**Objective**

**Opportunity:** Cars and bikes are often inconvenient to use when traveling around a crowded city. A collapsible electric powered scooter is a more effective mode of transportation for urban areas due to its convenience, speed, efficiency and portability.

**Goal:** Design a collapsible scooter that is lightweight and small enough to fit inside a backpack. Due to time constraints, the electric motor was not considered.

**Target Market:** Students and young business professionals, 15-34 years old, in the DC Metro area which includes approximately 1.5 million people.

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**Concept Generation**

**Similar Products**
- Razor A2 & E300 Models

**Concepts**
- **Concept 1**
  - Pro: Compact
  - Con: Complex, unstable
- **Concept 2**
  - Pro: Simple, sleek, compact, stable
  - Con: Less space for components

**Final Concept**
- Features: Telescoping handlebar, folding platform, 3 wheels

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**Prototype and Testing**

**FEA stress results of platform with 220 lb load**

**Early Prototype of K'Nex to Determine Assembly Layout**

**Final Prototype Goals:** Demonstrate the scooter’s folding functionality and compact dimensions

<table>
<thead>
<tr>
<th>Part</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handlebar</td>
<td>Modified extension pole</td>
</tr>
<tr>
<td>Platform</td>
<td>Red oak with foam core</td>
</tr>
<tr>
<td>Wheels</td>
<td>Reused from Razor</td>
</tr>
<tr>
<td>Hinges</td>
<td>Pre-made</td>
</tr>
</tbody>
</table>

**Results:** The scooter successfully passed our backpack test, meaning it fit in a backpack when folded.

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**Test Results and Future Work**

**Future Work**
- Integrate motor and brakes
- Create ride-able prototype out of stronger materials
- Develop partnerships with manufacturers for large scale production

**Reflection**
- A weighted decision matrix is a easy way to make objective decisions when team members have a variety of ideas and opinions
- Constructing the prototype of the scooter without the proper materials and tools proved to be more difficult than anticipated

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**Design**


**Innovations:** interlocking wheels, handlebar/platform interface, hinge locking mechanism

**Tradeoffs:** Sacrificed handlebar stability for collapsibility

**Requirement Satisfaction:**
- Lightweight: < 20 lbs, mostly Aluminum
- Portable: 18” x 6” x 7” min dimensions
- Aesthetics: curved and sleek platform
- Easy to fold: Only 3 folding steps

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**Customer Requirements | Engineering Characteristics | Constraints**
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Lightweight</td>
<td>Portable</td>
<td>Weight</td>
</tr>
<tr>
<td>Easy to fold</td>
<td>Looks cool</td>
<td>Folded size</td>
</tr>
<tr>
<td>Safe</td>
<td>Reliable</td>
<td>Unfolded size</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carry one person</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18 in. x 10 in. x 7 in.</td>
</tr>
</tbody>
</table>

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**Decision Criteria | Criteria Weights | Concept 1 | Concept 2**
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Space for Components</td>
<td>0.0498</td>
<td>0.7014</td>
<td>0.2132</td>
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<tr>
<td>Weight</td>
<td>0.1342</td>
<td>0.1179</td>
<td>0.6806</td>
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<tr>
<td>Strength</td>
<td>0.3708</td>
<td>0.1932</td>
<td>0.7235</td>
</tr>
<tr>
<td>Foldable Size</td>
<td>0.4453</td>
<td>0.1373</td>
<td>0.6232</td>
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</table>

**Concept | Alternative Value**
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Concept 1</td>
<td>0.1835</td>
</tr>
<tr>
<td>Concept 2</td>
<td>0.6477</td>
</tr>
</tbody>
</table>

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**Team TAG: Vector Scooter**

[Tom Bailey, Tim Gill, Stephanie Martin, David Matten, Jeff Sturman]