

Second Generation Bike

Problem Definition and Project Plan

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Overview

- Client
- Customer Needs
- Project Goal
- Objectives
- Constraints
- Testing Environment
- Quality Function Deployment (QFD)
- Project Planning
- Conclusion

Clients

- Dr. Srinivas Kosaraju
 - PHD Mechanical Engineering
 - Senior Design Professor
- Green Fund
 - Funded project in 2013

Customer Needs

- The 1st Generation Charging Bicycle Station does not possess an adequate interactive display or an efficient energy storage system.

Project Goal

- Goal: Complete and improve the 2013-2014 2nd Generation Bicycle Charging Station.

Objectives

- The bike should be able to power small electronics
- The touch screen should be able to sustain heavy use
- The bike should be durable and reliable
- The bike should have an efficient energy storage system
- The control system should be inexpensive
- The system should look aesthetically pleasing

Objectives

Objective	Measurement	Units
Powers Small Electronics	Test with a Load Bank	Watts (W)
Durable Touch Screen	Surface Roughness/Scratches	Number of Scratches
Durable and Reliable Design	Maintenance Costs	Dollars (\$)
Efficient Storage System	Test System Load Capacity	Watts (W)
Inexpensive	Cost of Additional Components	Dollars (\$)
Aesthetically Pleasing	Compare Survey Results	Survey

Constraints

- Capable of charging common electronic devices in only a few hours
- Charging station must be capable of being converted from stationary to mobile in only a few minutes

Constraints

- Station must contain an interactive touch screen display that shows:
 - Power generated
 - Power used
 - Calories lost
 - Distance traveled
 - Total power generated over lifetime of the charging station

Testing Environment

- A Laboratory Experiment
 - Will be used to analyze the power output of the charging station (via computer program)
- A Field Test
 - Will be used to test durability and functionality of the charging station and display screen.

Quality Function Deployment (QFD)

Legend:
1 = Weak
2 = Moderate
3 = Strong

		Importance	Weight	Power Output	Cost	Maintenance	Accuracy
Customer Requirements	Accessibility/Ease of Use	7	1		1	1	
	Interactive Display	10	1		3	1	2
	Power Generation	10	2		2	2	3
	AC Power Capability	6	1	2	1	1	1
	Mobility	7	1		1		
	Aesthetic Design	8			1		
	Multiple Charging Outputs	7			2		2
	Power Storage System	9	1		3	3	3
	Output Displays	10		1		1	3
		Score:		59	22	119	80
	Relative Weight:		14%	5%	29%	20%	31%
	Units of Measure:		lbs	Watts	\$	Hours	% error

State-of-the-art Research

- Raspberry PI - <http://www.raspberrypi.org/>
- Arduino - <http://arduino.cc/>
- Python - <https://www.python.org/>
 - Beginning Python 3.0 : Using Python 2.6 and Python 3.1 eISBN 9780470626641
- C++ - Mastering Windows 8 C++ App Development
 - eISBN 9781849695039
- Super Capacitors - [http://batteryuniversity.com/learn/article/whats the role of the supercapacitor](http://batteryuniversity.com/learn/article/whats_the_role_of_the_supercapacitor)
- Lithium Ion Batteries - [http://batteryuniversity.com/learn/article/lithium based batteries](http://batteryuniversity.com/learn/article/lithium_based_batteries)

Project Planning



2014

Presentation #1

PreReport #2#2

Presentation #3

Final Presentation

Week 37 9/7/14 Week 38 9/14/14 Week 39 9/21/14 Week 40 9/28/14 Week 41 10/5/14 Week 42 10/12/14 Week 43 10/19/14 Week 44 10/26/14 Week 45 11/2/14 Week 46 11/9/14 Week 47 11/16/14 Week 48 11/23/14 Week 49 11/30/14 Week 50 12/7/14

Name	Begin date	End date
Project Assessment	9/10/14	9/19/14
SOTA (State of The Art) Research	9/10/14	9/19/14
Previous Project Analysis	9/10/14	9/19/14
Presentation #1	9/17/14	9/17/14
Report #1	9/19/14	9/19/14
Concept Generation	9/19/14	10/17/14
Hardware and Electronics Selection	9/19/14	10/8/14
Coding Research	9/19/14	10/17/14
Presentation #2	10/15/14	10/15/14
Report #2	10/17/14	10/17/14
Engineering Analysis	10/17/14	11/12/14
Coding	10/17/14	11/7/14
Control System	10/17/14	11/7/14
Electrical Efficiency Analysis	10/17/14	11/12/14
Presentation #3	11/12/14	11/12/14
Report #3	11/14/14	11/14/14
Project Proposal	11/14/14	12/3/14
Project Finalization	11/14/14	12/3/14
Final Presentation	12/3/14	12/3/14
Final Report	12/5/14	12/5/14

Conclusion

- Engineering Design Process
 - Improving upon the 1st Generation Charging Station by adding an interactive display and a more efficient storage system
- Testing Environment
 - To be tested both in the field and in the laboratory
- Quality Function Deployment
- State-of-the-art Research
 - Research into the types of programming and microcontrollers
- Project Planning