Objective
A bicycle-powered charger to power your mobile device using a sustainable energy source

Target Market: D.C. Metro Area, ages 18-60+. 30,000 metro area residents commute via bicycle.

Customer Requirements:
- Ease of use & Installation
- Works every time
- Lifetime of at least 3 years
- Electronic compatibility
- Retrofitability

Constraints:
- Cost
- Standard bicycle frame and wheel sizes
- Device power requirements

Product Architecture:

Concept Generation

Design Characteristic | Weight
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Power Ratio | 19.9%
Added Resistance | 13.6%
Reliability | 12.4%
Power Output | 10.4%

Prototype and Testing

A: Dynamo
B: Rectifier circuit
C: Rectifier USB output in casing

Prototype Goals
- Achieved: charging as low as 6mph
- Weatherproof casing
- Simultaneous battery/device charging with option

Testing
- Weather resistance (passive test): dynamo left outside for 3+ weeks
- Voltage v. speed (left): speedometer on rear wheel, voltage recorded at 2mph steps (bicycle stationary for test)

Results and Future Work

Future Work
- Engineering on subcomponent level:
  - Increase electrical efficiency
  - Decrease marginal costs
  - Increase device lifetime: Low-voltage cutoff
- Prepare for manufacture, i.e. SMC layout, molding drafts, etc.

Product Development Process
- Early work done to gauge “voice of the customer” helped guide future design decisions
- Developed functional prototype early on to make usage modeling significantly easier

Operation:
Dynamo motor generates power from the rear tire rotation.
Generated energy powers a mobile battery pack and USB output.

Key Innovations:
Motor allows user to charge device while riding, battery allows user to store energy to charge device later

Customer Satisfaction:
- Lightweight, with no significant resistance to pedaling
- Prototyped case is weatherproof and durable
- Option to power device by rechargeable battery

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CTQ Engineering Characteristics:
- Mechanical Drag on Wheels
- Power Output
- Reliability
- Added Resistance to Pedaling
- Durability

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