Lighting Resources LLC

Team C1

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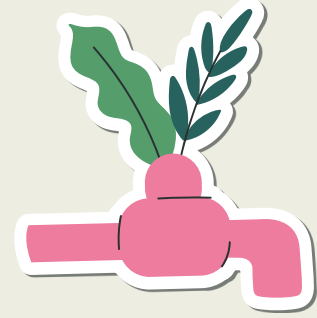
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01
Introduction and Problem Statement

Intro to Lighting Resources

- **Nation's Largest Bulb Recycler:** 25+ years of eco-friendly recycling solutions.

- **14 Facilities & Fleet:** Handles universal waste, from single units to truckloads

.

- **Comprehensive Services:** Recycles bulbs, batteries, ballasts, mercury devices, electronics, and more.

- **Nationwide Reach:** Operates 13 U.S. locations with mail-back kits for small recyclables.

Problem Statement

Decision Problem
Lighting Resources LLC wants to know how to increase college students' engagement with recycling

Research Question
What are the most effective design and branding strategies for Lighting Resources recycling bins to attract more UIUC college students' recycling?
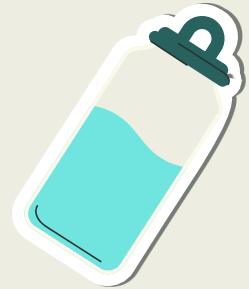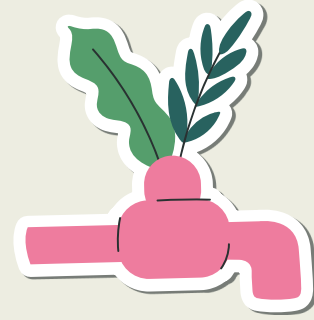
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Research Design

Exploratory - Descriptive - Causal

Research Design

Exploratory

We will use a combination of ZMET and literary reviews to deliver both quantitative and qualitative insights to develop effective and reliable recycling strategies

Descriptive

We will use surveys to conduct descriptive research, gathering quantitative data on preferences, behaviors, and attitudes. This method is efficient for collecting insights from large samples, especially through cross-sectional studies. Surveys will help us analyze recycling trends within college institutions with clear and measurable results.

Causal

We will use a test market if needed. For example, placing Lighting Resources' recycling bins in a high-traffic location like CIF could measure the impact of design features like LED displays and aesthetics on recycling behaviors. Success would be determined by tracking the number of batteries and lightbulbs collected.

03

Methodology
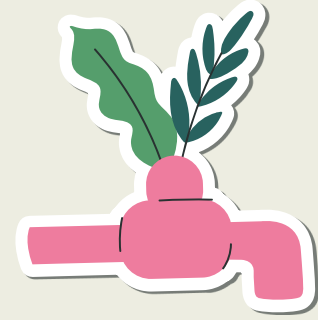
Secondary Data

Literature Review

Design and Branding

- Labeling recycling bins, implementing different colors, and carefully placing openings can all increase recycling rates

Boosting Student Engagement
- Many students aren't engaged on campus, a way to increase that is through incentives

Campus Recycling Programs
- Universities can implement educational awareness campaigns, partner with local recycling companies to stay up-to-date, and engage in social media campaigns to keep students informed on how they can recycle

Primary Data: Qualitative (ZMET)

Our ZMET research revealed three key themes: Collaboration, Waste, and Recycling.

1. Collaboration emphasizes the need for collective efforts to address environmental challenges
2. Waste reduction focuses on minimizing excessive consumption.
3. Recycling, especially of items like bulbs and batteries, was identified as a practical way to reduce environmental impact and promote sustainability for future generations.

Primary Data Quantitative

- **Survey Outreach**: Surveyed 100+ participants, including friends, professors, and campus community members, for a diverse and representative sample.
- **Survey Details**: Hosted on Qualtrics with 25 questions, taking ~5 minutes to complete.
- **Data Collected**: Insights into recycling habits, influencing factors, respondent characteristics, and trends.
- **Additional Focus Areas**: Interest in recycling competitions, motivational rewards, preferred incentives, and the environmental impact of recycling.

04

Results

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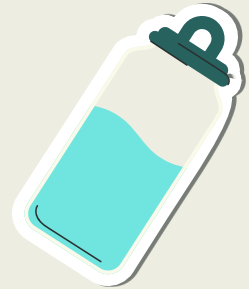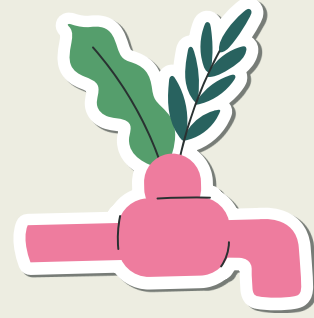
Results: Frequency

Q13. What design elements influenced your decision?
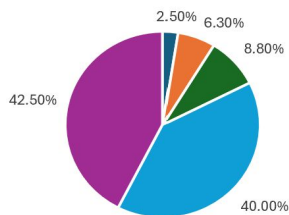
Progress counter

- Extremely unlikely — 2.50%
- Somewhat unlikely — 6.30%
- Neither likely nor unlikely — 8.80%
- Somewhat likely — 40.00%
- Extremely likely — 42.50%

QR Code connected to mobile app

- Extremely unlikely — 4.90%
- Somewhat unlikely — 23.50%
- Neither likely nor unlikely — 16.00%
- Somewhat likely — 24.70%
- Extremely likely — 30.90%
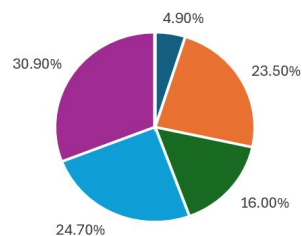
Easy to understand labels (images of what goes in specific bins)

- Extremely unlikely — 2.50%
- Somewhat unlikely — 4.90%
- Neither likely nor unlikely — 8.60%
- Somewhat likely — 35.80%
- Extremely likely — 48.10%
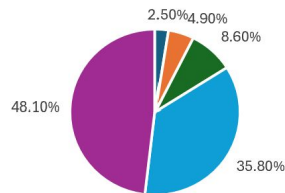
Bright colors and eye-catching design

- Extremely unlikely — 4.90%
- Somewhat unlikely — 11.10%
- Neither likely nor unlikely — 19.80%
- Somewhat likely — 44.40%
- Extremely likely — 19.80%
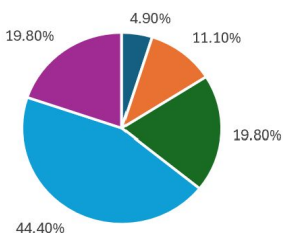
Progress counter and easy to understand labels are the most effective design elements in influencing students' recycling decisions

Results: Descriptive

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Q12. Based off of the three proposed recycling bin, how likely would you be to recycle batteries and lightbulbs? - Image 1	81	1	5	4.22	.837
Q12. Based off of the three proposed recycling bin, how likely would you be to recycle batteries and lightbulbs? - Image 2	81	1	5	3.83	.863
Q12. Based off of the three proposed recycling bin, how likely would you be to recycle batteries and lightbulbs? - Image 3	81	1	5	3.42	1.192

←Image 1

←Image 2

←Image 3

Image 1 is the most effective design in increasing battery and lightbulb recycling

Results: Correlation

Correlations

		Q6. Which of the following locations would make you more likely to recycle? - On campus recycling (dorm, libraries, academic buildings)	Q11. What would motivate you to recycle batteries or lightbulbs? - Ease of Access to Bins	Q16. How likely would you be to participate in a campus-wide recycling competition for the following items if one were organized? - Batteries	Q15. How likely would you be to recycle the following items if recycling stations were more prominent or included technology like interactive designs? - Batteries	Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - LED lights on bin that change color when you recycle	Q15. How likely would you be to recycle the following items if recycling stations were more prominent or included technology like interactive designs? - Lightbulbs
Q6. Which of the following locations would make you more likely to recycle? - On campus recycling (dorm, libraries, academic buildings)	Pearson Correlation	1	.362**	.256*	.401**	-.002	.283*
	Sig. (2-tailed)		<.001	.022	<.001	.988	.010
	N	99	98	80	81	81	81
Q11. What would motivate you to recycle batteries or lightbulbs? - Ease of Access to Bins	Pearson Correlation	.362**	1	.325**	.394**	.239*	.370**
	Sig. (2-tailed)	<.001		.003	<.001	.033	<.001
	N	98	98	79	80	80	80
Q16. How likely would you be to participate in a campus-wide recycling competition for the following items if one were organized? - Batteries	Pearson Correlation	.256*	.325**	1	.580**	.311**	.562**
	Sig. (2-tailed)	.022	.003		<.001	.005	<.001
	N	80		80	80	80	80
Q15. How likely would you be to recycle the following items if recycling stations were more prominent or included technology like interactive designs? - Batteries	Pearson Correlation	.401**	.394**	.580**	1	.368**	.853**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001
	N	81	80		81	81	81
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - LED lights on bin that change color when you recycle	Pearson Correlation	-.002	.239*	.311**	.368**	1	.383**
	Sig. (2-tailed)	.988	.033	.005	<.001		.001
	N	81	80	80	81	81	81
Q15. How likely would you be to recycle the following items if recycling stations were more prominent or included technology like interactive designs? - Lightbulbs	Pearson Correlation	.283*	.370**	.562**	.853**	.383**	1
	Sig. (2-tailed)	.010	<.001	<.001	<.001	<.001	
	N	81	80	80	81	81	81

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Q6: Recycling Locations (On-Campus Recycling)

- **Ease of Access to Bins (Q11)**: r = .362, p < .001 (moderate positive correlation). Students who value convenient bin access are also more likely to prefer on-campus recycling locations.

Q11: Motivation (Ease of Access to Bins)

- **Participation in Recycling Competitions (Q16)**: r=.325, p=.003 (moderate positive correlation). Ease of bin access motivates students to participate in competitions.

Q16: Campus-Wide Recycling Competition (Batteries)

- **Recycling Batteries with Enhanced Stations (Q15 - Batteries)**: r=.580, p<.001 (strong positive correlation). Participation in competitions aligns strongly with likelihood to recycle with enhanced stations.

Results: T Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Q15. How likely would you be to recycle the following items if recycling stations were more prominent or included technology like interactive designs? - Batteries	Equal variances assumed	1.849	.178	-3.304	79	<.001	.001	-.755	.229	-1.210	-.300
	Equal variances not assumed			-3.245	66.316	<.001	.002	-.755	.233	-1.220	-.291

- F=1.849,p=0.178: Since p>0.05, there is no significant difference in variance between genders and recycling batteries, supporting the assumption of equal variances for the t-test.

- Confidence interval (CI): The 95% CI ranges from –1.210 to –0.300 confirming the mean difference is significant and not likely due to random variation.

Results: Regression

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	1.350	1.733		.779	.518
Q13. What design elements influenced your decision? - Easy to understand labels (images of what goes in specific bins)	.146	.277	.127	.527	.651
Q13. What design elements influenced your decision? - Progress counter (visual displays showing how many batteries or bulbs have been recycled)	3.046	1.531	2.248	1.989	.185
Q13. What design elements influenced your decision? - Bright colors and eye-catching design	-.377	.301	-.278	-1.251	.337
Q13. What design elements influenced your decision? - QR Code connected to mobile app	-1.360	.685	-1.040	-1.985	.186
Q13. What design elements influenced your decision? - Other (specify)	-.181	.203	-.158	-.892	.467
Q18. What is your year in school?	.164	.247	.144	.664	.575
Q19. What is your gender?	-.346	.469	-.134	-.739	.537
Q20. What college do you attend?	-.230	.062	-.610	-3.735	.065
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - LED lights on bin that change color when you recycle	1.702	.399	1.526	4.271	.051
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Recycling rewards point systems- receive points for every battery/lightbulb recycled and redeem points for discount on food in the Union, free entry into sports game, discounted merch from the bookstore, etc.	-1.338	.763	-1.023	-1.753	.222

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Mobile app including bin locator, reminders and notifications, educational information, and rewards	.843	.489	.590	1.725	.227
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Targeted educational campaigns and training sessions	-.413	.190	-.394	-2.170	.162
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Dorm vs. dorm competition- semester-long recycling competition where winners can collect prizes such as a pizza party or catered dinner	-.966	.433	-.788	-2.230	.155
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - VIP exclusive access- offers recyclers the chance to win VIP access to special campus events, such as Spring Jam and more	.110	.335	.083	.329	.773

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Social media challenge- students post on social media with specific recycling, each post is an entry for a prize raffle	.874	.402	.630	2.174	.162
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Recycling quest- recycling turned into a scavenger hunt with checkpoints across campus. Students who recycle at different bins can collect virtual stamps or tokens, leading to a prize at the end of the semester.	.183	.298	.161	.613	.603
Q14. How effective do you think both of these incentives would be in encouraging more recycling batteries and lightbulbs? - Surprise boxes- "mystery boxes" will be placed randomly at recycling bins for students to win when they recycle. Prizes can range from small items like snacks or a drink to larger items such as a free ticket to a football gam	-.223	.213	-.213	-1.050	.404
Q12. Based off of the three proposed recycling bin, how likely would you be to recycle batteries and lightbulbs? - Image 1	-.773	1.208	-.490	-.640	.588
Q12. Based off of the three proposed recycling bin, how likely would you be to recycle batteries and lightbulbs? - Image 2	.509	.336	.319	1.515	.269
Q12. Based off of the three proposed recycling bin, how likely would you be to recycle batteries and lightbulbs? - Image 3	-.263	.179	-.250	-1.468	.280
Q1. How often do you recycle? - On campus	-1.312	.559	-1.213	-2.347	.143
Q1. How often do you recycle? - At home	.560	.175	.625	3.202	.085
Q4. How would you rate your current knowledge about recycling (e.g., what can be recycled and where)?	.129	.512	.085	.253	.824

None of the coefficients are significant at a 0.05 level. The closest variable is the effectiveness of LED lights in encouraging recycling with a significance level of 0.051

Results: Regression Cont

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.793	23	1.817	10.080	.094[b]
	Residual	.361	2	.180		
	Total	42.154	25			

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.996[a]	.991	.893	.425

Although the model has a very strong relationship it is not significant this can happen because
- **Overfitting the model**: model having too many predictors relative to sample size
- **Multicollinearity**: two or more variables in a model are highly correlated

Based off of ANOVA Sig, we can conclude there is no significance between gender, year, college, how often do you recycle, current knowledge, image, incentives, and design elements and recycling likelihood of batteries and lightbulbs

The high R value of 0.996 and R^2 value of 0.991 indicate that the model explains 99.1% of the variance in the dependent variable, suggesting a very strong relationship between the predictors and the outcome.
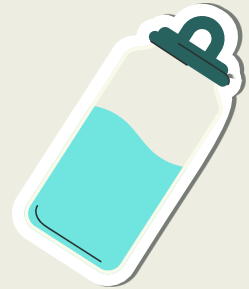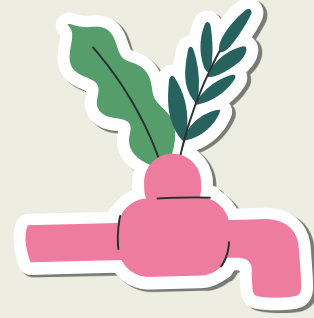
05

Conclusions

Effective Approach & Opportunities For Growth

Conclusions

Strong Insights into Student Engagement:

- The research provided valuable insights into the preferences of UIUC college students, highlighting the effectiveness of recycling rewards programs, mobile apps, and competitions in fostering greater engagement.
- Image 1's popularity reinforces the importance of innovative and appealing design elements such as easy-to-read labels and a progress counter, in encouraging recycling behaviors.
- Through correlation analysis, we can conclude that students who value convenient bin access are also more likely to prefer on-campus recycling locations.
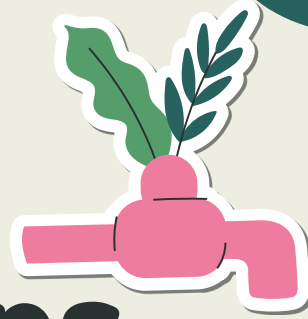
Effective Research Approach:

- The high R^2 value (0.991) indicates that the regression model successfully explains most of the variability in recycling behavior. This affirms the research's overall validity and reliability in guiding actionable strategies.

06
Recommendations
+ Limitations

What to keep in mind

Recommendations and Limitations

Recommendations:

1. **Launch a Pilot Program**:
   ○ Implement a test market initiative in high-traffic locations like CIF, using top-rated designs and incentives mentioned earlier. This will provide actionable feedback and measurable success metrics.
2. **Innovative Communication**:
   ○ Develop educational campaigns tailored to college students, leveraging digital platforms to promote recycling rewards and proper waste management in a relatable and engaging way.

Limitations:

1. **Sample Bias**:
   ○ The study primarily sampled business students, which may limit the generalizability of findings to other demographic groups on campus.
2. **Short-Term Focus**:
   ○ Results are based on cross-sectional data and may not capture long-term behavior changes in recycling habits.