Oyster Aquaculture

Context:

- West/Rhode rivers are dead! (No underwater grasses, limited wildlife)
  - Affects watermen that need a healthy river and their supply chain/buyer chain
  - Affects homeowners and their supply chains
- Inability to grow underwater grasses to sustain wildlife due to excess *nutrients* in the water (nitrogen, phosphorous).
- Excess nutrients are the catalyst to a downward spiral that causes dead zones in the rivers (excess algae bloom, reduced SAV, algae die-off, algae decomposition, no oxygen, unhealthy habitat).
- Excess nutrients from Susqhuena River.
- Can't stop nutrients coming is, so try and take them out using bi-valves
- Tried clams, which exhibit frequent reproductive cycles, but unable to sustain a population due to low salinity levels that can occur due to natural weather patterns (i.e. rain)
- So try oysters, but due to infrequent reproductive cycles (once every 3 years), need to artificially grow the oysters

Stakeholders:

- Waterman – earn living harvesting oysters
- Local Businesses – supply watermen equipment and resources
- Local businesses – dependent on watermen for affordable supply of fresh oysters
- Riverkeeper – advocate for river across all stakeholders. Mostly funded by homeowners, recreational river users, and local businesses
- Homeowners – want clean, safe, affordable river

Tension #1: no one owns the whole problem and can solve in economically viable way (businesses in NY and Penn use nutrients that end up in bay)
Tension #2: watermen vs environmentalists

Problem/Need:

- Develop an economically viable aquaculture business that can sustain: (1) a population of oysters to maintain acceptable nutrients levels in the rivers (to start positive growth cycle) and (2) harvesting of oysters for watermen and local businesses

Inputs:

Salinity levels in bay/river
Nutrients in bay/river
Other river environmental parameters
Tidal flow
Cell attributes
oysters and stage of growth

Acquisition costs of aquaculture equipment
Operational costs of aquaculture enterprise

Outputs:

River turbidity
Oyster biomass

ROI, NPV, Breakeven
Cost vs utility for design alternatives

Design Alternatives:

1) Methods for growing oysters
    a. Larvae
    b. Seed
    c. Spat-on-shell
2) Oyster product
    a. Half shell
    b. Shucked/canned
3) Distribution
    a. Wholesale
    b. directsales

Training and Evaluation of Time Sensitive Operations

Context:

- State referee association is measured based on quality of refereeing
- State referee association must assign referees to different levels of games (games grade 8, 7, 6, 5) based on referees ability
- State referees association has very few refs that grade 7, 6, 5
    - No incentive (e.g. $) to move from grade 8 to 7,6,5
    - Limited number of assessors
- State referee must assign referees without knowing which are the best referees
- The lack of development of quality referees at the state level also impact the development of national and international referees
    - Has impact on the quality of national players and player development

Stakeholders:

- State referee association – need to develop referees by assigning competent refs to better games
- Referees that want to progress – need to officiate at better games
- Players and Developmental coaches – want quality refs to develop better players

- USSF – wants to develop international class referees
- USSF – want s to develop world-class players

Tension #1: State referee association hands tied by lack of funding and system of incentives
Tension #2:

Problem/Need:

- (for the purpose of assigning the best developing referees to better games) identify the grade 8 refreees that are capable of refereeing higher level games (i.e. grade 7, 6, 5)

Inputs:

Ball position probabilities
Event probabilities
Referee characteristics

Outputs:

Call accuracy
Cost vs utility for design alternatives

Design Alternatives:

1) Alternative referee characteristics (speed, prediction, ….)

Greenhouse Gases\Carbon Neutral Airport

Context:

- To maintain quality of life, the quality of natural resources (i.e. water and air) are regulated according to federal (e.g. NAAQS), state, and municipal standards
  - A region is considered to be in non-attainment if it does not meet standards
- Most regulations are for stationary sources of emissions. Regulations for non-stationary sources are coming (e.g. cap-n-trade)
- Airport operations generate emissions
  - Airside
  - Terminal
  - Ground access/landside
- Airports operations based on autonomous enterprises that interact
- Airport managers must coordinate activities to ensure remain in attainment of water and air quality standards

Stakeholders:

- Airport operators – must coordinate activities of all Airport service providers to ensure remain in attainment of water and air quality standards
- Airport service providers (e.g. airlines, concessions, rental cars, …) - need to operate for profitable business. Will do "right thing" if profitable
- Homeowners – want quality water/air
- Businesses and regional homeowners – want affordable air transportation services
- Politicians – want affordable transportation services (to grow local economy) AND clean water/air (to keep constituents safe and happy)

Tension #1: profit and affordability vs do the right thing
Tension #2:

Problem/Need:

- Develop carbon neutral airport

Inputs:

Flights per year (with fleet mix)
Stationary and non-stationary sources of emissions (coefficients for models of emissions)
Usage characteristics for stationary and non-stationary sources of emissions

Outputs:

Emissions inventory output
Cost vs utility for design alternatives

Design Alternatives:

- Reduce energy needs
  - ….
- Maximize energy efficiency
  - Mass-transit, Hybrid vehicles, …
- Renewable energy sources
  - Electric vehicles….
- Offsets
  - ….

Needs more work to define explicit design alts.

Space Exploitation

Context:

- Resources on earth in short supply
- Resources exist in space
- Cost prohibitive to min/manufacture resources in space
- Several **independent** enterprises are attempting to leverage resources in space
    - Space tourism, satellite debris collection, asteroid protection, exploration, …
- What if these enterprises "pooled" their resources or coordinated their activities to reduce the costs of access to space and create synergies
    - Coordinated stepping stones into space

Stakeholders:

- Miners/Manufacturers – profitable operations
- Space-based users of space mining/manuf - affordability
- Earth-based users of space mining/manuf – affordability
- Suppliers of equipment to space enterprises
- Governments – protect citizens, open new markets
- Insurance companies – economic liabilities
- Space enterprises:
    - Tourism, satellite debris, ….

Tension #1: who should have access to space for what purpose (e.g. Moon Treaty)
Tension #2: who should have to pay for development and risk (i.e. investment in space or poverty etc. on earth

Problem/Need:

- Identify alternate feasible sequences of "stepping stones" into space to make mining/manuf economically viable

Inputs:

Costs of alternate stepping stones
Value of space resources

Outputs:

ROI
Cost vs utility for design alternatives

Design Alternatives:

- Alternate stepping stones into space **generated by running the simulation**

Enterprise Modeling

Context:

- Government contractors depend on successful proposal generation
- Proposal generation is COST CENTER for an enterprise (i.e. it does not directly generate profit. It is overhead)
- Proposal process must meet organizational expectations for: quality (i.e. win rate), time, cost/effort
- Proposal generation process has 4 steps, ….
- Each step in process is characterized by type of activity:
    - Decision-making
    - Networking
    - Recall
    - Manual labor

Stakeholders:

- Staff assigned to work on proposals – get highest quality work done in a timely manner
- Capture managers – quality (i.e. win rate)
- Senior management – costs and resources

Tension #1: tradeoff between quality, cost, effort

Problem/Need:

- Improve the quality, time and cost of proposal generation process
- Understand the trade-off between quality, cost, and time

Inputs:

Probability of proposal complexity
Quantitative process steps characterization (decision-making, ….)

Outputs:

Time, cost, quality
Cost vs utility for design alternatives

Design Alternatives:

- Staffing
- New tools (e.g. data-base)

Needs more work to develop design alternatives based on explicit definition of tasks.

Health Care Analytics

Context:

- Heathcare costs are soaring
    - Driven by **several** reinforcing scenario
        - The higher they get , the less people insured, the higher the insurance rates.
        -
- Healthcare efficiency in US poor compared with other counties.
- Digital health record keeping is mandated by the government
- Digital health records (e.g. Public Use Files) are available to the public to use for improving the health care system
- **.puf** digital health records can be applied at various levels of the health care system:
    1) Patient/doctor health management for patient visits and wellness checks
    2) Facility logistics (e.g. doctors practice, hospital, …)
    3) Regional and national trends
    4) …
- What level ? facility – what facility?

Stakeholders:

- Depends on above decision of level

Problem/Need:

- Leverage digital health records to improve quality, reduce costs and reduce illness time
- Understand the trade-off between quality, cost, and time

Inputs:

Outputs:

Design Alternatives: