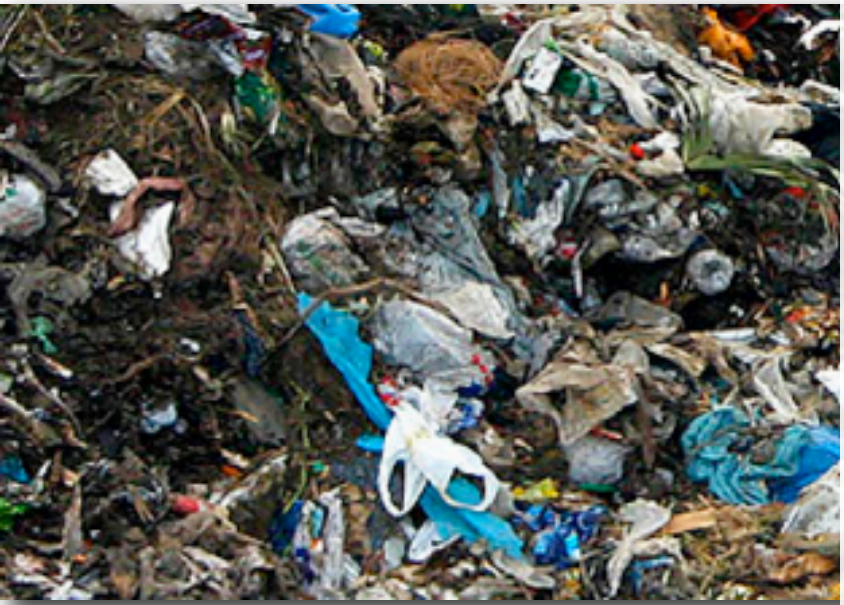
Designing Sustainable Waste & Recycling Services

Designing Business Services & Customer Experiences

ADS 714, ADS 560, or INDD 578, April 2008
University of Kansas, Department of Design
Michael Eckersley, PhD, Instructor

Executive Summary



Twenty-four graduate and undergraduate Industrial Design and Design Management students from the University of Kansas set out to study the public waste and recycling system for the City of Lawrence, Kansas. Students also researched best practices broadly for waste and recycling. Business (economic), technology, and customer experience factors were considered. The result is a rough design plan for phased implementation of a more efficient, comprehensive waste management system for the City of Lawrence with the promise of increased convenience and significantly improved rates of household recycling behavior.

Who we are

We are 24 graduate and undergraduate Interaction Design, Design Management and Industrial Design students

What we do

We create products, services and systems of value to people and to organizations

Why

We do it in order to address human and systems problems, address the needs and desires of people, facilitate communication, and create value

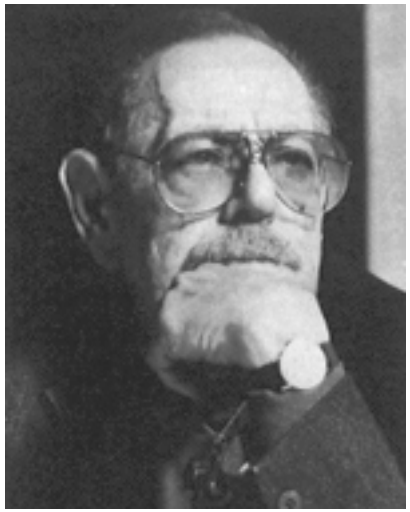
Disclaimers

We are not experts in environmental science or waste management.

We are learning how to manage complex systems problems that affect people and organizations.

We want to be part of the solution

Designers have been part of the problem



Victor Papanek (1927-1999)
"Design For The Real World"
Former KU Professor of
Architecture & Industrial Design

The designer-planner is responsible for nearly all of our products and tools and nearly all of our environmental mistakes. He is responsible either through bad design or by default: by having thrown away his responsible creative abilities, by "not getting involved".

The designer must be conscious of his social and moral responsibility. For design is the most powerful tool yet given man with which to shape his products, his environments, and by extension, himself; with it, he must analyze the past as well as the foreseeable future consequences of his acts.

Goals and intent

1. Research and analyze the scope of factors and dynamics underlying the system of public waste and recycling services. Document and benchmark best practices in comparable communities.

2. Develop a next phase waste and recycling system that is viable, feasible, and desirable and takes into consideration relevant technological, business, and customer experience requirements.

Values driving our design

Economy, Responsibility, Enterprise

Design Requirements

1. The program must Be viable, feasible, desirable (i.e., sustainable)

2. The program should: Adapt to the whole of Lawrence; advance the current system; be a phased solution

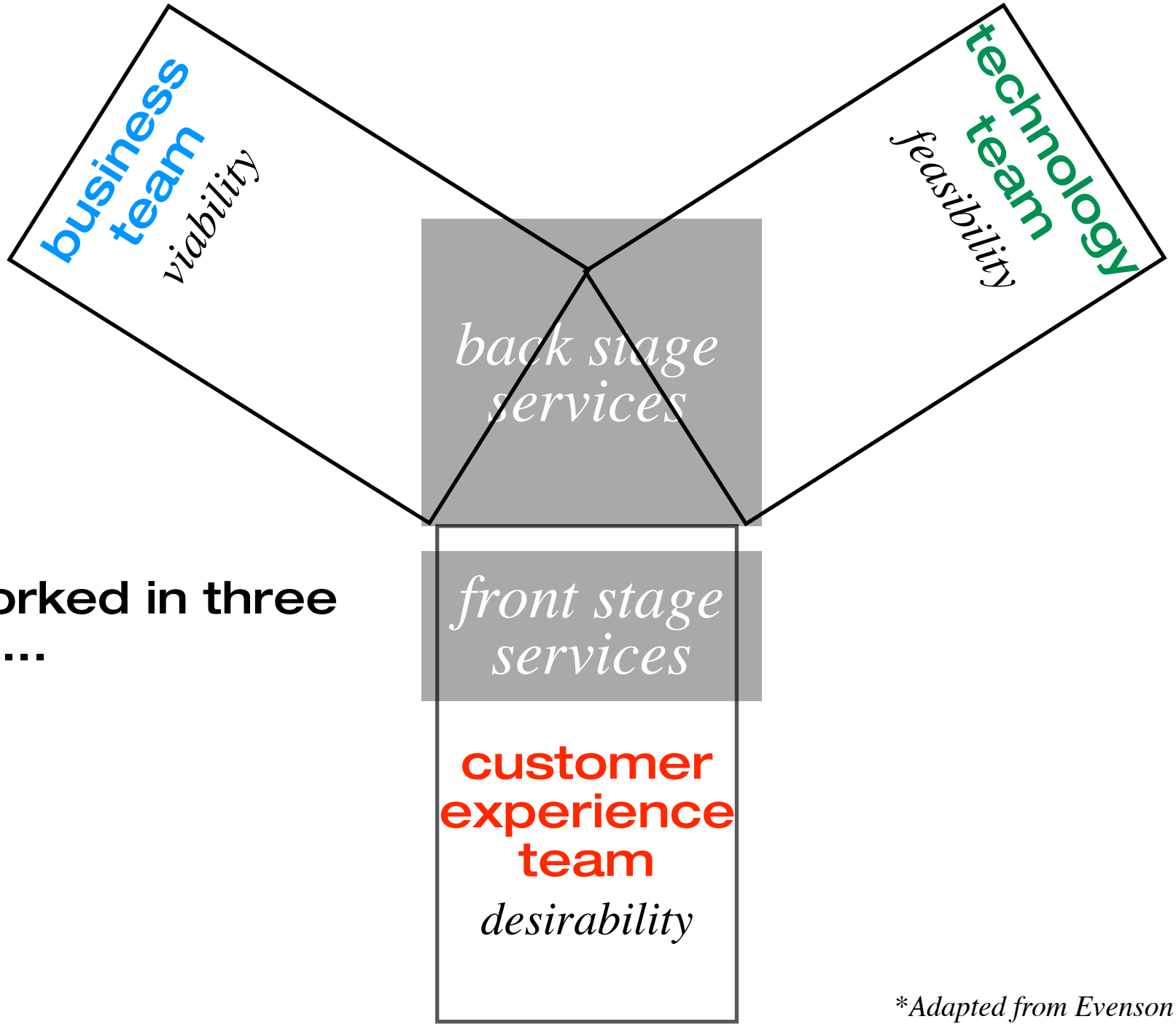
3. The program should not require net increased customer fees to develop and implement

Services should be understood and developed as an integrated system solution, not as individual parts

*back stage services**

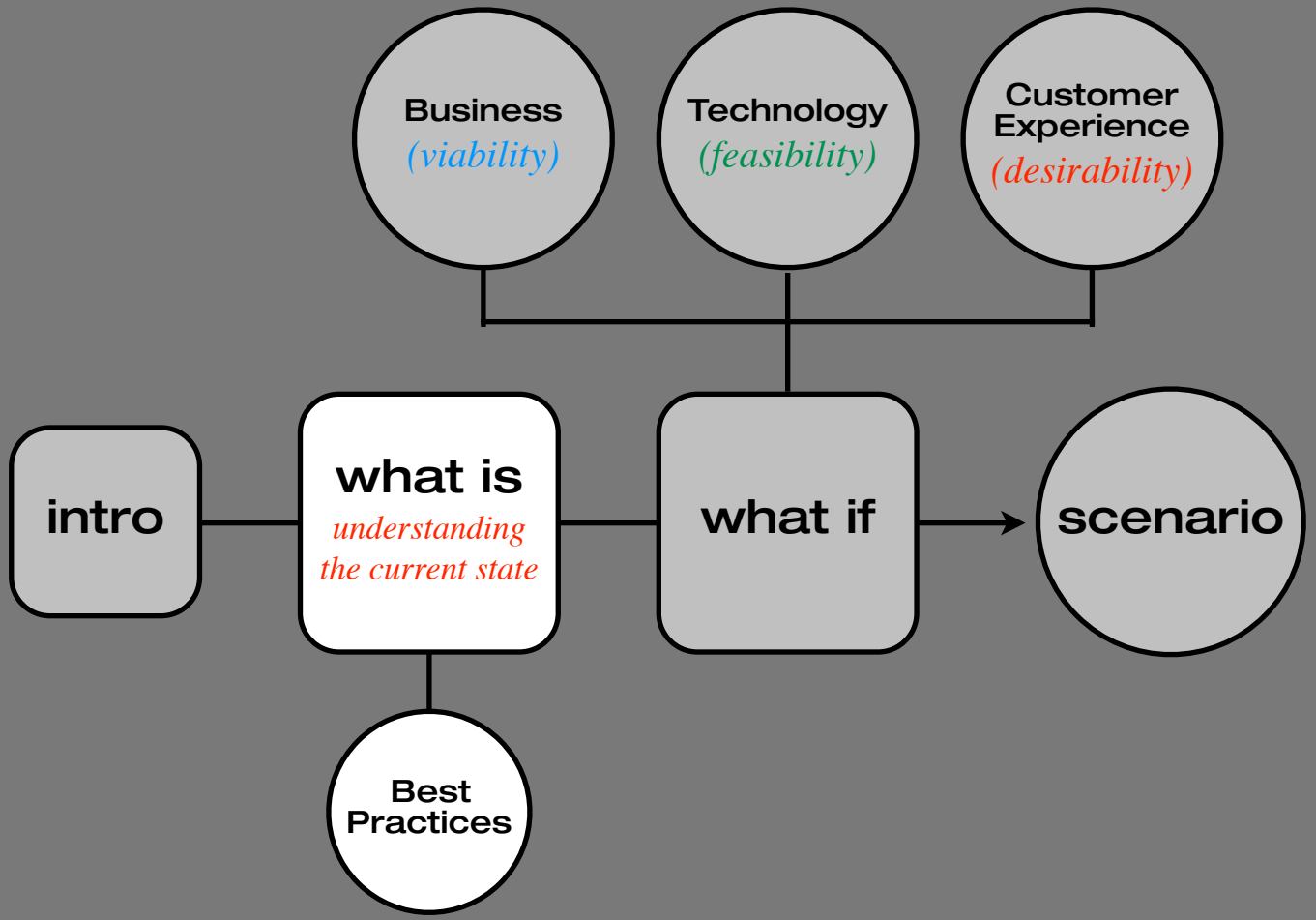
*front stage services**

**Adapted from Evenson & Dubberly*



We worked in three teams...

*Adapted from Evenson & Dubberly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What we think Lawrence is currently good at...

- Composting - over 13,000 tons of material was recycled by the Solid Waste Division with 98% compliance in preferred containers
- Commercial cardboard and paper revenues last year totaled approximately $221,000
- Making sure trash is picked up, no matter the circumstances

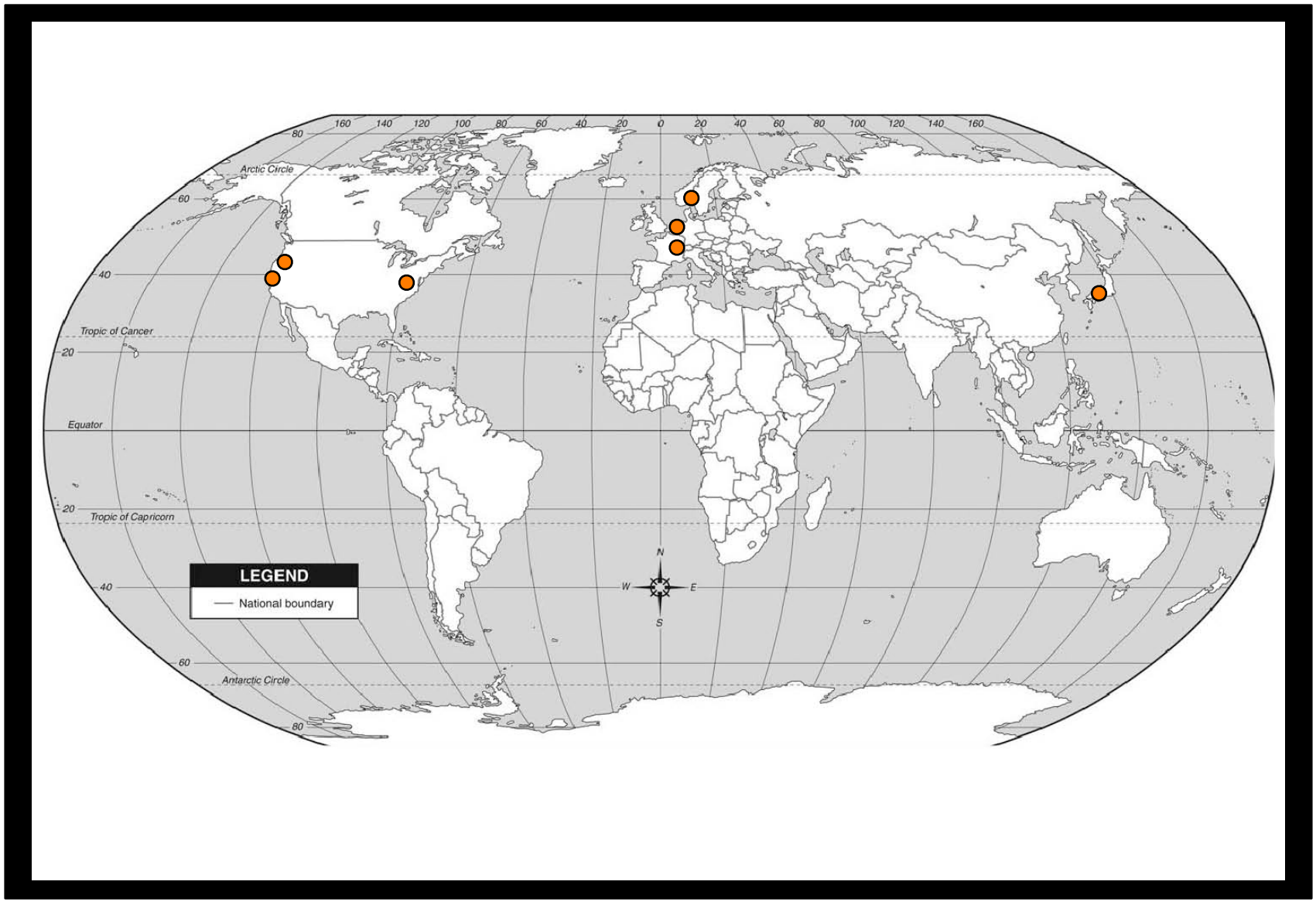
City of Lawrence KANSAS

LAWRENCE WASTE REDUCTION & RECYCLING

Hamm Landfill is Cheap!

Tipping fees ~ $20/ton

Best Practices in Waste Removal Services



International

European Union

The European Union (EU) have reached the most advanced state in waste management in the world. How?

- Extensive source separation and material and energy recovery from wastes have led to a constant decrease of land-filled material.
- Policy-making in the field of waste management is primarily driven by environmental objectives.

(International Solid Waste Association Report)

Sweden

Multiple neighborhood recycling drop-off locations

Burn waste = electricity

International

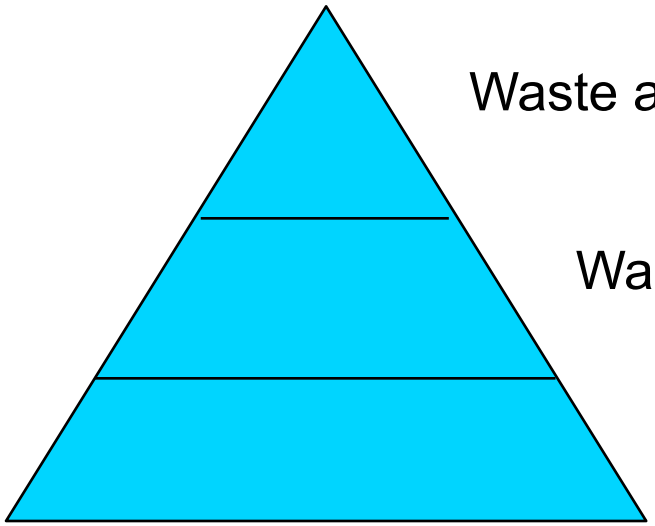
Germany

"Avoidance, recycling, environmentally sound disposal!"

Goal: to achieve recycling-based economy that conserves resources and the environment

The Act for Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal was enacted in 1996

(owners or generators of waste are responsible for waste avoidance, recovery, and disposal)



Waste avoidance

Waste recycling

Wastes that can neither be avoided nor recycled

International

Zurich, Swiss

- Zuri-sack: purchased from the government at $5 Swiss francs (~US $4.25). a piece.
- Household trash has reduced in 40% since 1992 and now packaging is minimal (Zurich's Logistics and Recycling Bureau).
- Power plants now burn trash from Germany.

Kyoto, Japan

- Fee-based collection program introduced in 2006 yielded a 16.5% drop on household waste weight in just 9 months.
- $1 yen (~US$.86c) per litter of household trash, and about half that price for recyclables.

National

Seattle, WA

- Two-year education campaign launched before formally enforcing the ordinance on January 1st, 2006 prohibiting recyclables from commercial and residential garbage
- Awareness of the recycling ordinance increased by 50% and overall support of Seattle's recycling regulations grew to 82%.

San Francisco Fantastic Three Program:

- State of CA's 50 percent waste diversion goal
- 30% of the waste in SF was found to be food discards – which could be used for composting
- Pilot program launched in July 1997, households surveyed in September 1998
- Recycling and composting service is included in the rates residents pay for trash, at no extra cost -- residents actually save $$ for being able to use smaller trash bags.

Encouraging Recycling through Financial Incentives

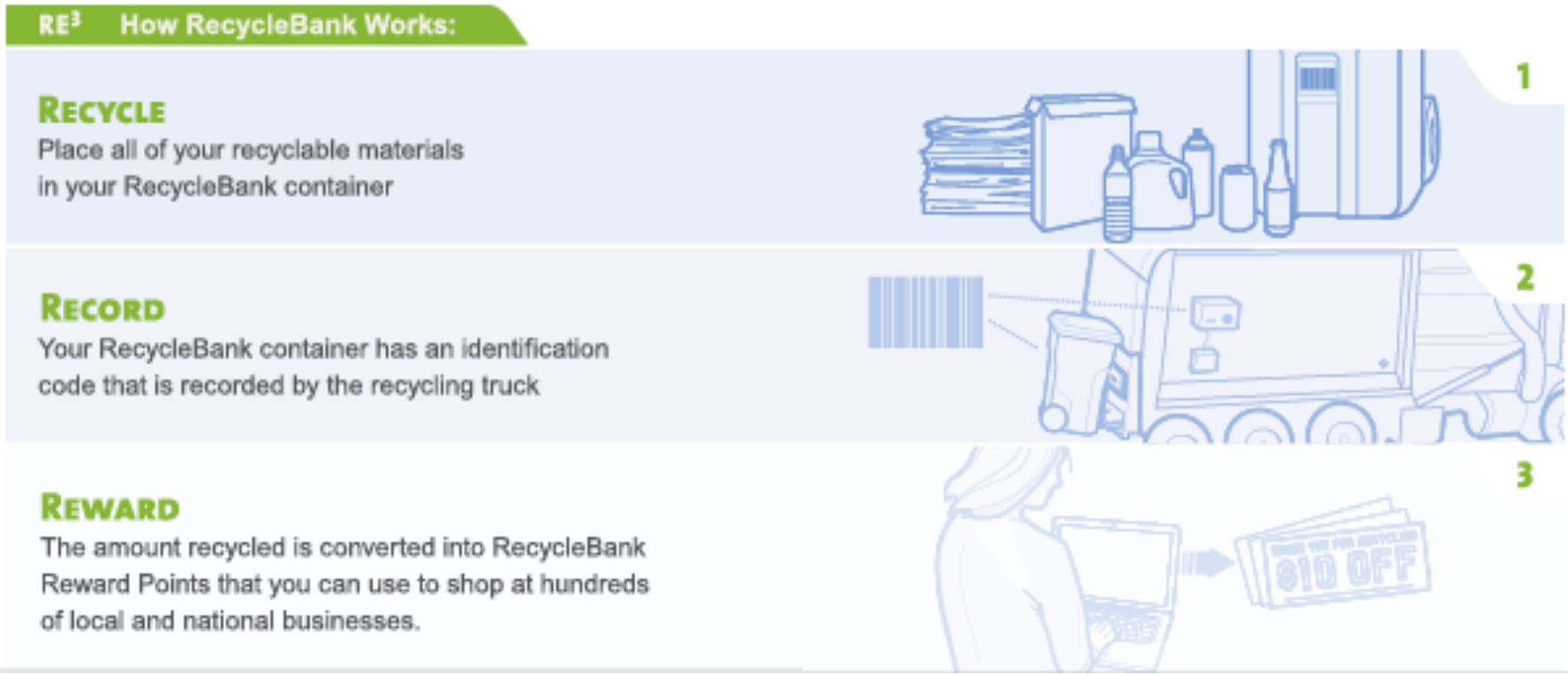
- Community-based social marketing is based upon research in the social sciences and demonstrates that:

  "Behavior change is most effectively achieved through initiatives delivered at the community level, which focus on removing barriers to an activity while simultaneously enhancing the activity benefits." — Dr. Doug McKenzie-Mohr

- RecycleBank as an example - linking with communities to dramatically increase recycling rates

- "Make the process easy for residents, where all curbside recyclables are placed in one cart, and offer rewards for participation." – Ron Gonen, CEO and cofounder

RecycleBank Rewards You For Recycling



How it works:

- Everyone was given a free 48 or 96 gallon trash cart, embedded with an RFID chip
- The cart is weighed on the collection truck and the RFID tag associates that weight with the individual household
- The more a resident recycles, the more rewards or credits they receive, which can then be redeemed at local and national partners

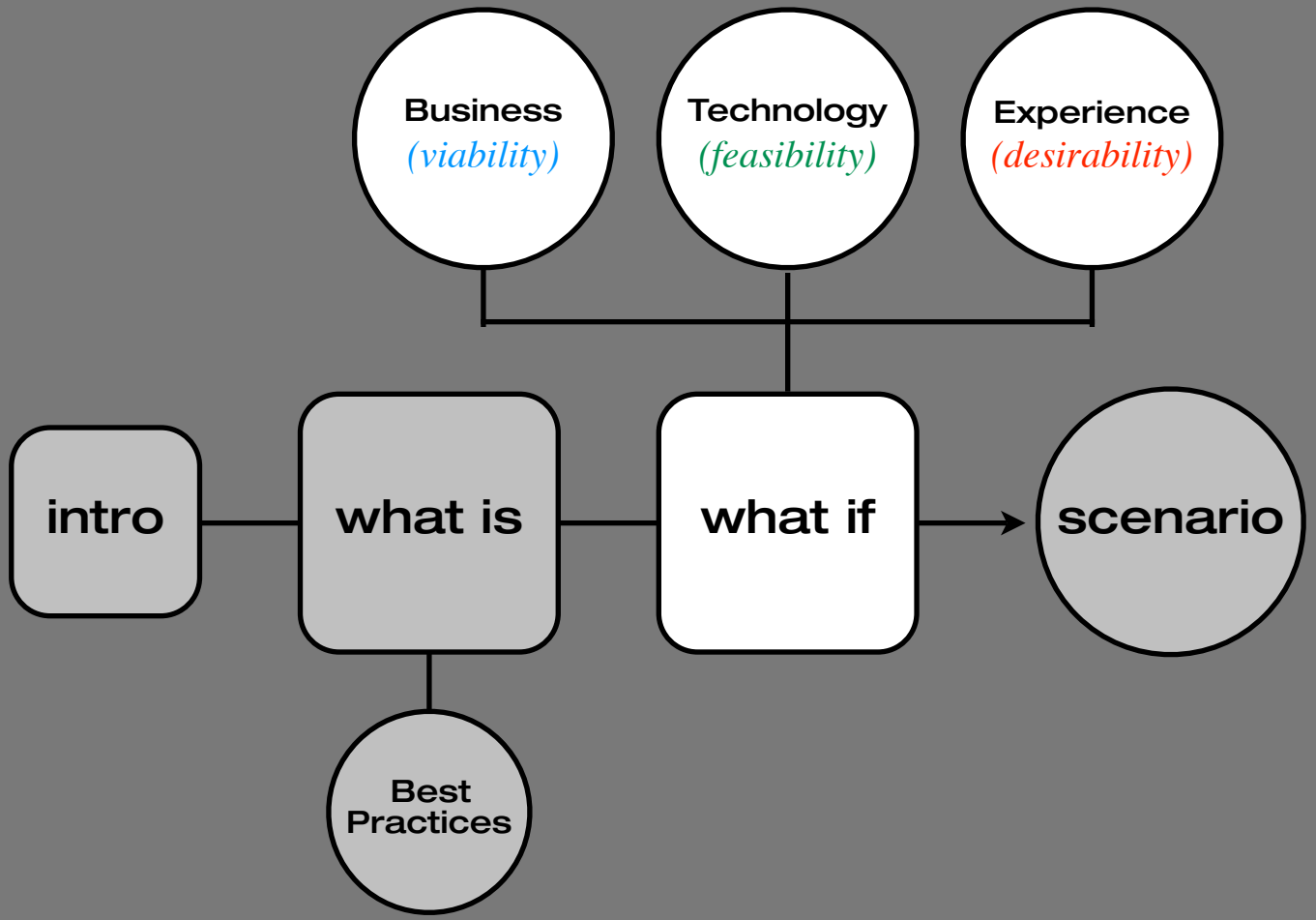
- in 2007 Wilmington, Delaware implemented RecycleBank citywide at no extra cost to the residents
- Pilot in June 2006 - 1,200 residents tripled participation in a matter of months from 30% to 90%
- Collection is provided two times weekly, with recycling service replacing one of two trash set out days
- Wilmington has achieved nearly a 35% diversion rate from the landfill with 90% compliance on a biweekly basis - forecasted savings at 40-45% diversion rate
- $150,000 price increase to the city's $3,500,000 annual budget - will save money in the long run paying RecycleBank instead of paying the landfill tipping fees
- Determined that by building a $4,500,000 recycling sorting facility will save $22 million over time in landfill fees, and eventual landfill expansion that would need to occur.

What we've learned...

Lawrence City has made real progress on waste and recycling services for over the years, establishing a recycling rate of approximately 34% (by weight), the highest in Kansas.

Lawrence City is already doing a good job of curbside and other collection of trash and yard waste. Nevertheless, the recycling rate of household materials could be significantly improved by increasing collection effeciency and by reducing barriers to household recycling.

What's the next step?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What would make an improved system feasible?

TECHNOLOGY

Technology *(feasibility)*

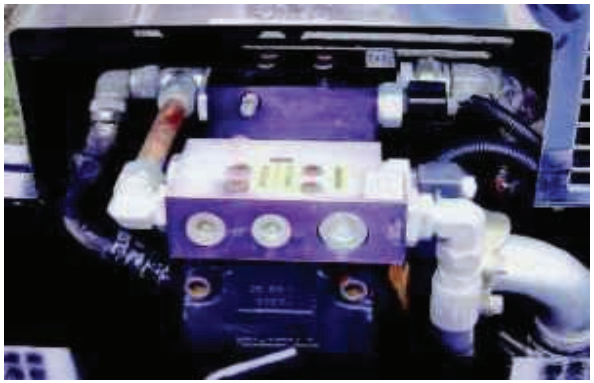
Automated Trash Collection

The Curotto Can technology affixed to a (phased-in) fleet of front-loading trucks affords significant labor savings, and allows a single driver to visually inspect container contents from the driver's seat.

Technology *(feasibility)*

Efficient Truck Idling Systems

Reduces fuel consumption from 15-30 percent
Longer pump life
High reliability
Quiet operation
Lower operating temperatures
Cuts up to 15 percent of time on route
Less operator fatigue



Technology *(feasibility)*

GPS Tracking

Data Mining from GPS can help with the following information:

Data Mining - Input
GPS - Location/Time
Engine Computer - Diagnostics,
Fuel Gauge, Start/Stop, Idle Times
Automated Pickup - Weight

Cross Reference the following data
Location - Time
Location - Gas
Time - Gas

- Establish patterns both positive and negative from data review
- Adjust variables and continuously evaluate
- Used in combination with Route Management Software would create an incredibly valuable history of data that can increase efficiency by saving time and money

Technology *(feasibility)*

Composting Efficiencies

Using a nitrogen rich additive can accelerate overwinter composting.

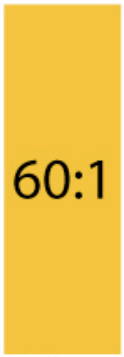
Fill hopper with yard waste.

Throw additive into hopper.

Run hopper to mix additive.

ideal ratio
30 : 1
carbon : nitrogen

grass



foilage

Rearloader = 25 cubic yards

25 cubic yards of leaves = 60:1

30:1 = 180oz of nitrogen

180oz of nitrogen = 7 gal of urea

Note: In the fall, the Carbon to Nitrogen ratio is out of balance due to the increase in foliage. This results in large areas that do not compost for months. To offset this, a nitrogen rich additive is added to maintain the ideal ratio and expedite breakdown.

What could make an improved system feasible?

- The Curotto Can technology combined with front loading trucks would cut collection labor costs by approximately 66%, freeing-up employees for “back stage” sorting of household recyclables at a to-be-built and scaled-up collection center.
- Efficient Truck Idling Systems will significantly improve fuel and route time efficiency
- GPS technology can increase truck routing efficiencies and systematization.
- Using nitrogen-rich additive can accelerate over-winter composting, probably saving the costs of expanding currently maxed-out composting site.

What would make an improved system desirable?

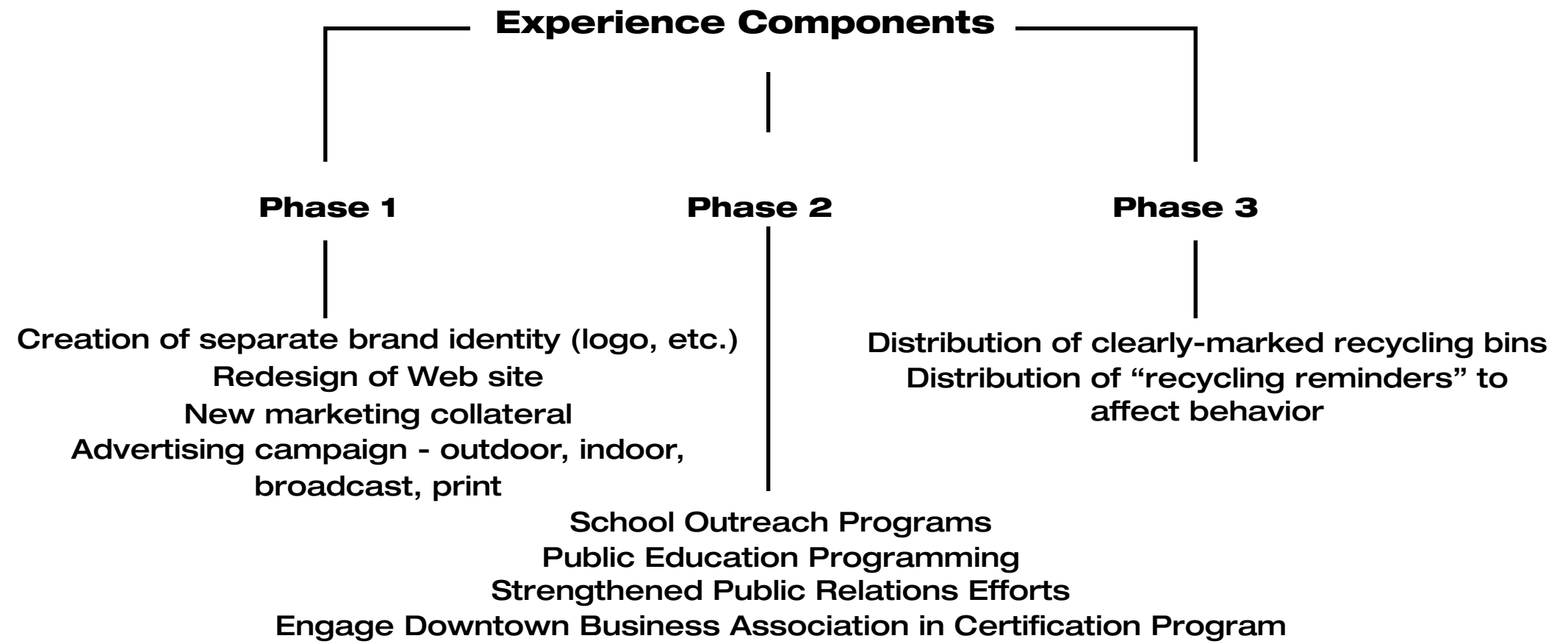
CUSTOMER EXPERIENCE

Customer Experience *(desirability)*

A sustainable waste management and recycling program requires a customer experience that is polished and effective at every touchpoint. A reliable, rewarding experience encourages customer loyalty.

Re-imaging the Lawrence Solid Waste Management brand would yield a more visually integrated customer perception of services and facilitate the marketing of future enhanced recycling services.

Customer Experience *(desirability)*



Customer Experience *(desirability)*

Phase 1

New Identity for Lawrence Waste Management System

New Brand for City of Lawrence Solid Waste Division

Separate identities for each division of current system is confusing. To help foster communication and education, a single monolithic identity should be established to reference all waste management, recycling and composting activities within the city.

Unified brand will build positive perception of waste management system, and project more professional image.

City of Lawrence
Solid Waste Division

LAWRENCE WASTE REDUCTION & RECYCLING

LAWRENCE WASTE MANAGEMENT

(facsimile, not intended to imply new logo)

Customer Experience *(desirability)*

Phase 1

Update current LawrenceRecycles.org web site

Web site will:

- Serve as primary info source about city's waste management system.
- Reflect new brand identity
- Be easy to navigate
- Be able to provide quick reference for customer questions.

Contact form allows users to ask questions of staff and provide for more personalized responses.

Customer Experience *(desirability)*

Phase 1

Provide new high capacity polycarts for automated routes

A sticker would be placed on top of bin to make customers aware of recyclable materials they might be about to throw away

Customer Experience *(desirability)*

Phase 2

Education and Public Relations Campaign

New automated pickup requires some alteration of past practice. Info guides would be distributed to customers being phased into the new system

New Waste Management Guide is distributed to customers to acquaint them about recycling programs, composting, hazardous waste, etc. Replaces 30+ brochure currently in use

Handy fridge magnets show the whole family customers what's recyclable

Customer Experience *(desirability)*

Phase 2

Education and Public Relations Campaign

Coordinated public relations and public affairs effort will help change perceptions locally. These efforts include:

- *Expand outreach education to schools*
- *Strengthen public relations efforts*
- *Engage community businesses in a possible certification marketing program*
- *Redesign existing recycling brochure: simpler, more visuals*

Customer Experience *(desirability)*

Phase 3

Implement Curbside Recycling Program

Distribute curbside polycarts for “single-stream” recycling of all household recyclables. Recycling polycarts are different color and clearly labeled as distinct from garbage polycarts.

Apartment complexes and communal recycling areas (like this one from Germany) will be set up for ease of pick-up by new front-loading trucks

What could make an improved system desirable?

- Re-image the Lawrence Solid Waste Management service
- Update current LawrenceRecycles.org web site
- Provide new high capacity polycarts for automated routes
- Education and Public Relations Campaign

What would make an improved system economically viable?

BUSINESS

Business *(feasibility)*

Goal

Produce full economic value from waste by reducing trash and recycling collection costs

Strategy

Implement a program for easy household recycling that creates incentive for recycling compliance

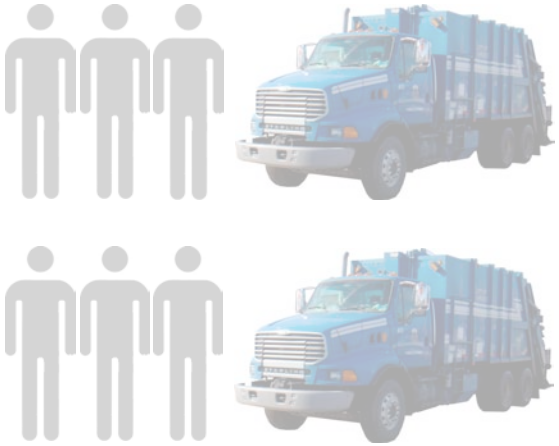
Tactics

Increase automation
Create commercial advertising opportunities
Implement curb side recycling gradually across Lawrence

Business *(feasibility)*

Current State

Two trucks purchased each year requiring a crew of three to operate.



Proposal

Annually purchase two automated front loading trucks to run alternating trash and recycling routes. Use less labor to expand service possibilities.

Business *(feasibility)*

Current State (2008)

Residential curb side pick-up only includes waste and composting

Phasing State

Purchase new trucks, reallocate labor, phase-in recycling route by route

Final State (2015)

Bi-weekly curb side recycling for all of Lawrence

Business *(feasibility)*

Reallocated Labor

Labor that was invested in waste pick-up would be applied in a single stream recycling center. This facility's recycling capabilities would be gradually expanded.

Business *(feasibility)*

Advertising Revenue

Allow businesses to buy space with waste management. This provide a new stream of revenue for the city and allow businesses to associate themselves with the best recycling city in the state.

Business *(feasibility)*

Individual

Customer sets out recyclables on the curb

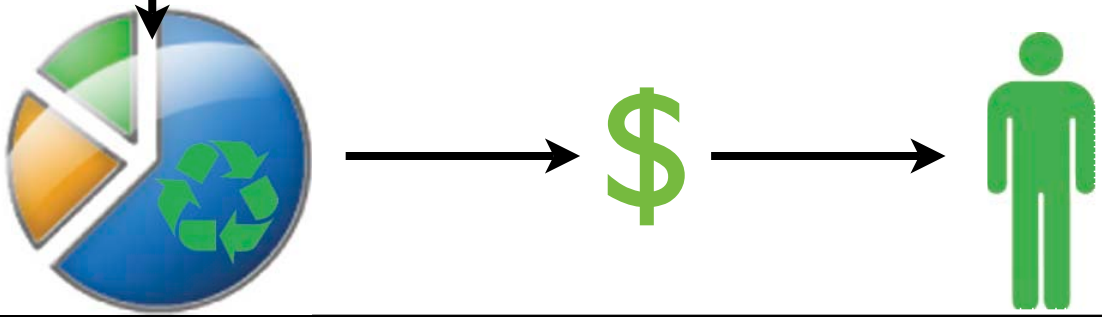
Method of generating recycling incentive

Waste Management

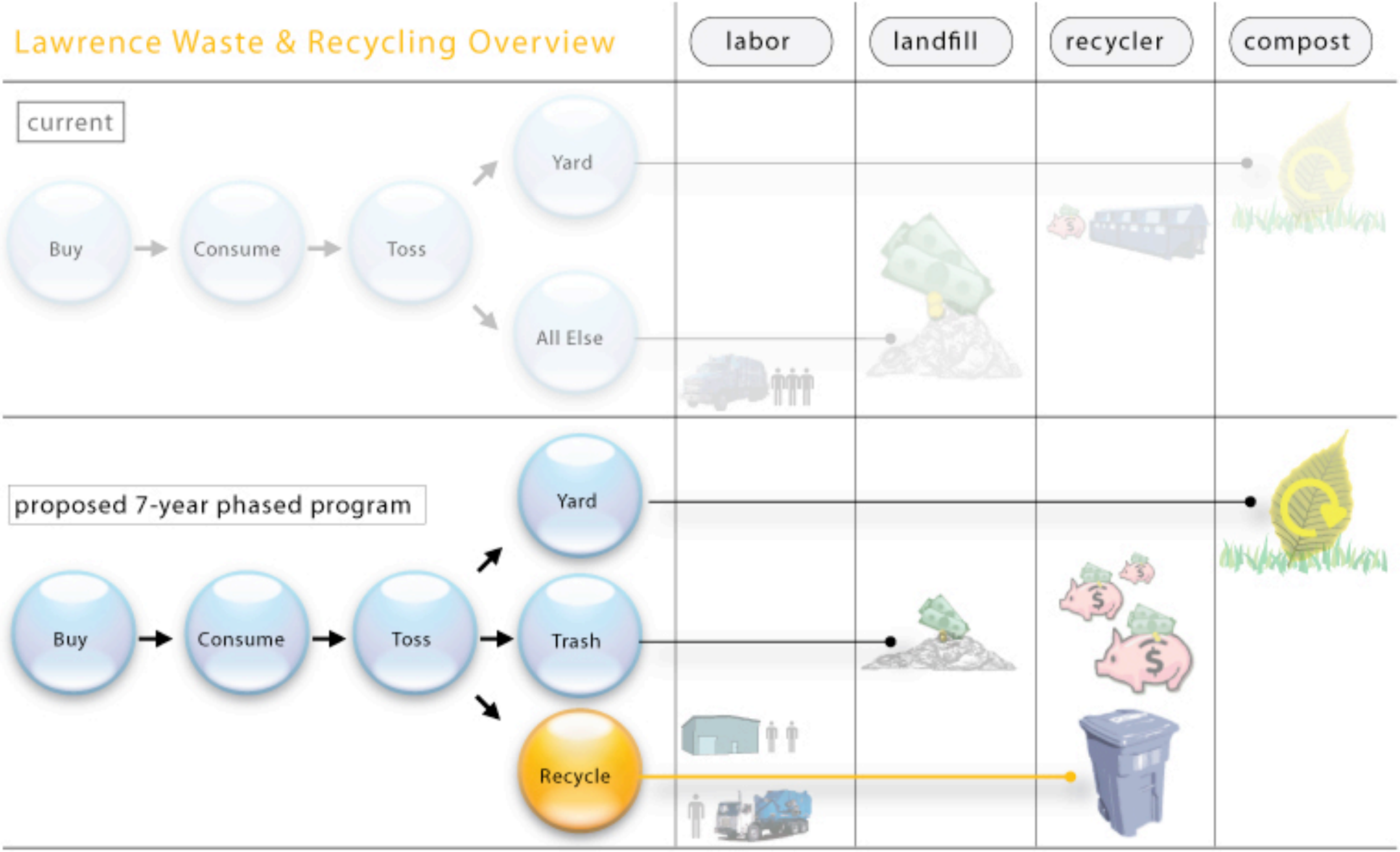
Lawrence Waste Management dumps less garbage (pays smaller tipping fees) and sells more recyclable material

City

City calculates percentage of recyclable revenue per route and rewards route with highest recycling rate



Lawrence Waste & Recycling Overview



Service

Introducing full residential curbside collection & recycling service.

Efficiency

Front loading trucks equipped with the Curotto Can reduces risk of injury, manpower and truck idle time.

Recycling

New incentives and convenience for residential customers reduces barriers to recycling compliance.

Cost

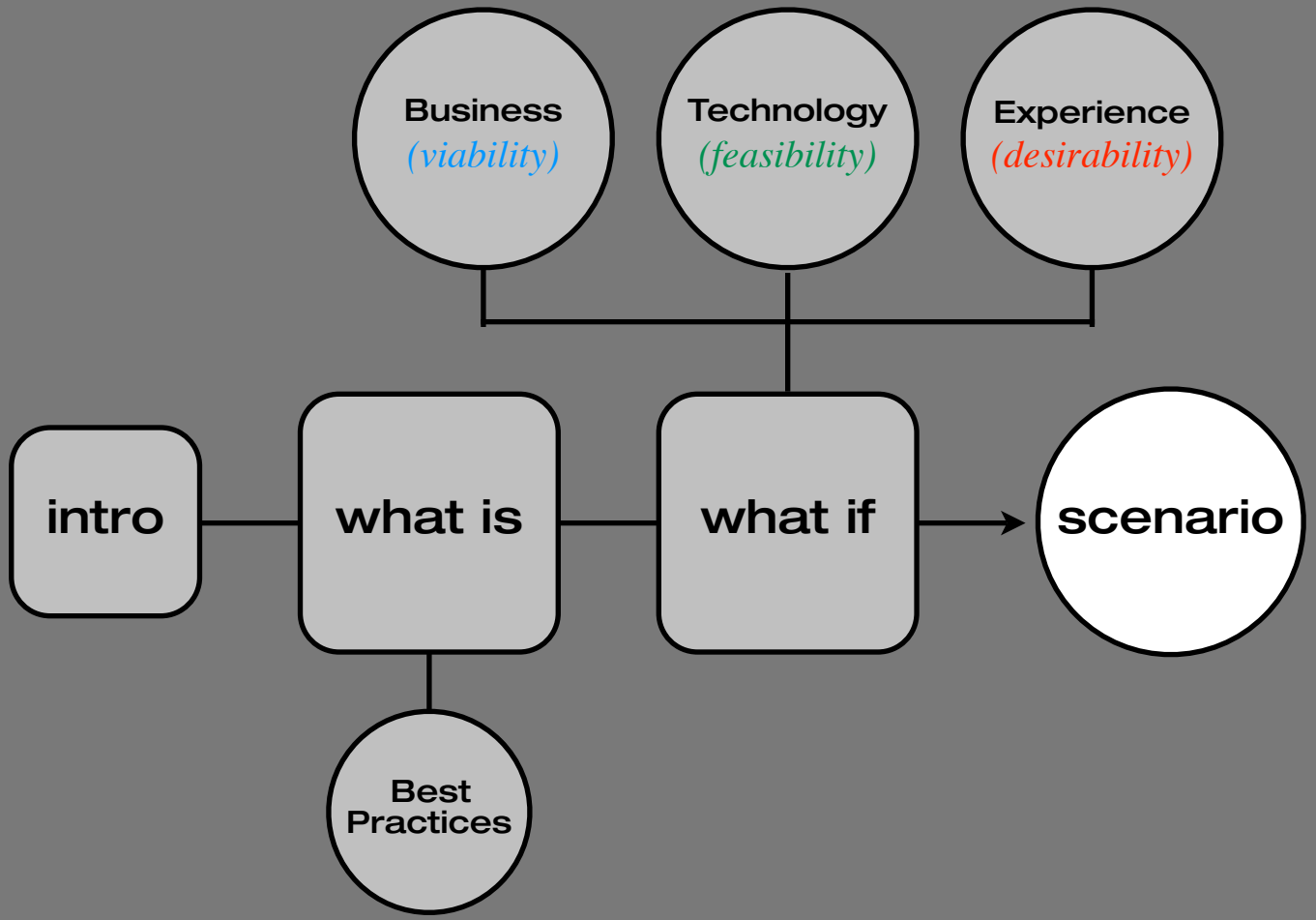
Increasing revenue from recycables combined with higher labor efficiencies offset startup capital for curbside recycling service.

Landfill

An increase in recycling leads to a decrease in landfill tipping fees.

What makes an improved system economically viable?

- *Reallocation of labor*
- *Advertisement revenue*
- *Reduced tipping fees*
- *Reduced household waste-to-recyclables ratio means fewer trash pick ups. Trash collection and recyclables collection occur on alternate weeks. Yard waste collection schedule remains unchanged, but is now automated. Compost is bagged and sold for profit.*
- *Higher recycling income*
- *Greater recycling with incentive program*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Front stage customer experience scenario, 2015

Margie and Bob Grayson are homeowners in central-west Lawrence. They've been married 12 years and have two children, Jenny 10, and Tommy, 7. Margie is a homemaker who does most of the family's shopping and budget duties. She has a strong sense of economy and tries to get the most value for her dollar.

One day about three years ago Jenny came home from school and mentioned how people from Lawrence Recycling had visited her school today and showed students how the new curb-side collection system worked. Jenny gave her mom the brochure detailing the program's specifics.

Margie knew something about the new program from articles in the *Journal World*, but hadn't yet figured out how it would affect her family. She read the brochure and put the info magnet on the fridge. They would have one year to recycle voluntarily, then everybody in their neighborhood would be expected to participate in the program.

Margie later filled out the registration card and mailed it off with her water and trash bill. The next week a new poly trash cart and a recycling bin were delivered to the Graysons. They were now ready to begin!

Immediately Margie's family begins sorting recyclables and putting them out to be hauled away. They had periodically dumped materials in the bins outside the grocery store, but not nearly everything that could be recycled.

Encouraged by the drastic reduction in their household waste, the Graysons tell their neighbors about the curb-side program and its incentives.

The following week, the Grayson's trash and recyclables were collected by Lawrence Waste Management. The trucks are later weighed and recycling performance displayed, by neighborhood, every month on the website. Margie reviews the site periodically to see how her neighborhood recycling rates compare to other neighborhoods in the city.

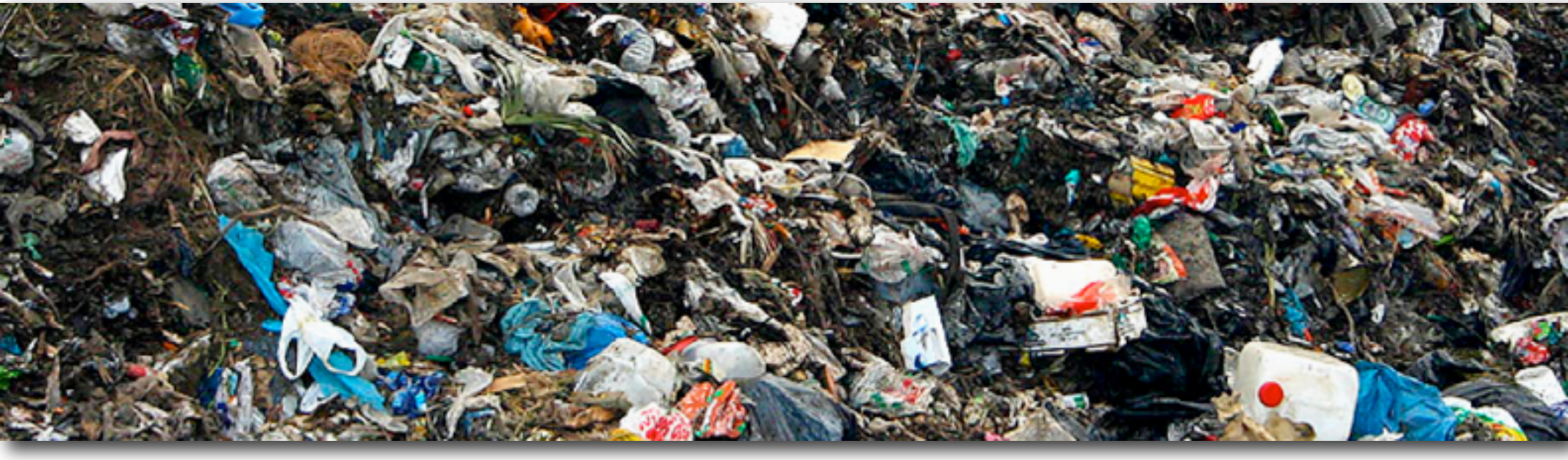
The Graysons shop and buy gas at area grocery stores and gas stations that participate actively in the Lawrence Waste Management program

At the end of the year the Graysons got a check from Lawrence Waste Management that was calculated on a percentage of the revenues and cost savings generated from the program. Last year, their neighborhood ranked second city-wide for recycling performance. For that they and their neighbors got an additional bonus! Next year they want to be number one!

In return for their recycling help around the house, Jenny and Tommy get to deposit the money earned into their college savings accounts.

Thank you!

Designing Sustainable Waste & Recycling Services



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