OR Problems in BPO

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Talk Outline

- Traffic Estimation
- Resourcing
- Transport Scheduling

A BPO Outfit

- What do they do?
  - Technical support for foreign products.
  - Typical customers: Sun Microsystems, Norton Antivirus (Symantec).
  - Paid for calls answered. Big Issue: Calls missed.
- Staffing
  - 4000 employees all over Chennai.
  - 27 overlapping shifts of 8 hours each.
  - At one time, easily 2000 people can man the desks.
  - Different employees have different and possibly more than one skill-sets.
  - All employees must be picked up and dropped from home.

Traffic

- Loss of a call is revenue missed.
- Loss of an employee is $ 110 of revenue missed.
- Monthly salary about Rs. 5000 to Rs. 20000 (i.e., $ 120 to $ 500)

Question 1: Estimate the traffic (calls/slot[1]) per client, given past data.

This helps in planning the staffing requirement for the slot.

[1] A slots is 30 minutes

Approach and Issues

- Past Data
  - data for 6 months, 24/7.
  - grouped client-wise and slot-wise.
  - later, client-side holidays.
- Observations
  - Two lean periods in a day and a bell-shaped peak period in the middle.
  - 10am to 4pm is peak. Peak is flat-top bell and has call-rate 20 times lean period.
  - Mondays and Fridays are different.
  - Pre- and Post-holiday is very different.

Solution

- Tackle Ordinary days
  - Peak-period observations taken as samples.
  - 3-piece polynomial curve fit for the peak period.
- Procedure
  - Compute the slot-mean and slot-variance.
  - throw away the vaiance and use the mean as sample.
  - fit a piece-wise polynomial.

Delicate matters

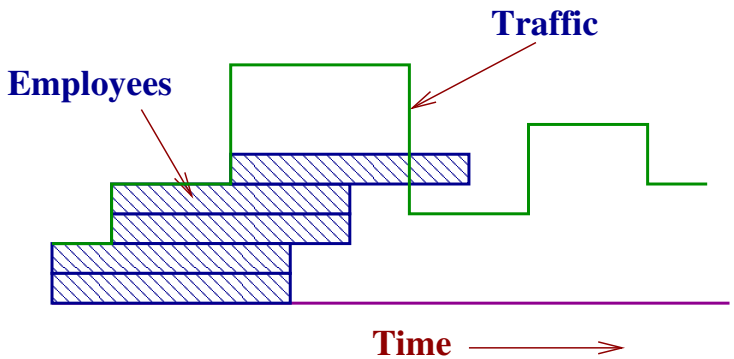
- Error estimation
  - this revealed a fewer piece approximation did not work.
  - fore-casting against observed data.
- Results
  - Ramping-up and Ramping-down accurate to 5 %.
  - Peak period variance too much.
  - For peak period, conservative estimates best, i.e., throw away points well below the mean.

Question 2: Resourcing

- Input
  - Slot-wise client requirement data.
  - Employee skill (client-handling) data.
- Constraints
  - 8 hour slots per employee with 16 hour off-time.
  - For every slot, a multi-skilled person MUST be committed to a particular skill.
  - staffing must match or exceed requirements.
- Costs: number of employees.

Single client

- When-ever need felt, call an employee.
- This greedy strategy is optimal.
- Proof: Postpone optimal strategy to get greedy.



Question: How to tackle multiple clients?

The Transport Problem

- Employees must be dropped and picked up at home.
- Women employees may need special care.
- Housing all over Chennai.
- Four office location, alas offices nearby.
- Cars, Vans, Sumos and Innovas to be deployed.
- Cost per employee about Rs. 2000 per month.
- About 270 employees per shift.
- Time taken during peak and non peak hours available.
- No employee to travel for much longer than if she were to come by herself.
- Employee to be at the desk at least 15 minutes before slot time.

A first approach

- Handle one office and only pick-ups. Note that this is a severe restriction.
- Divide the city into 7 sectors and each sector into 5 segments at increasing distance from the office.
- Proceed from outermost segment inwards.
- Minimize pickups across two segments.
- Possibly easier to model the drop and pick-up problem in this model.

This is being implemented and tested against their past policy.

Issues with current solution

- How to better segment the city?
- Pick-up involves travelling to the door. This takes time. Routing within a segment is an issue.
- Any use for GPS data?
- Sensitivity of plan to sector marking. Is there a more global approach?
- One piece of data: 70% within 12km.
- Couple drop and pick-up.
- Couple different offices.

Thank you.