• Detailed Product Design
• Business Analysis
Capabilities and Constraints

- Injection Mold Machine
Capabilities and Constraints

• EDM
Capabilities and Constraints

- Bridgeport Mill
- Hardinge Lathe
Capabilities and Constraints

- Hardinge Mill
Capabilities and Constraints

- Hardinge Lathe
- Mazak Lathe (live tooling)
• Capabilities & Constraints
• Concept Development
• Survey Data
• Concept Selection
• Detailed Product Design
• Business Analysis
Concept Development

- Book Ends
- Card Holders
Concept Development

- Bottle Opener
- Others
Concept Development

- Patent Issues
- Manufacturing issues
Engineering Models

- Finite Element Analysis
• Capabilities & Constraints
• Concept Development
• Survey Data
• Concept Selection
• Detailed Product Design
• Business Analysis
1st Survey Data

Products interested in buying

- Picture Frame: 26%
- Key Chain: 14%
- Magnets: 15%
- Bottle opener key chain: 45%
1st Survey Data

Products they want as a gift or they would buy themselves

- Business Card Holder: 16%
- Picture Frame: 20%
- Plexiglas Diploma Frame: 37%
- Desk Clock: 18%
- Book ends: 9%
2nd Survey Data

"Want as a Graduation Gift"

- Diploma Frame: 30%
- Picture Frame: 18%
- Desk Clock: 27%
- Card Holder: 10%
- Bookends: 8%
- No Reply: 7%
• Capabilities & Constraints
• Concept Development
• Survey Data
• Concept Selection
• Detailed Product Design
• Business Analysis
## Concept Selection

### Attribute Importance Matrix

<table>
<thead>
<tr>
<th></th>
<th>Manufacturing Ease</th>
<th>Estimated Sales Volume</th>
<th>Sufficient Skills</th>
<th>Sufficient Number of People</th>
<th>Aesthetics</th>
<th>Survey Data Support</th>
<th>Estimated Sales - Cost Ratio</th>
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## Concept Selection

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</tr>
</tbody>
</table>
• Capabilities & Constraints
• Concept Development
• Survey Data
• Concept Selection
• Detailed Product Design
• Business Analysis
Curved Ball Business Card Holder

• Features
  – Curved Groove
  – Aluminum
  – Anodized black
  – Engraved RIT logo
Picture Frame

• Features
  – Holds a 4 x 6 in. picture
  – One-piece Aluminum
  – Engraved RIT logo
Cylindrical Card Holder

- **Features**
  - Small footprint
  - Aluminum
  - Anodized black
  - Engraved RIT logo
Bookend

• Features
  – Two-Piece Aluminum
  – Anodized
  – Engraved RIT logo Both Sides
Flat Bottle Opener

- Features
  - Small
  - Light Weight
  - Tough
  - Anodized Aluminum
  - Engraved RIT logo
Plexiglas Diploma Frame

- Features
  - Clear Acrylic
  - Designed for 10” x 12” RIT Diploma
  - Engraved RIT logo
Magnet/Keychain/Coaster

• Features
  – Injection Molded
  – High Quality Plastic
  – RIT Logo
  – Common Design
• Capabilities & Constraints
• Concept Development
• Survey Data
• Concept Selection
• Detailed Product Design
• Business Analysis
Cost Analysis

• Unit Cost was estimated based on:
  • Material Price Estimates
  • Machining Time Estimates
  • Labor Time Estimates
  • Finishing Costs

• Cost equation

\[
\text{Unit Cost} = \frac{\text{Setup Cost}}{\text{Batch Size}} + \frac{\text{Fixed Cost}}{\text{Total Volume}} + \text{Variable Costs}
\]
### Price Analysis

- **Estimated Unit Cost**
- **25% Profit**

<table>
<thead>
<tr>
<th>Product</th>
<th>Unit Cost</th>
<th>Selling Price</th>
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<tbody>
<tr>
<td>Curved Ball Card Holder 04017-092</td>
<td>$14.36</td>
<td>$19.15</td>
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<tr>
<td>Picture Frame 04017-030</td>
<td>$16.69</td>
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<td>Bookend 04017-002</td>
<td>$18.86</td>
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<td>Diploma Frame 04017-041</td>
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<td>Cylindrical Card Holder 04017-120</td>
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<td>Bottle Opener 04017-020</td>
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<tr>
<td>Magnet/Keychain/Coaster 04017-01x</td>
<td>TBD</td>
<td>TBD</td>
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</table>
## Market Analysis

- **Proportion Of Campus Population**

<table>
<thead>
<tr>
<th>Population Subset</th>
<th>Size (N)</th>
<th>Awareness Fraction (A)</th>
<th>NxA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduating Seniors</td>
<td>1,903</td>
<td>0.40</td>
<td>761</td>
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<tr>
<td>Faculty/Staff</td>
<td>3,145</td>
<td>0.40</td>
<td>1,258</td>
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<tr>
<td>Alumni</td>
<td>90,000</td>
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<td>4,500</td>
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<tr>
<td>Graduate</td>
<td>2,374</td>
<td>0.40</td>
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<tr>
<td><strong>Total</strong></td>
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<td>7469</td>
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Demand Analysis

Estimated Demand Trend

\[ y = 0.0624x^2 - 4.3696x + 73.329 \]

- **Bottle Opener key chains**
- Poly. (Bottle Opener key chains)

- Selling Price ($)
- Quantity
## Demand Forecast Table

<table>
<thead>
<tr>
<th>Demand</th>
<th>Calculated</th>
<th>Worst Case</th>
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<td><strong>Products:</strong></td>
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<tr>
<td>Picture Frame</td>
<td>34</td>
<td>12</td>
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<tr>
<td>Ball Card Holder</td>
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<td>Curved Bookend</td>
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<td>6</td>
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<tr>
<td>Diploma Frame</td>
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<tr>
<td>Flat Bottle Opener</td>
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<tr>
<td>Cylindrical Card Holder</td>
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<td>24</td>
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<tr>
<td><strong>Results:</strong></td>
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<tr>
<td>Total Units</td>
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<td>93</td>
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<tr>
<td>Annual Cost</td>
<td>$2,671</td>
<td>$1,143</td>
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<tr>
<td>Gross Income</td>
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<td>$1,493</td>
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<tr>
<td>Annual Profit</td>
<td>$890</td>
<td>$350</td>
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Business Plan

- Marketing Plan
- Operational Plan
- Sales and Accounting Plans
- Management Plan
- Startup Cost Analysis
- Financial Plan
Next Steps

• Manufacturing Planning
• Fixture Design & Build
• CNC Programming
• Marketing/Advertising/Sales
  – Website
  – Flyers
  – Wholesale Marketing
• Handling/Storage/Inventory
• Full Scale Production
Lessons Learned

• Planning, Planning, Planning
• Industrial Design *can* be useful (and fun)
• Engineers *Should* Take Business Classes
• Forecasts are *always* wrong
• Don’t carry prototypes loose in a bag