

Integrative Thinking Template

Figure 5-7. Template: Sketching the Models

Problem (What is the problem you are solving?)
<ul style="list-style-type: none">- High levels of litter polluting the River Kelvin and the surrounding areas- Limited data on the litter types, quantities, and locations.

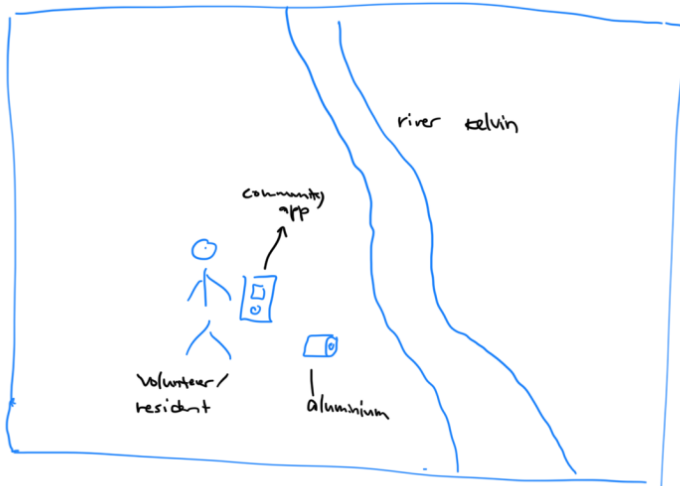
Opposing Models (What are the two opposing models?)	
Model 1 : Manual Community Monitoring Relying on volunteers and residents to manually record litter sighting using community apps or clean-up reports.	Model 2 : Automated Tech Monitoring Use of environmental sensors, image recognition and data analytics to automatically detect, classify and map litter in real-time.

Essential Components (How would you describe each model in three bullet points, specifying the key choices that make them extreme and opposing?)	
Model 1 . Volunteers and residents log litter sightings manually. . Data collection is irregular and varies in quality and consistency. . Focus on community engagement and responsibility.	Model 2 . Use of smart sensors and AI cameras to detect and classify litter. . Consistent, scalable, and real-time data collection. . Prioritizes accuracy and data-driven insights over human interactions.

Figure 5-8. Template: Visualization

Model 1

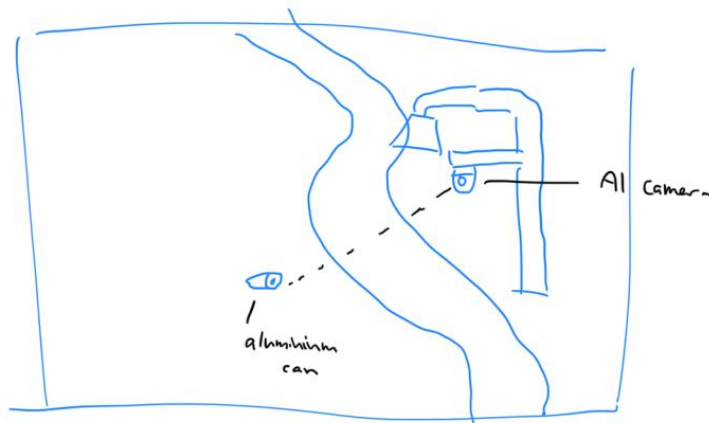
(Draw a simple sketch that illustrates this model.)



It illustrates a volunteer or resident finding litter on the side of the river such as an aluminum can and using a community app to log the litter.

Model 2

(Draw a simple sketch that illustrates this model.)



It illustrates how AI camera can be installed on things such as lamp posts to keep tabs on the litter situation around the river and possibly identify the litter type using the AI.

Figure 5-9. Template: Pro/Pro Chart, Model 1

Model 1: Manual Community Monitoring

Volunteers	Government	Environmental NGO / Schools
<ul style="list-style-type: none"> . Feeling empowered to make a difference in their community . Foster sense of ownership and environmental awareness . Build social cohesion through shared clean-up activities 	<ul style="list-style-type: none"> . Save cost on deploying tech solution . Gain support from the grassroot organizations for environmental initiatives. . Build trust with community by being involved. 	<ul style="list-style-type: none"> . Opportunity to educate and engage the public. . Create campaigns or studies based on the locally sourced data. . Form sustainable partnership with community groups.

What is this model really about?

It is about empowering citizens to actively monitor and combat littering while fostering their sense of community responsibility.

Figure 5-10. Template: Pro/Pro Chart, Model 2

Model 2: Automated Tech Monitoring		
<div>Government</div> <div><ul style="list-style-type: none">. Gain access to real-time data to make policy decisions.. Allocate resources efficiently based on hotspot data for litter.. Show commitment to innovative and modern infrastructure with the use of technology.</div>	<div>Tech Companies</div> <div><ul style="list-style-type: none">. Opportunity to develop and deploy new AI technology.. Gather valuable environmental data for research/commercial use.. Showcase environmental impact to clients and funders.</div>	<div>Policy Makers</div> <div><ul style="list-style-type: none">. Gain reliable evidence to support legislation/enforcements. Able to track trends over time to assess effectiveness of interventions.. Make data-driven decisions with increased credibility.</div>
<div>What is this model really about?</div> <div>Using technology to efficiently collect data to inform action and policy.</div>		

Figure 6-5. Template: Similarities, Differences, and What You Value Most?

Similarities

. Where do you see benefits that occur in both of the models in some way?

Both models can help to reduce litter and protect the River Kelvin by generating data and involving key stakeholders to influence policy decisions.

. Where do you see different outcomes that may be produced by similar mechanisms in each of the models?

Both models aim to collect data, however community monitoring focuses on local engagement and awareness, whereas automated tech ensures fast and precise interventions to litter.

Differences

. What are the benefits that are produced in one model but not the other?

Manual community monitoring builds the civic responsibilities and social cohesion of the locals. Whereas automated technology ensures real-time and large-scale data accuracy of litter around the area.

. How do the models advantage the players in different ways?

Community members gain sense of ownership with their involvement in Model 1, while authorities and policy makers benefit from the insights gained from Model 2.

Valued Benefits

Looking at the models together, how do the most valued benefits fall across them?

. Is it really just one truly essential benefit from each model?

Yes, Model 1 - essential benefit is community engagement and ownership.
Model 2 – accurate, real-time data collection.

. Is it all the benefits from one model and one essential benefit from the other?

No, both model offer distinct and essential benefits that address different aspects of the problem.

. Is it all the benefits from both of the models?

Yes, combining civic engagement of Model 1 with the technological efficiency of Model 2 can create a more holistic and sustainable solution.

Figure 6-6. Template: Tensions

Tensions
<p>. What elements of the two models are in tension? What would stop you from using both models at game time?</p> <p>The tension lies in manual effort and coordination required for Model 1 and the cost, complexity and potential privacy concerns deploying automated technology. It may be better to combine the 2 models to create something that can work around the tension in both models.</p>
<p>. What is the overlap between the elements that are in tension and the benefits you most value?</p> <p>Community engagement and accurate data are tied to the elements in tension.</p>
<p>. What would you have to do differently to make the tensions go away?</p> <p>A hybrid that integrates low-cost tech tools for data collection with community efforts that balance participation with efficiency.</p>

Figure 6-7. Template: Assumptions

Assumptions								
<p>. What are the core assumptions that underlie each model?</p> <table border="0"><thead><tr><th>Model 1</th><th>Model 2</th></tr></thead><tbody><tr><td>1. People would volunteer their time</td><td>1. Technology can accurately detect and classify litter.</td></tr><tr><td>2. Information gathered is useful and reliable</td><td>2. The cost of tech offset by litter recycling efforts.</td></tr><tr><td>3. Community engagement lead to behavioral changes</td><td>3. Real-time data enables quick interventions</td></tr></tbody></table>	Model 1	Model 2	1. People would volunteer their time	1. Technology can accurately detect and classify litter.	2. Information gathered is useful and reliable	2. The cost of tech offset by litter recycling efforts.	3. Community engagement lead to behavioral changes	3. Real-time data enables quick interventions
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<p>. If those assumptions didn't hold, how might you think differently about the problem?</p> <p>The focus would shift towards developing an approach that can balance both human participation and efficiency of tech.</p>								

Figure 6-8. Template: Causal Relationships

Causal Relationships

. What are the most valuable or most critical benefits from each model?

Model 1 (Manual Community Monitoring) – Build strong sense of community ownership and encourages long-term behavioral change towards littering.

Model 2 (Automated Tech Monitoring) – Provides real-time, accurate data that enables quick and targeted interventions to reduce litter efficiently.

Sketch a causal model for the most critical benefit or desired outcome.

Consider:

- . What causes what to happen?
- . Where might there be key feedback loops and off-ramps?

Model 1: Community Engagement → Behavioral Changes → Cleaner River

By getting volunteers to participate in monitoring and cleanup → They feel more responsible for environment → reduced littering behavior in the community → Cleaner River Kelvin

Feedback Loop:

Environment improves, more people feel motivated, reinforces the cycle.

Off-Ramp:

Volunteer interest declines, behavior change weakens.

Model 2: Real-Time Data → Rapid Response → Cleaner River

Sensor detects litter hotspot in real time → deploy cleaning resources / implement policy to reduce the litter → Litter prevention → Cleaner River Kelvin

Feedback Loop:

As intervention becomes more efficient, littering and pollution will reduce, recycling efforts can help to increase investments into tech.

Off-Ramp:

If tech fails, data inaccuracies could lead to misallocation of cleaning resources, costing more in the process.